

# Supplementary material III-S5

## A. List of variables

Variables	Code	Unit	Calculation	Hypothesis ○ used for calculation ① explanatory ● response
<i>Tree variables</i>				
Plot diversity level	Diversity_1_evel	none	Treatment	①②③
Forest vertical stratification	ENL	none	Calculated from laser scanning measurements (Perles-Garcia et al. 2021 <i>under review</i> )	①②③
Diameter at Breast Height	DBH	m	Measured	○
Basal Area	BA	m <sup>2</sup>	$BA = \frac{(DBH)^2}{4\pi}$	○
TSP biomass	TSP <sub>biomass</sub>	m <sup>2</sup>	Calculated from BA (Appendix S4)	①②③
Surrounding trees biomass	tree <sub>biomass</sub>	m <sup>2</sup>	Calculated from BA (Appendix S4)	①②③
Specific Root Length	SRL	m.g <sup>-1</sup>	Measured	○
Root Diameter	RD	m	Measured	○
Fungal association	AM or EM	none	Estimated from literature	○
Root diameter community weighted mean at TSP level	TSP <sub>CWM RD</sub>	m	$TSP\ CWM\ RD = \sum_{i \in TSP\ species} \frac{RD_i \times BA_i}{TSP_{biomass}}$	①②③
Specific root length community weighted mean at TSP level	TSP <sub>CWM SRL</sub>	m.g <sup>-1</sup>	$TSP\ CWM\ SRL = \sum_{i \in TSP\ species} \frac{SRL_i \times BA_i}{TSP_{biomass}}$	①②③
Fungal association ratio at TSP level	TSP <sub>AM/EM</sub>	none	$TSP\ \frac{AM}{EM} = \sum_{i \in TSP\ species} \frac{a_i \times BA_i}{TSP_{biomass}}$ $a_i = -1\ or\ 1\ if\ EM\ or\ AM\ association$	①②③
Root Diameter community weighted mean at neighborhood level	CWM <sub>RD</sub>	m	$CWM\ RD = \sum_{i \in species} \frac{RD_i \times BA_i}{tree_{biomass}}$	①②③
Specific Root Length community weighted mean at neighborhood level	CWM <sub>SRL</sub>	m.g <sup>-1</sup>	$CWM\ SRL = \sum_{i \in species} \frac{SRL_i \times BA_i}{tree_{biomass}}$	①②③
Fungal association ratio at neighborhood level	AM/EM	none	$TSP\ \frac{AM}{EM} = \sum_{i \in species} \frac{a_i \times BA_i}{tree_{biomass}}$ $a_i = -1\ or\ 1\ if\ EM\ or\ AM\ association$	①②③
Root diameter functional richness at TSP level	TSP <sub>FRic RD</sub>	m	$TPS\ FRic\ RD = f(RD)_{TSP}$ , 'FD' package	①②③
Specific root length functional richness at TSP level	TSP <sub>FRic SRL</sub>	m.g <sup>-1</sup>	$TPS\ FRic\ SRL = f(SRL)_{TSP}$ , 'FD' package	①②③
Root diameter functional	FD <sub>isRD</sub>	m	$FDis\ RD = f(RD, BA)$ , 'FD' package	①②③

dissimilarity at neighborhood level				
Specific root length functional dissimilarity at neighborhood level	$FDi_{SRL}$	$m \cdot g^{-1}$	$FDi_{SRL} = f(SRL, BA)$ , 'FD' package	①②③
Specific root length functional dissimilarity at neighborhood level	$FDi_{AM/EM}$	none	$FDi_{EM}^{AM} = f(\frac{AM}{EM}, BA)$ , 'FD' package	①②③
Tree community root functional dissimilarity	$FDi$	none	$FDi = f(\frac{AM}{EM}, RD, SRL, BA)$ , 'FD' package	①②③
Leaf carbon content	$[C]_{leaf}$	$g \cdot g^{-1}$	Measured	○
Leaf nitrogen content	$[N]_{leaf}$	$g \cdot g^{-1}$	Measured	○
Annual litter productivity	$m_{litterfall}$	g	Measured	○
Annual litter carbon deposition	$C_{litterfall}$	g	$C_{litterfall} = m_{litterfall} \times [C]_{leaf}$	①②③
Annual litter nitrogen deposition	$N_{litterfall}$	g	$N_{litterfall} = m_{litterfall} \times [N]_{leaf}$	①②③
<b>Soil microbial community</b>				
Soil microbial biomass	mic.bio	$mg \cdot g^{-1}$	Measured	②③④
<b>MICRO-ENVIRONMENTAL VARIABLES</b>				
<b>Biotic environmental variables</b>				
Litter abundance observed on the ground	Litter.ab	none	Estimated	③
Litter carbon content	$[C]_{litter}$	$g \cdot g^{-1}$	Measured	③
Litter nitrogen content	$[N]_{litter}$	$g \cdot g^{-1}$	Measured	③
Root biomass	root.bioma ss	$g \cdot m^{-3}$	Measured from soil cores	③
Understory plant abundance	plant.ab	none	Estimated	③
<b>Soil chemistry variables</b>				
Soil carbon stock 2010	$Soil_c^{2010}$	$g \cdot g^{-1}$	Measured	①②③
Soil carbon stock 2018	$Soil_c^{2018}$	$g \cdot g^{-1}$	Measured	①②③
Soil nitrogen content in 2018	TN	$g \cdot g^{-1}$	Measured	③
Soil phosphorus content in 2018	TP	$g \cdot g^{-1}$	Measured	③
Soil C:N ratio	C:N	none	$C:N = \frac{Soil_c^{2018}}{TN}$	③
Soil C:P ratio	C:P	none	$C:P = \frac{Soil_c^{2018}}{TP}$	③
<b>Micro-climatic variables</b>				
Soil water content	RH	$g \cdot g^{-1}$	Measured	③
Minimum, average and maximum air temperature of the sampling day and	T.min, T.mean, T.max, T.min.wee	°C	Estimated from climatic models (Supplementary S2)	○

