

## Supplementary Information Tables S1 & S2

**Table S1:** Young maritime pine (*Pinus pinaster* Ait) nutritional threshold values (dry mass basis) of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg). Optimum and low reference values are calculated after van den Burg (1985).

	N (mg g <sup>-1</sup> )	P (mg g <sup>-1</sup> )	K (mg g <sup>-1</sup> )	Ca (mg g <sup>-1</sup> )	Mg (mg g <sup>-1</sup> )
Optimum value	13.7	1.4	5.2	2.9	1.9
Low value	12.2	1.0	3.4	2.0	1.2

**Table S2:** Growth of seven-year-old maritime pine trees at the wet-grass and the dry-ericaceous sites. Mean values of tree height, circumference at breast height (C<sub>130</sub>) and volume are shown for the wet-grass (n = 1,280 trees) and the dry-ericaceous (n = 1,928 trees) sites as a function of treatments ('P' and 'C' stand for phosphorus fertilisation and control, respectively; 'UD' and 'NC' for understory crushing and no understory crushing, respectively). Different letters indicate significant differences between groups (Tukey post-hoc test ; \*\*\*P < 0.001; ANOVA).

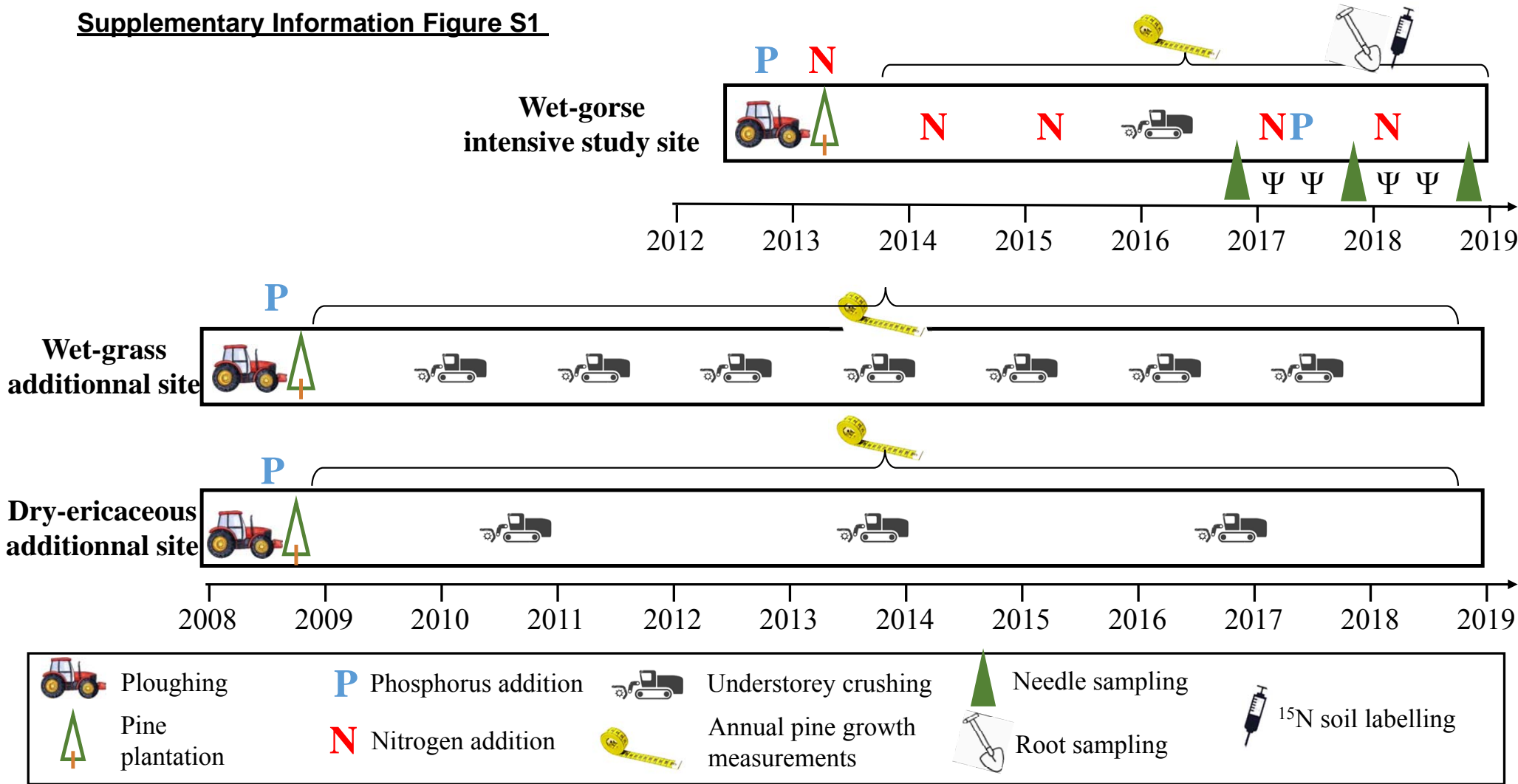
Treatments	Wet-grass			Dry-ericaceous		
	Height (cm) ***	C <sub>130</sub> (cm) ***	Volume (dm <sup>3</sup> stem <sup>-1</sup> ) ***	Height (cm) ***	C <sub>130</sub> (cm) ***	Volume (dm <sup>3</sup> stem <sup>-1</sup> ) ***
P/UD	500.8 ± 5.3 a	30.0 ± 0.4 a	11.4 ± 0.39 a	469.9 ± 3.5 a	25.0 ± 0.2 a	7.03 ± 0.15 a
P/NC	469.3 ± 4.7 a	26.8 ± 0.4 ab	8.54 ± 0.30 b	324.2 ± 4.8 b	16.1 ± 0.3 b	2.54 ± 0.11 b
C/UD	409.5 ± 4.8 b	23.7 ± 0.4 b	6.32 ± 0.28 b	503.1 ± 4.3 a	26.4 ± 0.2 a	8.41 ± 0.18 a
C/NC	352.3 ± 5.1 c	18.4 ± 0.3 c	3.54 ± 0.20 c	364.7 ± 4.7 b	17.8 ± 0.3 b	3.29 ± 0.12 b

