

## Appendix S1. Calculation of canopy photosynthetic rate in FORMIND-CL v.1.0

The calculation of canopy photosynthetic rate follows [1]. The rate of single-leaf photosynthesis ( $P_l$ ) is a saturating function of the incident light on the leaf ( $I_l$ ),

$$P_l(I_l) = \frac{\alpha I_l p_{\max}}{\alpha I_l + p_{\max}},$$

where  $p_{\max}$  is the maximum rate of photosynthesis and  $\alpha$  the initial slope of the light-response curve (both species-specific parameters). The irradiance incident on the surface of a leaf within the canopy of a tree is

$$I_l = \frac{k}{1-m} I_t,$$

with  $I_t$  being the irradiance incident on the tree crown,  $k$  the light extinction coefficient of the forest, and  $m$  the light transmission coefficient of leaves.  $P_l$  is integrated over the total LAI of tree ( $LAI_t$ ) to yield the instantaneous rate of photosynthesis of the tree ( $P_t$ , per unit crown projection area),

$$P_t(I_t) = \frac{p_{\max}}{k} \ln \frac{\alpha \cdot k \cdot I_t + p_{\max} (1-m)}{\alpha \cdot k \cdot I_t \cdot e^{-k \cdot LAI_t} + p_{\max} (1-m)}$$

To calculate total annual gross biomass production of the tree ( $PB$ ), the rate of photosynthesis is multiplied by the length of the photosynthetic active period per year ( $S$ ), the crown area of the tree ( $CA$ ) and a conversion coefficient ( $codm$ ) from absorbed  $CO_2$  to organic dry mass,

$$PB = P_t(I_t) \cdot S \cdot CA \cdot codm$$

Other equations of FORMIND can be found in [2] and [3].

### References

1. Thornley HMJ, Johnson IR (1990) Plant and Crop Modelling – A mathematical approach to plant and crop physiology. Oxford, UK.: Clarendon Press.
2. R ger N, Guti rrez AG, Kissling WD, Armesto JJ, Huth A (2007) Ecological impacts of different harvesting scenarios for temperate evergreen rain forest in southern Chile - A simulation experiment. Forest Ecology and Management 252: 52-66.
3. Guti rrez AG, Huth A (2012) Successional stages of primary temperate rainforests of Chilo  Island, Chile. Perspectives in Plant Ecology Evolution and Systematics 14: 243-256.

SUPPORTING INFORMATION

*Guti rrez et al. Forest responses to increased droughts*

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