week before sampling	k, T.mean.week, T.max.week			
Temperature conditions	Temperature	none	First PCA axis of climatic variables	③
<b><i>Plot topography</i></b>				
Slope	Slope	°	Design (Scholten <i>et al.</i> 2017)	①②③
Plan curvature	Curv. PL	°	Design (Scholten <i>et al.</i> 2017)	①②③
Profile curvature	Curv. PR	°	Design (Scholten <i>et al.</i> 2017)	①②③
Altitude	Altitude	m	Design (Scholten <i>et al.</i> 2017)	①②③

## B. Hypotheses

Hypothesis	Response variable	Explanatory variable
<b>H1</b>	$Soil_C^{2018}$	$Soil_C^{2010}$ , TSP <sub>biomass</sub> , tree <sub>biomass</sub> , C <sub>litterfall</sub> , N <sub>litterfall</sub> , TSP <sub>CWM RD</sub> , TSP <sub>CWM SRL</sub> , TSP <sub>AM/EM</sub> , TSP <sub>FRic RD</sub> , TSP <sub>FRic SRL</sub> , CWM <sub>RD</sub> , CWM <sub>SRL</sub> , AM/EM, FDis <sub>RD</sub> , FDis <sub>SRL</sub> , FDis <sub>AM/EM</sub> , FDis
<b>H2.1</b>	$Soil_C^{2018}$	mic.bio
<b>H2.2</b>	mic.bio	$Soil_C^{2010}$ , TSP <sub>biomass</sub> , tree <sub>biomass</sub> , C <sub>litterfall</sub> , N <sub>litterfall</sub> , TSP <sub>CWM RD</sub> , TSP <sub>CWM SRL</sub> , TSP <sub>AM/EM</sub> , TSP <sub>FRic RD</sub> , TSP <sub>FRic SRL</sub> , CWM <sub>RD</sub> , CWM <sub>SRL</sub> , AM/EM, FDis <sub>RD</sub> , FDis <sub>SRL</sub> , FDis <sub>AM/EM</sub> , FDis
<b>H3.1</b>	mic.bio	env.var ∈ [Temperature, RH, TN, TP, C.N, C.P, root.biomass, plant.ab, litter.ab, [C] <sub>litter</sub> , [N] <sub>litter</sub> ]
<b>H3.2</b>	env.var ∈ [RH, TN, TP, C.N, C.P, root.biomass, plant.ab, litter.ab, [C] <sub>litter</sub> , [N] <sub>litter</sub> ]	$Soil_C^{2010}$ , TSP <sub>biomass</sub> , tree <sub>biomass</sub> , C <sub>litterfall</sub> , N <sub>litterfall</sub> , TSP <sub>CWM RD</sub> , TSP <sub>CWM SRL</sub> , TSP <sub>AM/EM</sub> , TSP <sub>FRic RD</sub> , TSP <sub>FRic SRL</sub> , CWM <sub>RD</sub> , CWM <sub>SRL</sub> , AM/EM,

		FDis <sub>RD</sub> , FDis <sub>SRL</sub> , FDis <sub>AM/EM</sub> , FDis
	<i>Temperature</i>	TSP <sub>biomass</sub> , tree <sub>biomass</sub> , C <sub>litterfall</sub> , N <sub>litterfall</sub> ,