

## 6 Supplementary Material

### 6.1 Parameters

Parameter	Symbol	Value	Units	Source
Number of leaves produced by height increment	$\kappa$	345	$\text{nb}_{leaves} \cdot \text{m}^{-2} \cdot \text{m}_{tree}^{-1}$	Calibrated using leaf production on the +K Itatinga stand
Leaf Lifespan	$L L S$	400	days	Calibrated using leaf production, biomass and fall measurements on the +K Itatinga stand
Target leaf area	$S_{max}$	2750	$\text{mm}^2$	Measured in scans from the +K stand

Table S1: Parameters related to the leaf cohort sub-model that were modified from Part 1

Parameter	Symbol	Value	Units	Source
Sensitivity parameter for soluble sugar allocation	$p_{ss}$	0.1	unitless	Assumed
Sensitivity parameter for fine roots allocation	$p_{FR}$	0.1	unitless	Assumed
Conversion from LAI to target root biomass	$\lambda$	80	$\text{gC} \cdot \text{m}_{leaves}^{-2}$	Calibrated on the +K stand
Optimal wood K concentration at creation	$[K]_{Trunk}^{opti}$	$7.5710^{-3}$	$\text{gK} \cdot \text{gC}^{-1}$	Maximum K wood concentration measured on the +K stand
Minimal wood K concentration in a cohort	$[K]_{Trunk}^{min}$	$1.0010^{-3}$	$\text{gK} \cdot \text{gC}^{-1}$	Minimum K wood concentration measured on the +K stand
NPP driven rate of remobilisation of K in wood	$T_{KTrunk}$	0.00216	unitless	Calibrated on K wood concentrations measured on the +K stand
remobilisation efficiency of K in dying branches	$R_{KBranches}$	0.8	unitless	Measured difference in K content between live branches and dead branches in the +K stand
Annual turnover rate for branches	$M_{Branches}$	0.31	$\cdot \text{yr}^{-1}$	Calculated from biomass and necromass measurements in the +K stand
Annual turnover rate for fine roots	$M_{FR}$	0.71	$\cdot \text{yr}^{-1}$	(Lambais et al., 2017)
Annual turnover rate for bark	$M_{Bark}$	0.001	$\cdot \text{yr}^{-1}$	Calculated from biomass and necromass measurements in the +K stand
Exponential factor	$Q_{10}$	2	unitless	(Ryan et al., 2009)
Reference Temperature	$T_{MR}$	25	$^{\circ}\text{C}$	(Ryan et al., 2009)
Trunk minimum rate of respiration per unit nitrogen	$R_1^{trunk}$	$1.69 \times 10^{-3}$	$\text{gC} \cdot \text{gN}^{-1} \cdot \text{hr}^{-1}$	modified from Ryan et al. (2009)
Trunk maximum rate of respiration per unit nitrogen	$R_2^{trunk}$	$2.63 \times 10^{-2}$	$\text{gC} \cdot \text{gN}^{-1} \cdot \text{hr}^{-1}$	modified from Ryan et al. (2009)
Slope between trunk biomass and respiration per unit nitrogen	$R_2^{trunk}$	$4.18 \times 10^{-6}$	$\cdot \text{gN}^{-1} \cdot \text{hr}^{-1}$	modified from Ryan et al. (2009)