### Supplementary Information Table S3

Table S3: Maritime pine growth at the wet-gorse site (n = 72 trees). Circumference at breast height ( $C_{130}$ ) and volume per stem are shown as a function of treatment (fertilizer application is represented by the upper letters, i.e control 'C', nitrogen 'N' or phosphorus 'P'; gorse abundance is represented by the lower letters i.e. control 'C' or gorse addition 'G'). Different letters indicate significant differences between groups within one year (Tukey post-hoc test: [NS] non significant; [\*] $P < 0.1$ ; \* $P < 0.05$ ; \*\* $P < 0.01$ ; ANOVA).

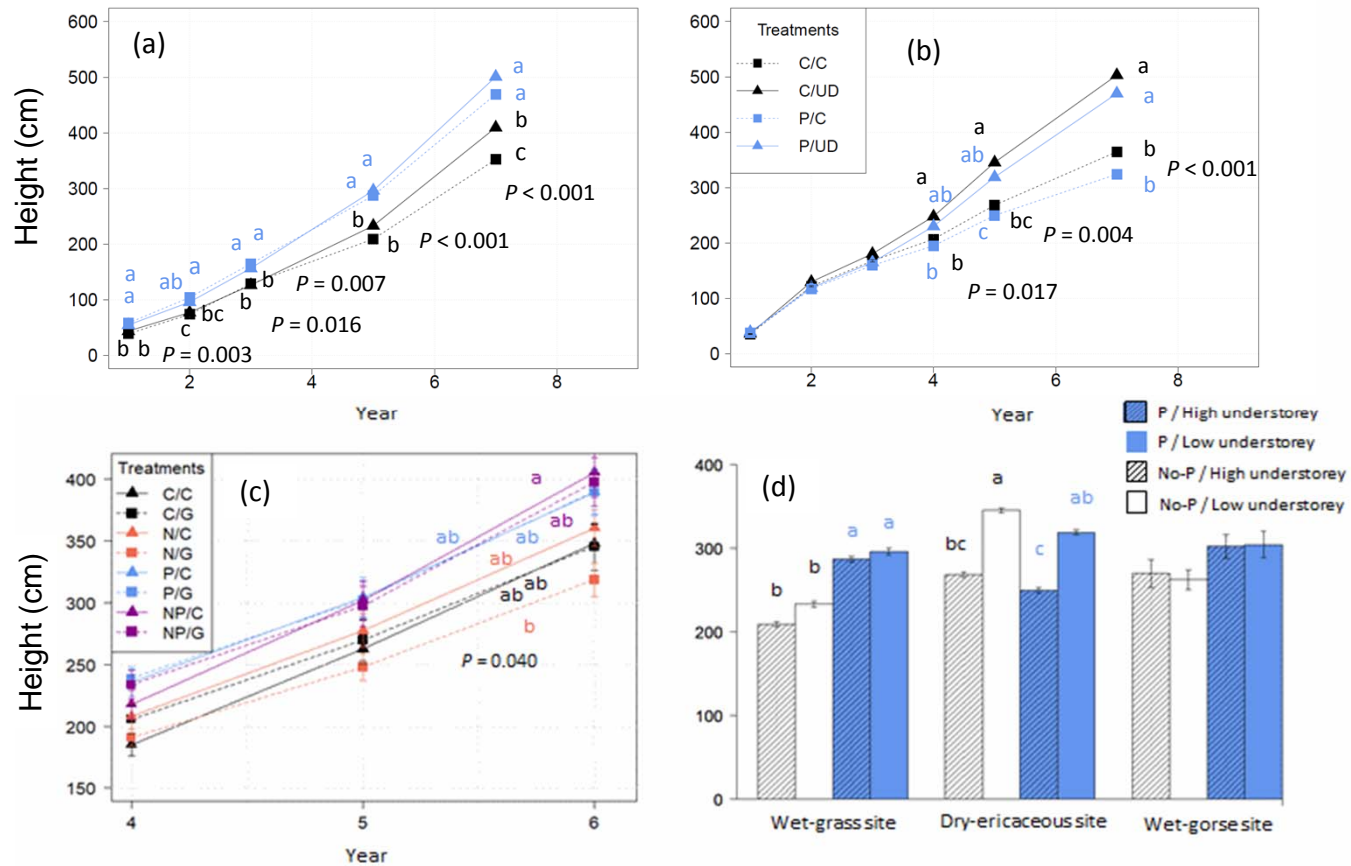
Treatments	Four years old pine (2016)		Five years old pine (2017)		Six years old pine (2018)	
