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*Supplement of*

## **Contrasting photosynthetic characteristics of forest vs. savanna species (far North Queensland, Australia)**

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**Table S1.** List of species measured with Site code (Table 1) and  $\Phi$  (Table S2) for the tropical moist forest species.

Site	Type	Species	$\Phi$ (forest species)	<i>n</i>
KBL-01	Forest	<i>Alangium villosum</i>	Sub-canopy	4
KBL-01	Forest	<i>Aleurites rockinghamensis</i>	Tall pioneer	4
KBL-03	Forest	<i>Apodytes brachystylis</i>	Sub-canopy	4
KCR-01	Forest	<i>Ardisia brevipedata</i>	Sub-canopy	4
CTC-01	Forest	<i>Argyrodendron peralatum</i>	Upper canopy	4
KBL-03	Forest	<i>Beilschmiedia tooram</i>	Upper canopy	1
CTC-01	Forest	<i>Cardwellia sublimis</i>	Tall pioneer	4
KCR-01	Forest	<i>Cardwellia sublimis</i>	Tall pioneer	5
KBL-01	Forest	<i>Castanospora alphanthii</i>	Upper canopy	1
CTC-01	Forest	<i>Cleistanthus myrianthus</i>	Upper canopy	3
DCR-02	Savanna	<i>Corymbia citriodora</i>		3
DCR-02	Savanna	<i>Corymbia clarksoniana</i>		3
DCR-01	Savanna	<i>Corymbia intermedia</i>		1
KBL-02	Savanna	<i>Corymbia intermedia</i>		4
KBL-01	Forest	<i>Elaeocarpus grandis</i>	Tall pioneer	1
KBL-03	Forest	<i>Elaeocarpus largiflorens</i>	Upper canopy	4
DCR-02	Savanna	<i>Eucalyptus portuensis</i>		4
KCR-01	Forest	<i>Eupomatia laurina</i>	Sub-canopy	5
CTC-01	Forest	<i>Haplostichanthus ramiflorus</i>	Sub-canopy	4
KBL-03	Forest	<i>Litsea leefeana</i>	Tall pioneer	1
DCR-01	Savanna	<i>Lophostemon suaveolens</i>		3
KBL-02	Savanna	<i>Lophostemon suaveolens</i>		4
CTC-01	Forest	<i>Mallotus mollissimus</i>	Small pioneer	4
KBL-01	Forest	<i>Neisosperma poweri</i>	Sub-canopy	4
KBL-01	Forest	<i>Neolitsea dealbata</i>	Small pioneer	4
KBL-03	Forest	<i>Neolitsea dealbata</i>	Small pioneer	4
KCR-01	Forest	<i>Neolitsea dealbata</i>	Small pioneer	6
DCR-01	Savanna	<i>Planchonia careya</i>		6
KCR-01	Forest	<i>Polyscias elegans</i>	Tall pioneer	4
CTC-01	Forest	<i>Pseuduvaria froggattii</i>	Sub-canopy	4
KBL-03	Forest	<i>Sloanea australis</i>	Upper canopy	4
KBL-03	Forest	<i>Symplocos hayesii</i>	Sub-canopy	4
KBL-03	Forest	<i>Synima cordierorum</i>	Sub-canopy	1
KCR-01	Forest	<i>Toechima erythrocarpum</i>	Sub-canopy	4
KBL-03	Forest	<i>Wilkiea angustifolia</i>	Sub-canopy	5
<b>Total number of A ↔ C<sub>i</sub> curves</b>				<b>125</b>
<b>Number of Site + Species combinations with replicates ≥ 3</b>				<b>28</b>

