Supplementary Material

Tab. S1 - Two *P. radiata* stands with and without water enrichment from upslope terrain positions, Boland region.

Plantation and Compartment no.	Kluitjieskraal B7	Kluitjieskraal B39
Mean annual precipitation (mm)	782	782
Lateral water seepage from upslope terrain positions?	Extends into dry season	Limited
Soil description	Youthful soils with E horizon	Non-red Duplex soils
Soil depth (cm)	>100	>100
Age of stand (years)	14	14
Stocking (Stems ha⁻¹)	406	432
Mean dbh (cm)	23.1	17.6
Mean Height (m)	16.2	12.3
Basal area (m² ha-1)	17.1	10.5
Leaf Area Index (m² m⁻²)	2.9	1.9
Stand Volume (m³ ha⁻¹)	106.2	51.9

The two stands are located 1.2 km apart with virtually the same rainfall and stocking but very different water flow regimes in the landscape and consequently widely different growth rates (after Chikumbu 2011).

Tab. S2 - ANOVA's for two models using mean δ^{13}C per site to describe water stress (estimated as g_c/g_{cmax} or Eta/Etp).

Relative Canopy Conductance (g_c/g_{cmax})

	Degrees of Freedom	Conductance SS	Conductance MS	Conductance F	Conductance *p*
Intercept	1	0.177847	0.177847	21.86570	0.000676
δ^{13}C	1	0.247822	0.247822	30.46883	0.000181
Error	11	0.089470	0.008134		
Total	12	0.337292			

Ratio of actual to potential evapotranspiration (ETa/ETp)

	Degrees of Freedom	ETa/ETp SS	ETa/ETp MS	ETa/ETp F	ETa/ETp *p*
Intercept	1	0.246845	0.246845	29.76459	0.000199
δ^{13}C	1	0.327529	0.327529	39.49353	0.000060
Error	11	0.091226	0.008293		
Total	12	0.418755			

Tab. S3 - Regression summary for the two best variables predicting the ratio of actual to potential evapotranspiration (ETa/ETp).

Variable	b*	Std error of b*	B	Std error of b	t(10)	p-value
Intercept			-1.9593	0.4398	-4.4548	0.0010*
δ¹³C (latewood)	-0.5168	0.1726	-0.0606	0.0202	-2.9945	0.0122*
Site index	0.4789	0.1726	0.0293	0.0105	2.7750	0.0181*

$R^2 = 0.779$ Adjusted $R^2 = 0.739$.

Fig. S1 - Typical mid-rotation *Pinus radiata* stand used for sampling in the Tsitsikamma region (Photo: Phillip Fischer).

Fig. S2 - Graphic representation of water stress periods with increasing duration tested in the pilot study.
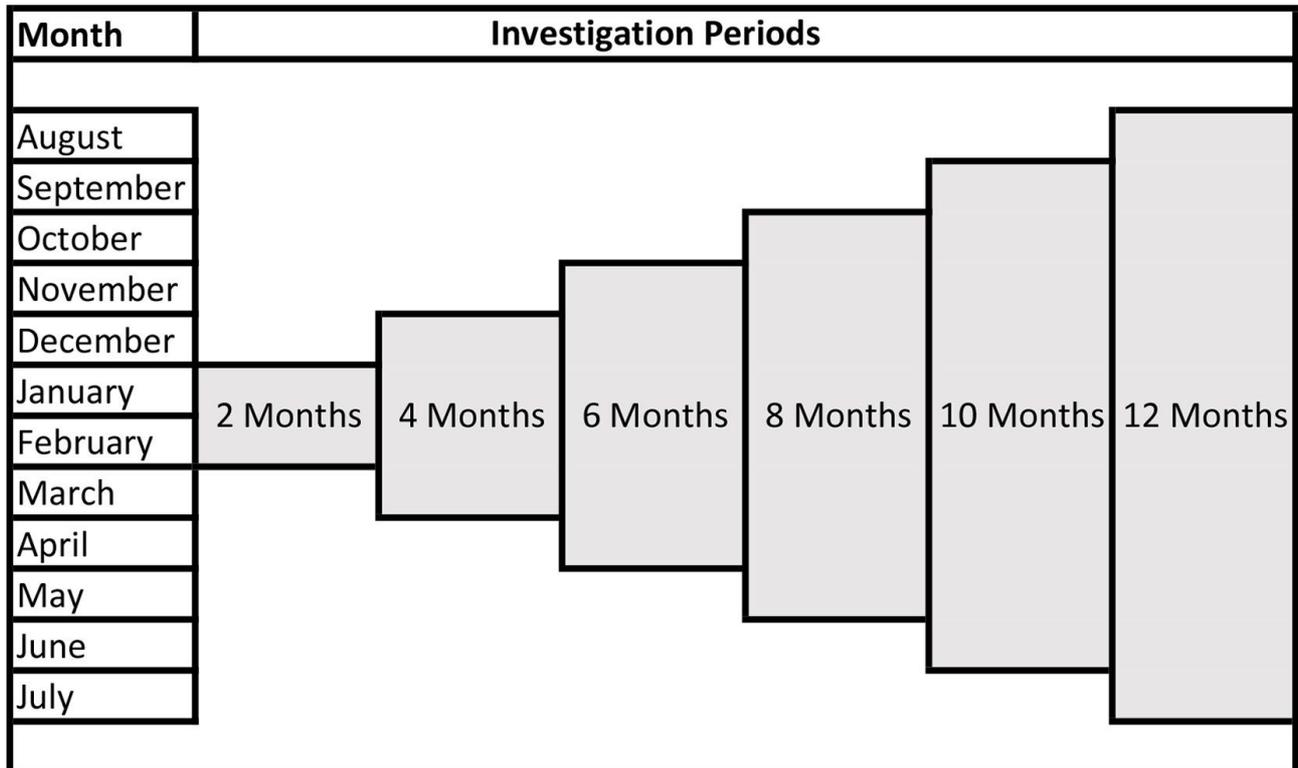
Fig. S3 - Relationship between the 5-yr means of relative canopy conductance and δ¹³C in cellulosic components of corresponding latewood tree rings. Dashed lines indicate the 95% confidence interval.