	$C_{130}$ (cm) [NS]	Volume ( $\text{dm}^3 \text{ stem}^{-1}$ ) [NS]	$C_{130}$ (cm) [*]	Volume ( $\text{dm}^3 \text{ stem}^{-1}$ ) [*]	$C_{130}$ (cm) *	Volume ( $\text{dm}^3 \text{ stem}^{-1}$ ) **
C/C	5.3 ± 0.8 a	0.15 ± 0.03 a	11.5 ± 0.8 ab	0.84 ± 0.12 ab	17.4 ± 1.0 ac	2.48 ± 0.31 ab
C/G	6.6 ± 0.9 a	0.25 ± 0.06 a	10.9 ± 1.2 ab	0.86 ± 0.19 ab	15.3 ± 1.6 bc	2.06 ± 0.40 b
N/C	7.8 ± 1.0 a	0.35 ± 0.08 a	13.3 ± 1.3 ab	1.27 ± 0.24 ab	18.9 ± 1.6 ac	3.19 ± 0.55 ab
N/G	5.6 ± 0.6 a	0.16 ± 0.03 a	9.9 ± 0.9 b	0.60 ± 0.10 b	14.2 ± 1.0 c	1.55 ± 0.23 b
P/C	7.4 ± 1.1 a	0.37 ± 0.11 a	13.9 ± 0.9 ab	1.44 ± 0.30 ab	20.2 ± 1.1 ac	3.71 ± 0.54 ab
P/G	8.6 ± 0.6 a	0.42 ± 0.05 a	13.6 ± 0.8 ab	1.33 ± 0.18 ab	19.3 ± 1.2 ac	3.46 ± 0.50 ab
NP/C	8.3 ± 0.9 a	0.40 ± 0.09 a	16.0 ± 1.4 a	1.98 ± 0.40 a	24.2 ± 1.9 a	5.93 ± 1.05 a
NP/G	8.2 ± 0.8 a	0.40 ± 0.08 a	14.4 ± 1.2 ab	1.56 ± 0.38 ab	21.2 ± 1.4 ab	4.29 ± 0.70 ab