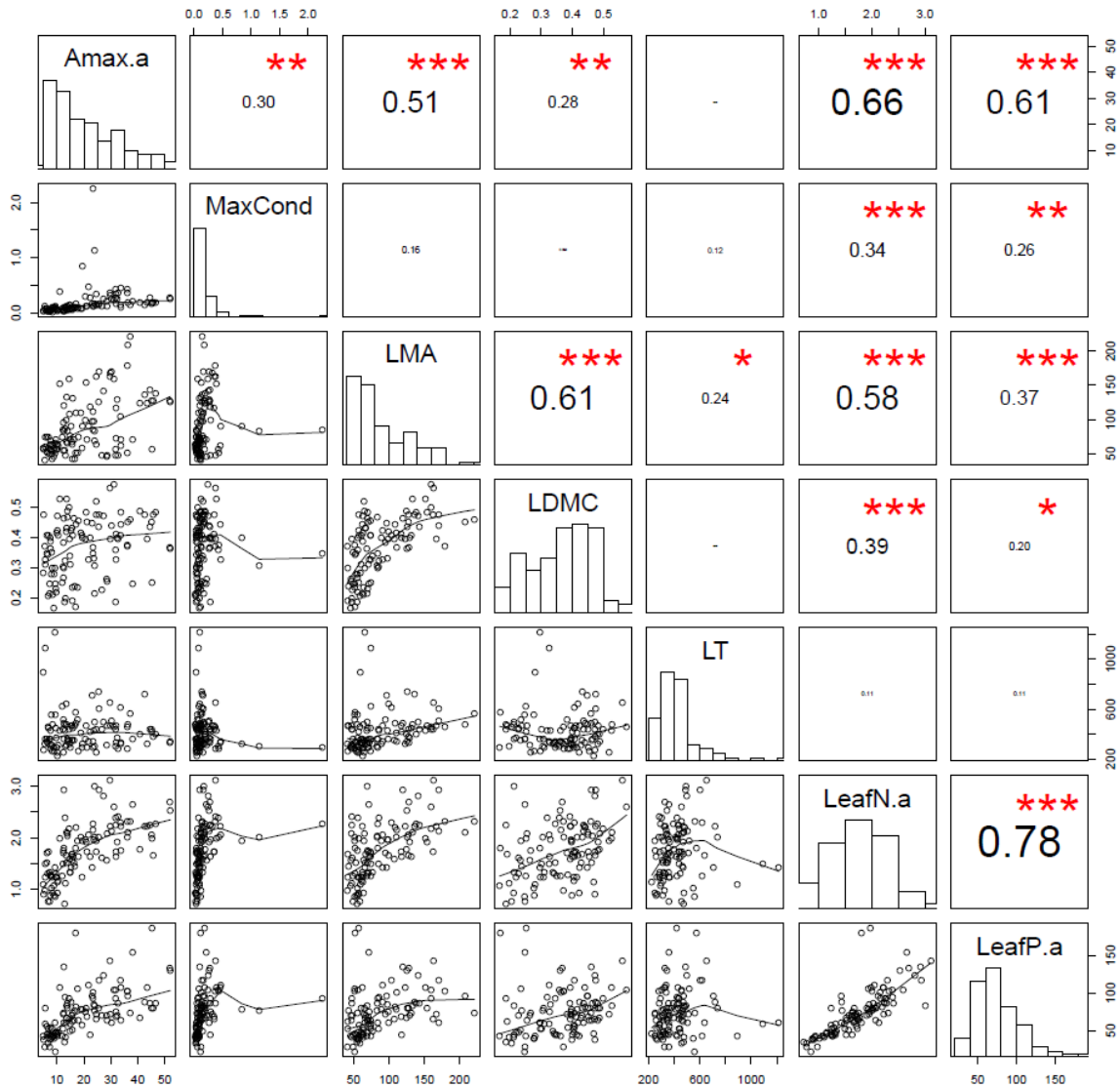
**Table S2.** Plant functional type ( $\Phi$ ) assigned to the forest species. The classification assigned to each species is based on light requirement and adult stature.