Table S2: New parameters related to C and K allocation

### 6.2 Figures

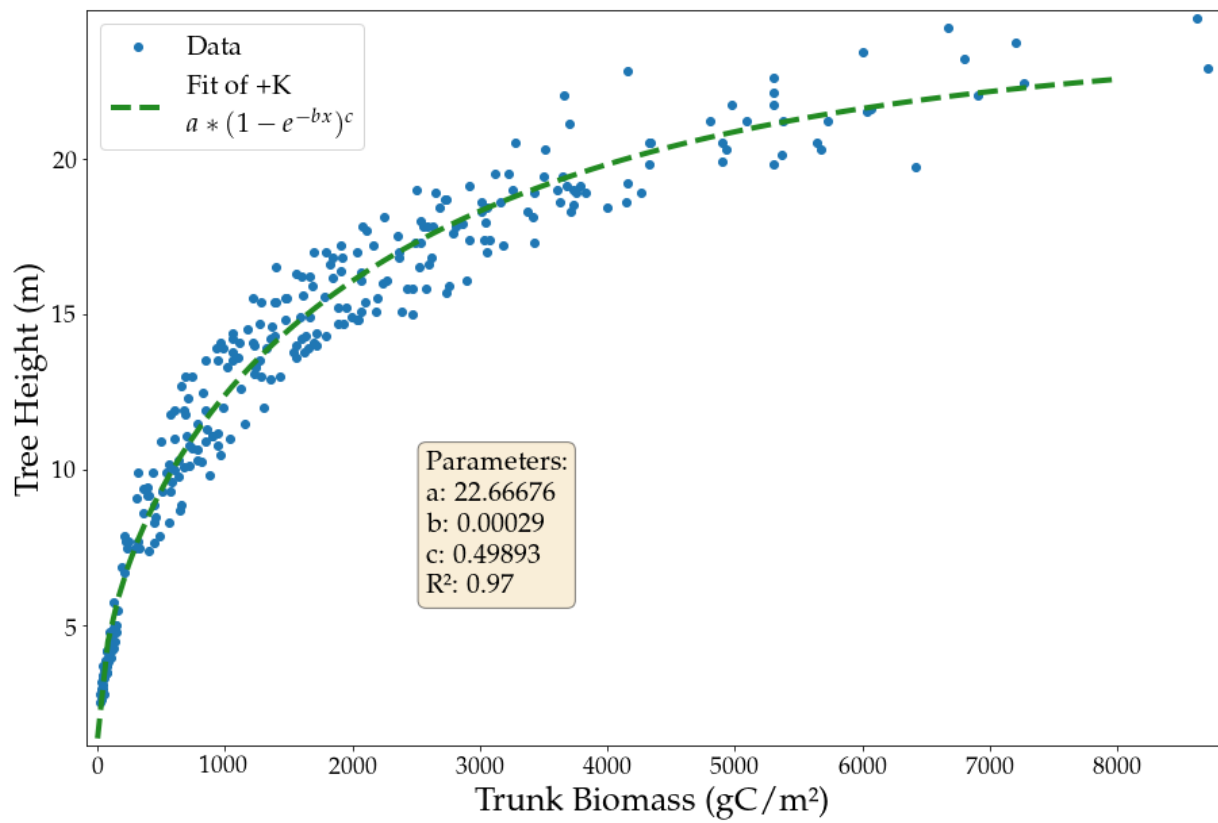


Figure S1: Tree height as a function of trunk biomass. The function was well adjusted.