**Supplementary Information Figure S1**



**Figure S1:** Timing of site preparation, soil and tree sampling for the wet-gorse, wet-grass and the dry-ericaceous sites.

## Supplementary Information Figure S2



**Figure S2:** Maritime pine (*Pinus pinaster* ait.) height as a function of age for the three sites studied. Panels a, b and c represent pine heights for the wet-grass ( $n = 1,280$  trees), the dry-ericaceous ( $n = 1,928$  trees) and the wet-gorse site ( $n = 72$  trees), respectively. Note that in (a) and (b) pine heights of the dry-ericaceous and the wet-grass site are shown from the first year after planting, while in (c) values start four years after planting. A comparison of the pine heights at five years old at each site is shown in panel d. Different letters indicate significant differences between groups within a site (Tukey post-hoc test).

### Supplementary Information Figure S3

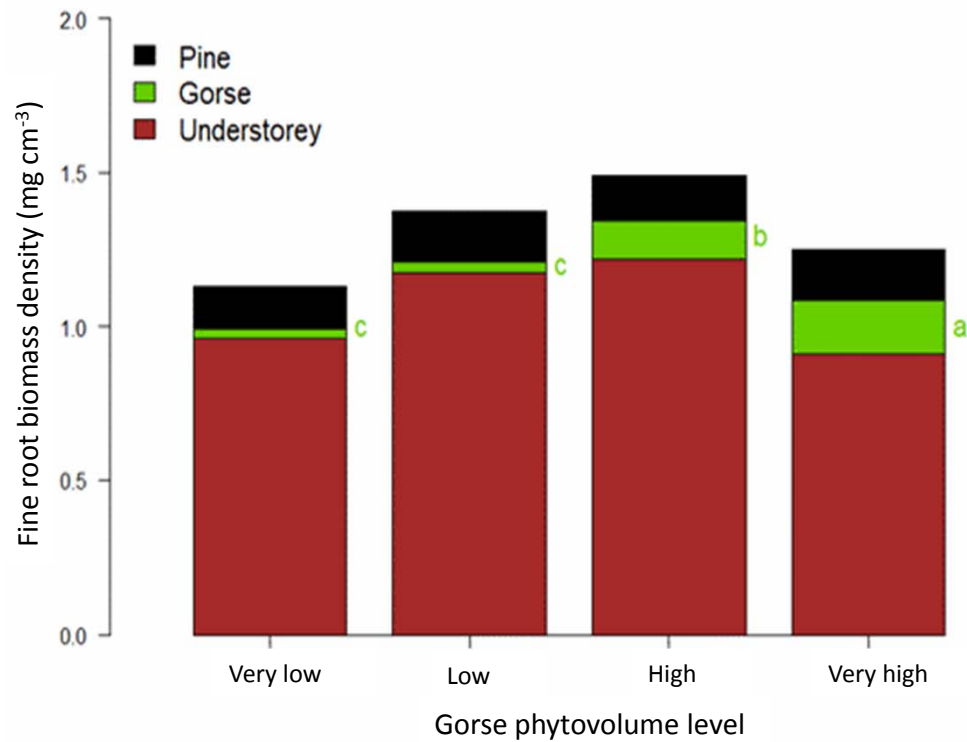


Figure S3: Fine root biomass density of maritime pine trees, gorse and the remaining understorey species. Total fine root biomass is presented as a function of gorse phytovolume levels and according to the three groups of vegetation: pine, gorse and the other species (named « Understorey »). Different letters indicate significant differences between gorse phytovolume levels (Tukey post-hoc test, n = 72 soil samples). Note that gorse fine root biomass increased significantly with gorse phytovolume (green letters).