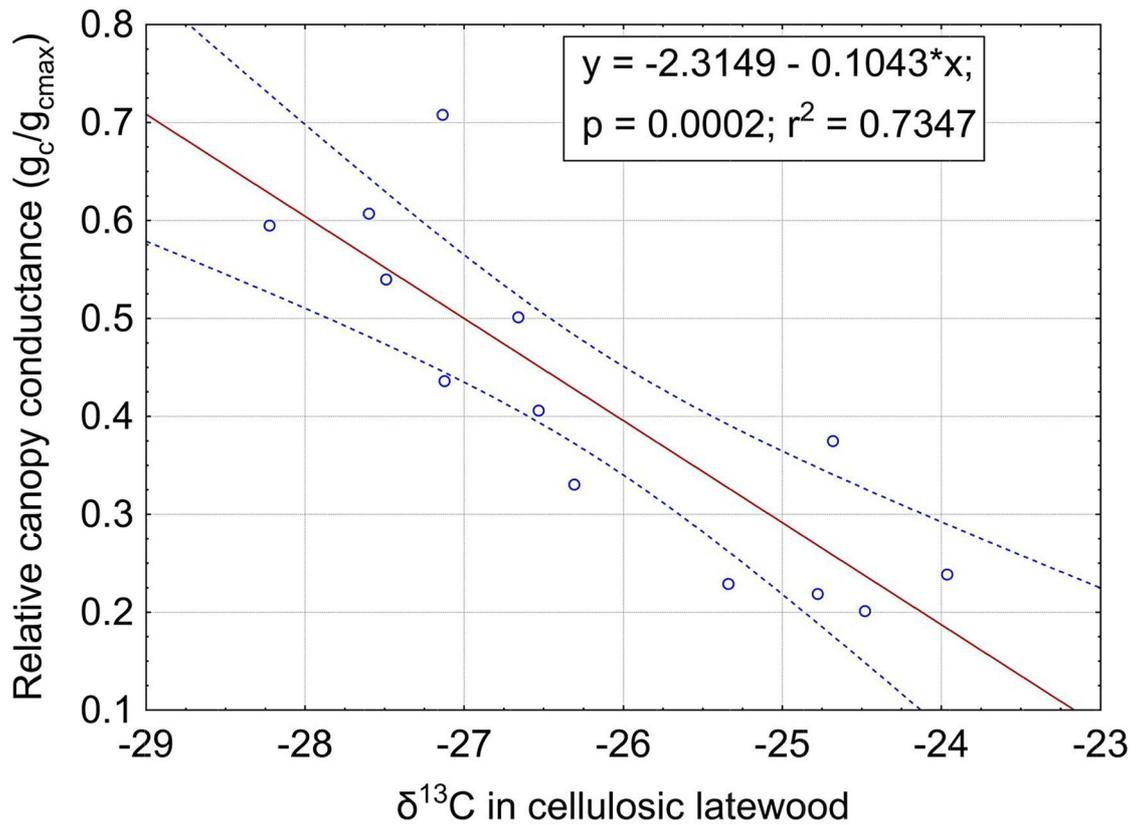**Fig. S4** - Relationship between 5-yr means of ETa/ETp ratio and δ¹³C in cellulosic components of corresponding latewood tree rings. Dashed lines indicate the 95% confidence interval.