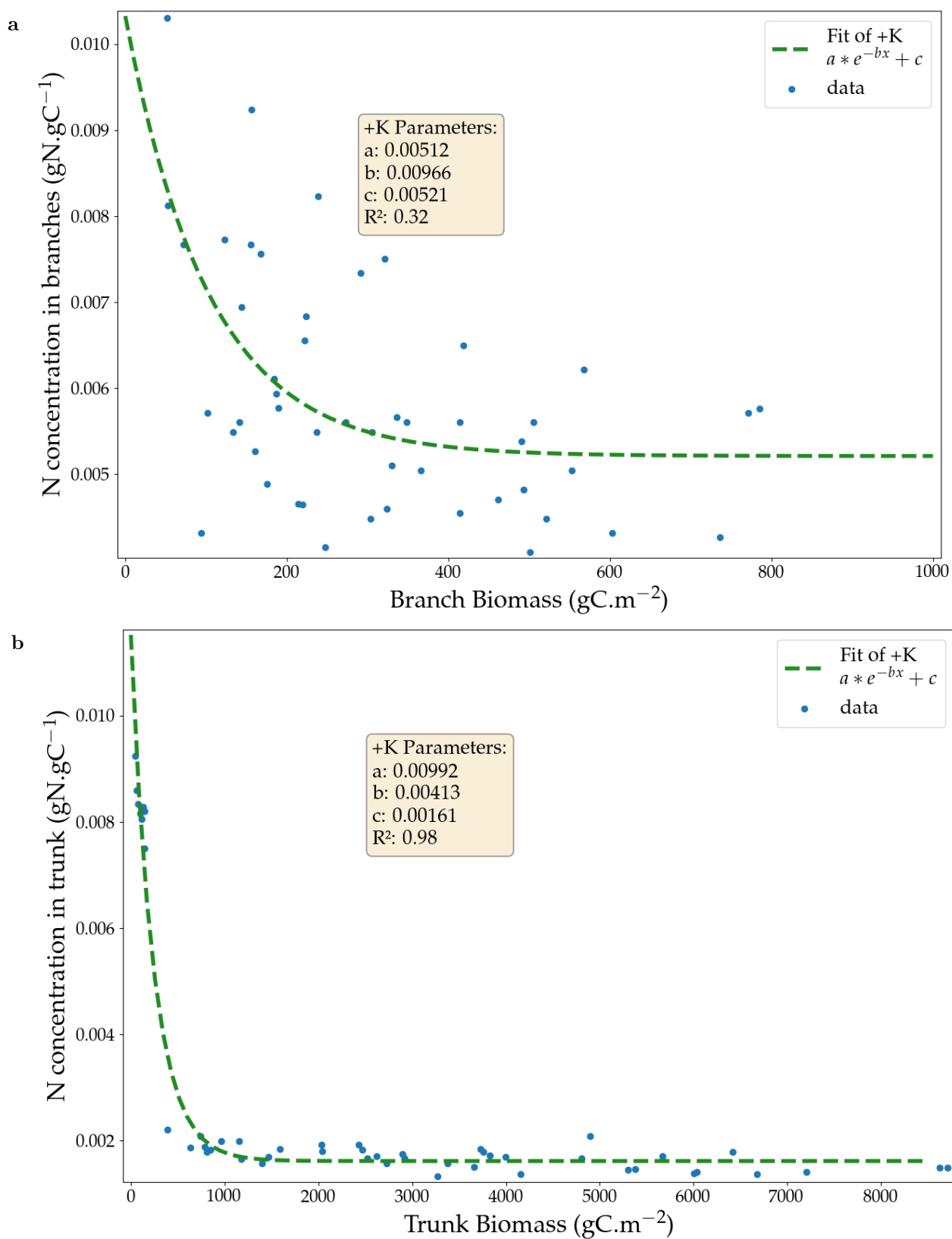


Figure S2: a) Branch N content in function of the biomass of living branches b) The trunk's N content in function of the trunk biomass.