### Supplementary Information Figure S4

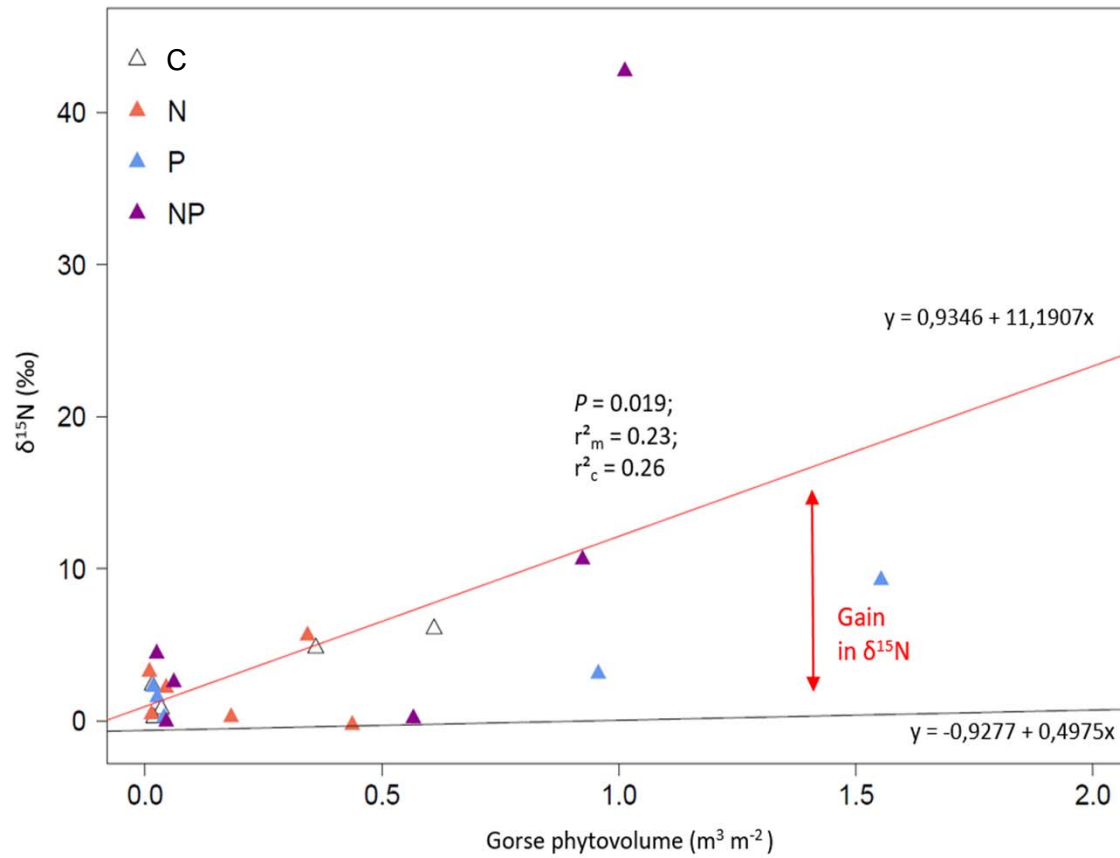


Figure S4: Gain in needle- $\delta^{15}N$  following soil  $^{15}N$  labelling at a depth of two cm as a function of the four fertilisation treatments (C = control, N = nitrogen, P = phosphorus, NP = nitrogen plus phosphorus). The black line represents the initial needle- $\delta^{15}N$  and the red line represents the gain in needle- $\delta^{15}N$  after the  $^{15}N$  labelling (n = 24 trees).