<b>Plant functional type (<math>\Phi</math>)</b>	<b>Description</b>
Small pioneer	Small stature pioneer, light demanding
Sub-canopy	Sub canopy, shade tolerant
Tall pioneer	Tall pioneer, light demanding
Upper-canopy	Upper canopy, shade tolerant, but well adapted to sunlit conditions

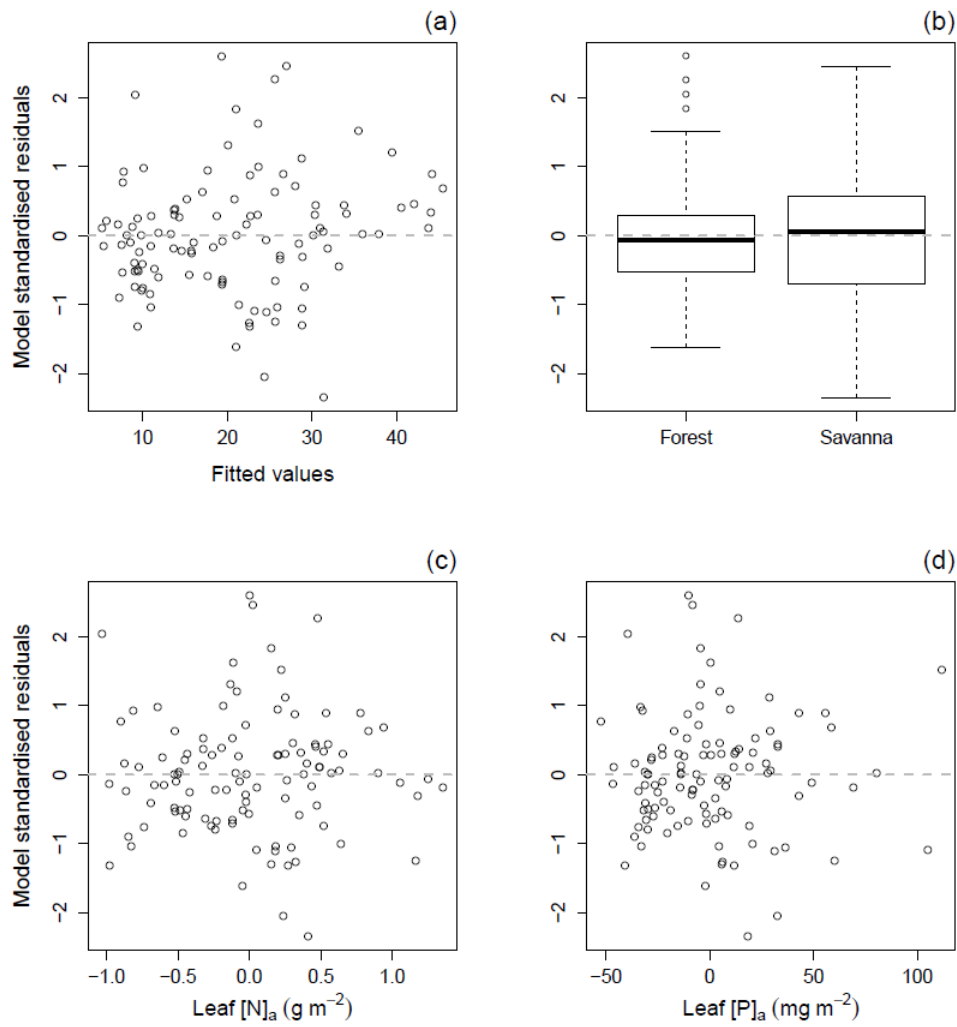
**Table S3.** Results of standardised major axis (SMA) bivariate relationships testing the null hypothesis that there was no difference between Forest and Savanna trees in slope (LR, Likelihood ratio statistic), intercept or axis shift (Wald statistic). For each bivariate relationship the assumption of linearity, for the dataset as a whole, was tested using Pearson’s correlation ( $r$ ). The dataset here excludes the four outlying points identified on Figure 2a.