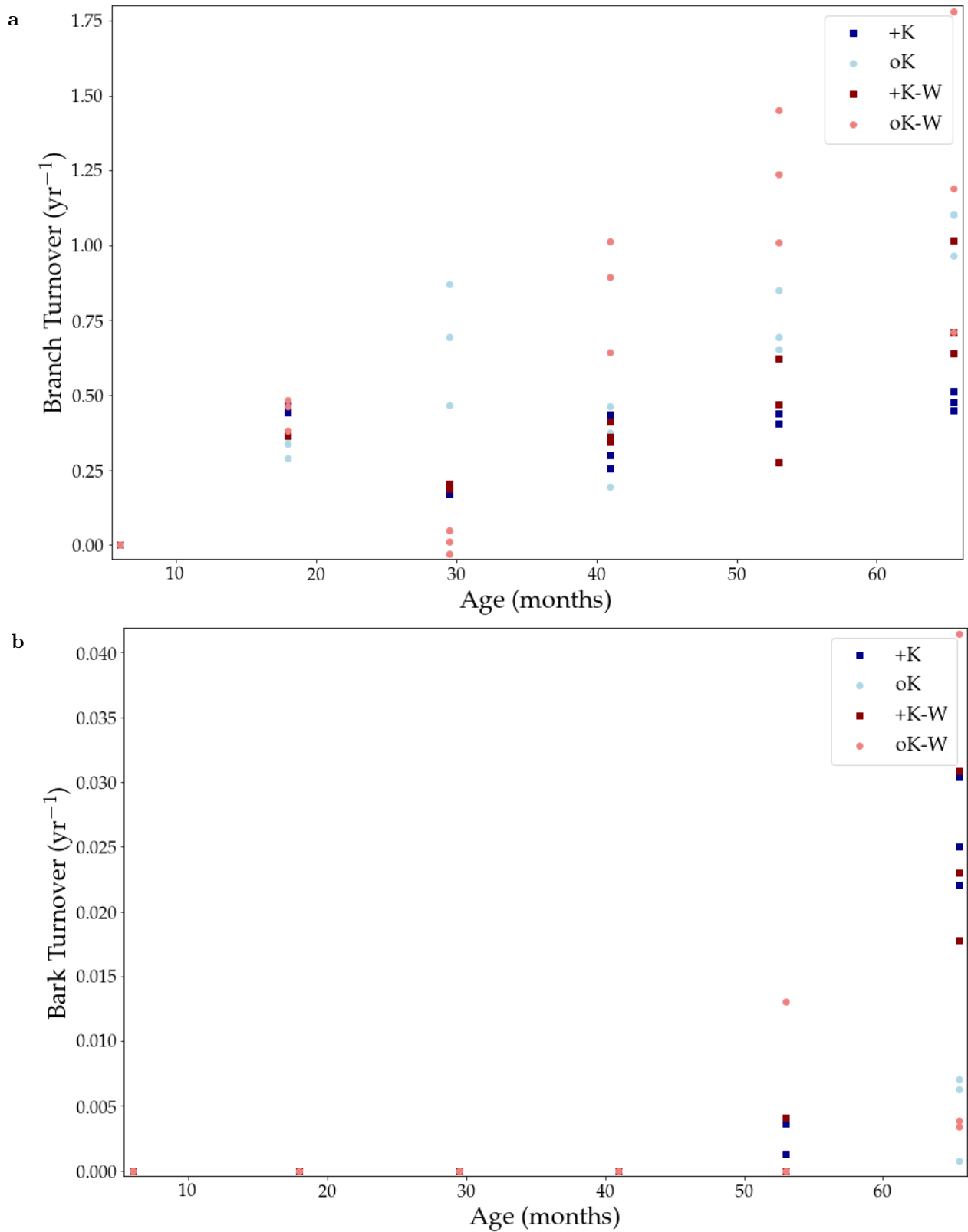


Figure S3: a) Turnover of bark in different fertilisation and rainfall exclusion plots (-W is 30% of rainfall removed). Each data is a separate data point. b) The turnover of branches in the same conditions.

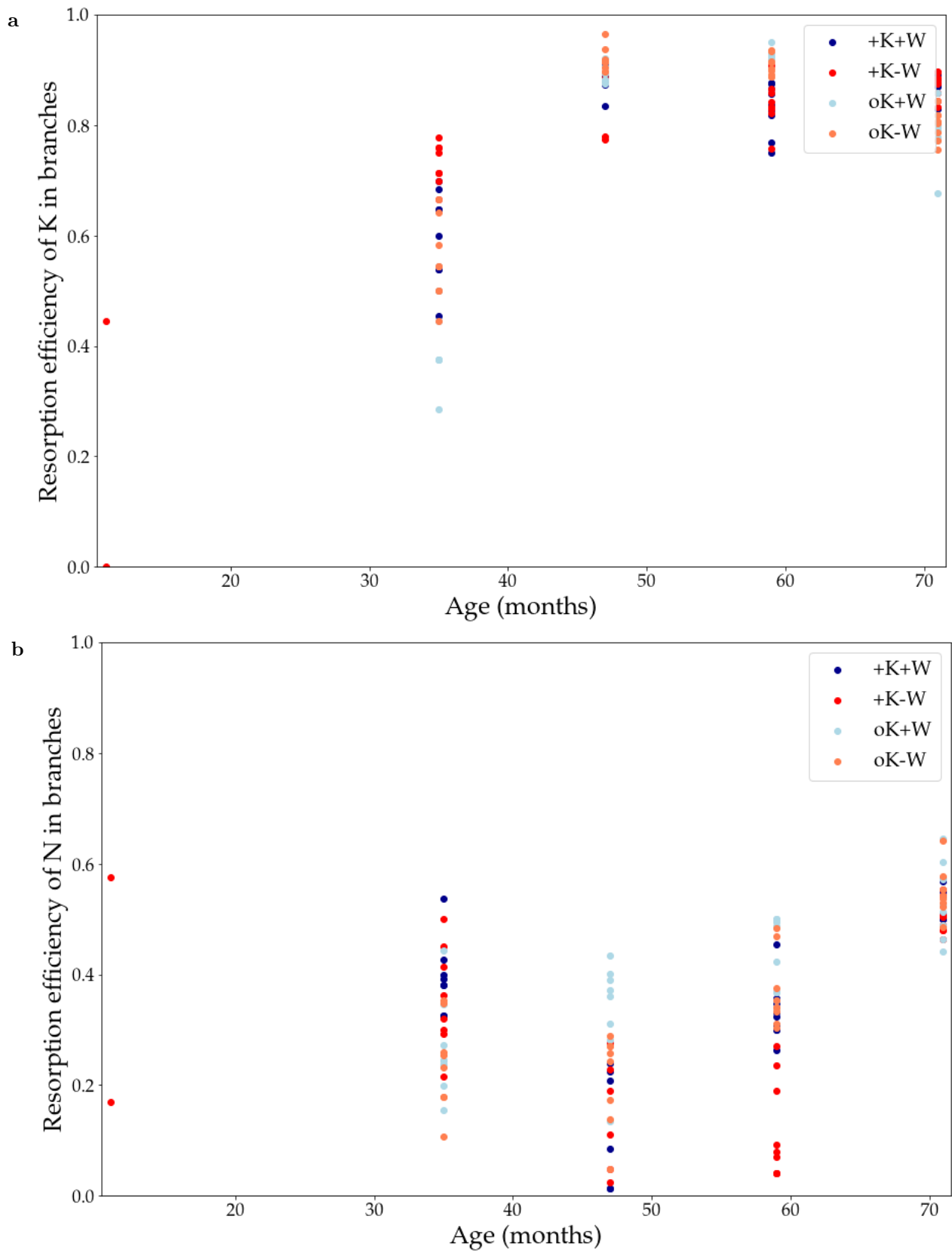


Figure S4: Branch resorption efficiencies for K (a) and N (b) that were calculated using annual measurements of K concentrations of live and dead branches on the same tree. Each data point is a tree in each treatment.