Response	Bivariate	Test for linear relationship			Significance of difference between Vegetation classes in					
		df	$r$	$p$	Slope		Elevation		Shift	
					LR	$p$	Wald	$p$	Wald	$p$
$[P]_a \leftrightarrow$	$[N]_a$	103	0.89	<b>&lt;0.0001</b>	7.58	<b>0.0059</b>	NA	NA	NA	NA
$[P]_m \leftrightarrow$	$[N]_m$	103	0.90	<b>&lt;0.0001</b>	3.41	0.0646	3.74	0.053	19.10	<b>&lt;0.0001</b>
$[N]_a \leftrightarrow$	$M_a$	103	0.63	<b>&lt;0.0001</b>	13.83	<b>0.0002</b>	NA	NA	NA	NA
$[P]_a \leftrightarrow$	$M_a$	103	0.53	<b>&lt;0.0001</b>	3.08	0.0794	10.00	<b>0.002</b>	45.74	<b>&lt;0.0001</b>
$A_{max,a} \leftrightarrow$	$[N]_a$	103	0.67	<b>&lt;0.0001</b>	16.09	<b>&lt;0.0001</b>	NA	NA	NA	NA
$A_{max,a} \leftrightarrow$	$[P]_a$	103	0.63	<b>&lt;0.0001</b>	3.98	<b>0.0459</b>	NA	NA	NA	NA
$A_{max,a} \leftrightarrow$	$M_a$	103	0.55	<b>&lt;0.0001</b>	0.02	0.8805	0.19	0.659	63.41	<b>&lt;0.0001</b>
$A_{max,m} \leftrightarrow$	$[N]_m$	103	0.69	<b>&lt;0.0001</b>	0.77	0.3809	40.36	<b>&lt;0.0001</b>	4.33	<b>0.037</b>
$A_{max,m} \leftrightarrow$	$[P]_m$	103	0.70	<b>&lt;0.0001</b>	0.02	0.8976	26.28	<b>&lt;0.0001</b>	2.40	0.121
$A_{max,m} \leftrightarrow$	$M_a$	107	-0.23	0.017	7.53	<b>0.0061</b>	NA	<b>NA</b>	NA	NA
$V_{cmax,a} \leftrightarrow$	$[N]_a$	103	0.65	<b>&lt;0.0001</b>	15.42	<b>&lt;0.0001</b>	NA	NA	NA	NA
$V_{cmax,m} \leftrightarrow$	$[N]_m$	103	0.68	<b>&lt;0.0001</b>	0.09	0.7686	63.93	<b>&lt;0.0001</b>	2.59	0.107
$V_{cmax,a} \leftrightarrow$	$[P]_a$	103	0.62	<b>&lt;0.0001</b>	3.51	0.0611	19.67	<b>&lt;0.0001</b>	41.12	<b>&lt;0.0001</b>
$V_{cmax,m} \leftrightarrow$	$[P]_m$	103	0.70	<b>&lt;0.0001</b>	0.56	0.4549	44.50	<b>&lt;0.0001</b>	1.17	0.279
$J_{max,a} \leftrightarrow$	$[N]_a$	103	0.69	<b>&lt;0.0001</b>	13.72	<b>0.0002</b>	NA	NA	NA	NA
$J_{max,m} \leftrightarrow$	$[N]_m$	103	0.70	<b>&lt;0.0001</b>	0.45	0.5034	49.83	<b>&lt;0.0001</b>	3.86	0.050
$J_{max,a} \leftrightarrow$	$[P]_a$	103	0.66	<b>&lt;0.0001</b>	2.85	0.0917	13.99	<b>0.0002</b>	39.73	<b>&lt;0.0001</b>
$J_{max,m} \leftrightarrow$	$[P]_m$	103	0.72	<b>&lt;0.0001</b>	0.14	0.7086	32.03	<b>&lt;0.0001</b>	2.07	0.150
$DM:H_2O \leftrightarrow$	$M_a$	107	0.62	<b>&lt;0.0001</b>	7.84	<b>0.0051</b>	NA	NA	NA	NA
$d \leftrightarrow$	$M_a$	107	0.24	<b>0.0113</b>	21.52	<b>&lt;0.0001</b>	NA	NA	NA	NA
$\rho \leftrightarrow$	$M_a$	104	0.82	<b>&lt;0.0001</b>	5.58	<b>0.0181</b>	NA	NA	NA	NA
$A_N \leftrightarrow$	$M_a$	103	0.34	<b>0.0004</b>	0.24	0.6249	0.86	0.353	58.44	<b>&lt;0.0001</b>