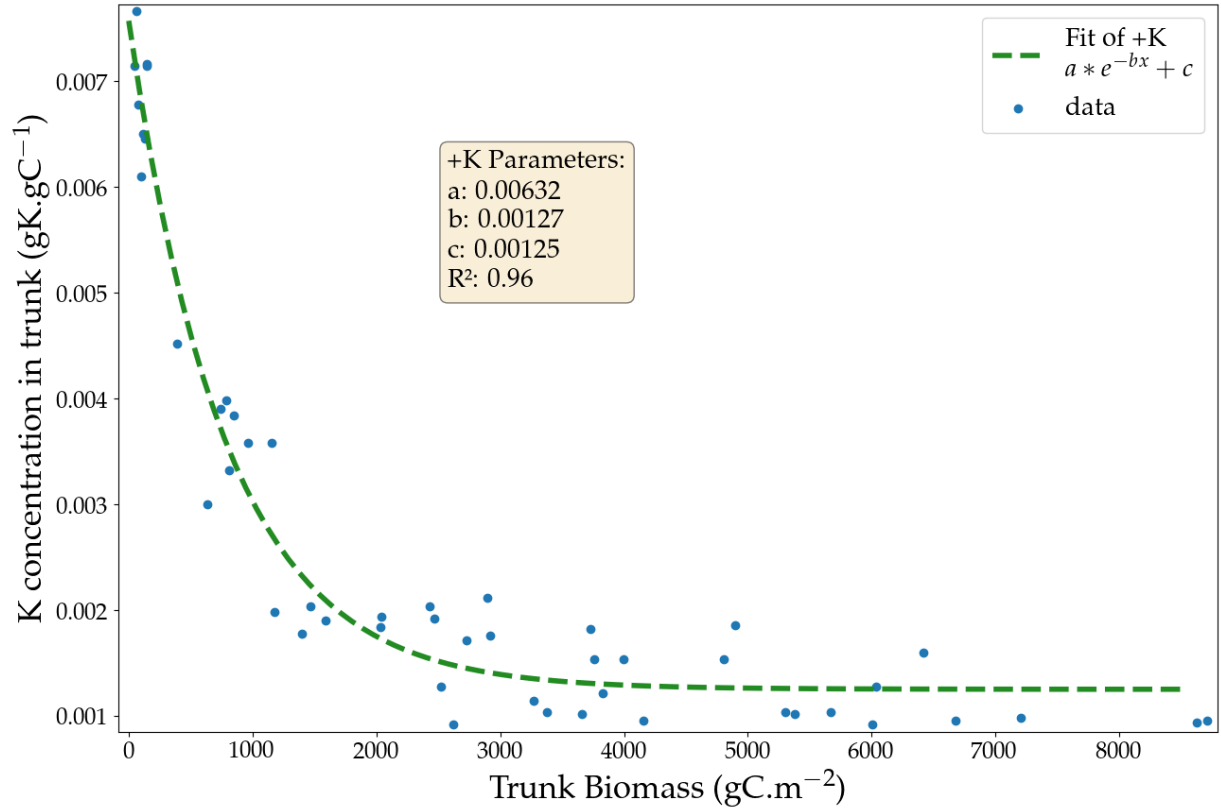


Figure S5: Trunk K content as a function of trunk biomass. A decreasing function was adjusted to the data. This function was not used in the model but the parameters were used to parametrise the K trunk wood cohort model. The non-limited trunk wood concentration at the creation of the cohort was equal to  $a + c$  of the function shown in the inset and the minimal trunk wood K content was similar to  $c$  (but corrected to account for the newly created cohorts in trunk wood).

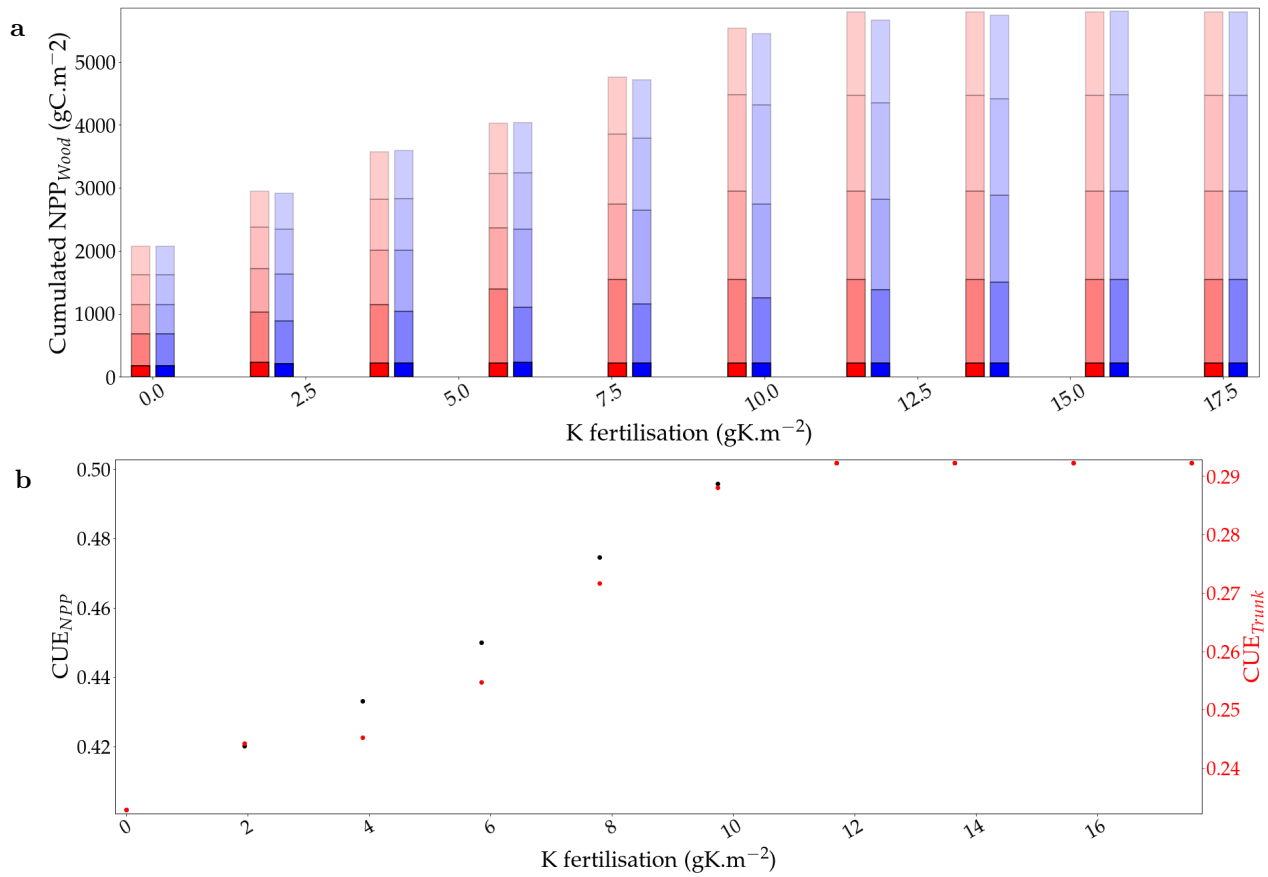


Figure S6: a) The response of cumulated NPP<sub>trunk</sub> to two different fertilisation regimes (applied once at planting in red and over 4 application over the early growth in blue) along a fertilisation gradient. b) The response of NPP CUE and trunk CUE to K fertilisation ranging from 0gK.m<sup>-2</sup> to 17gK.m<sup>-2</sup>

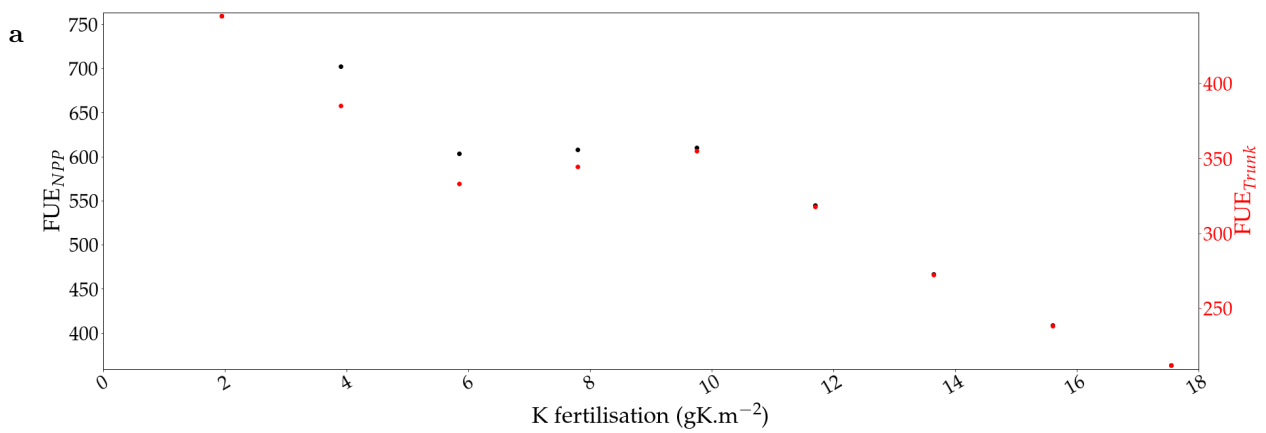


Figure S7: The fertiliser use efficiencies of NPP and of trunk production in function of the fertilisation level of the simulated stand.