**Figure S1.** Pair-wise plot of response and explanatory variables. The upper panel contains estimated pair-wise correlations and the font size is proportional to the absolute value of the estimated correlation coefficient. Significance codes: \*\*\* <math><0.001</math>, \*\* <math><0.01</math>, \* <math><0.05</math>, . <math><0.01</math>. The diagonal panel contains histograms and the lower panel scatterplots with a local regression smoother added to aid visual interpretation. The selected variables are photosynthetic capacity on an area basis as response with six continuous explanatory variables (spanning leaf morphology and nutrient levels). Trait units are  $A_{\max,a}$  ( $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ ), Maximum conductance ( $\text{mol m}^{-2} \text{ s}^{-1}$ ), Leaf mass per unit area ( $\text{g m}^{-2}$ ), Leaf dry matter content ( $\text{g g}^{-1}$ ), Leaf thickness ( $\mu\text{m}$ ), Total leaf nitrogen per unit area ( $\text{g m}^{-2}$ ), Total leaf phosphorus per unit area ( $\text{mg m}^{-2}$ ).



**Figure S2:** Model validation graphs for the random intercept mixed effects model (Eq. 2). Standardised residuals are plotted against fitted values and each of the explanatory factors and variables used in the model's fixed component.



**Table S4:** Output of a comparative linear mixed effects model (after Eq. 2) with leaf traits expressed on a mass basis: fixed effects (top) and random effects (bottom). The top section shows fixed effect parameter estimates and associated standard error, degrees of freedom, test statistic and associated  $p$ -value. The final ‘optimal’ model is compared against a simpler ‘null’ model that includes only vegetation class ( $\mathcal{V}$ ) in the fixed component, but has an identical random term of Species nested within Site. Continuous explanatory variables were centred on their respective means.

Fixed effect	Final model					Null model				
	Estimate	S.E.	DF	t value	$p$ value	Estimate	S.E.	DF	t value	$p$ value
Forest (with other variables at mean value)	210.04	14.81	71	14.181	<b>&lt;0.0001</b>	262.78	55.87	74	4.703	<b>&lt;0.0001</b>
Savanna (Vegetation contrast)	86.35	28.33	5	3.048	<b>0.0285</b>	-30.96	90.58	5	-0.342	0.7464
Leaf[N] <sub>m</sub>	6.95	2.14	71	3.252	<b>0.0018</b>					
Leaf[P] <sub>m</sub>	104.52	43.46	71	2.405	<b>0.0188</b>					
Leaf[N] <sub>m</sub> : Leaf[P] <sub>m</sub>	5.95	2.71	71	2.198	<b>0.0312</b>					
<b>Random effect</b>	<b>Variance</b>	<b>% of total</b>				<b>Variance</b>	<b>% of total</b>			
Intercept variance: Among sites	0	0.0%				10,328	38.8%			
Intercept variance: Among species	2,513	32.4%				11,645	43.8%			
Residual (within species, within sites)	5,251	67.6%				4,627	17.4%			
	<u>7,763</u>	<u>100.0%</u>				<u>26,600</u>	<u>100.0%</u>			
AIC				1,228					1,275	
Likelihood ratio test				-606					-632	

**Figure S3.** Kernel density plot showing smoothed probability distributions of leaf mass per unit area ( $\text{g m}^{-2}$ ) for each plant functional type.