### Supplementary Information Figure S5

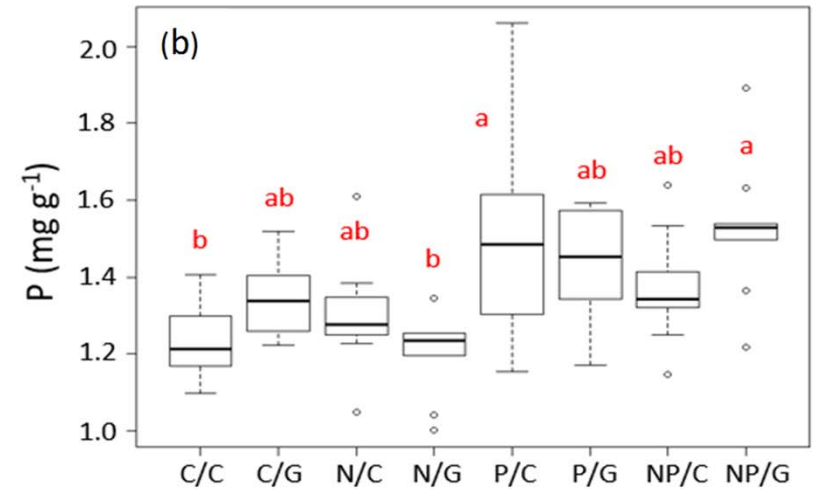
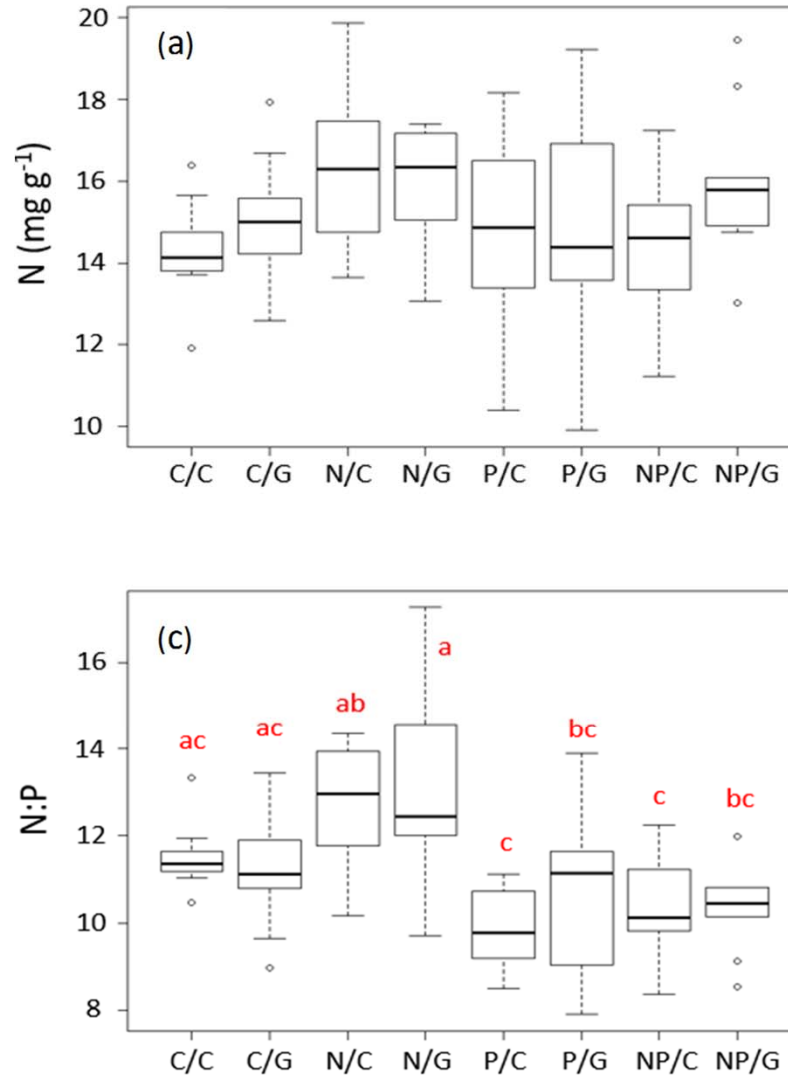
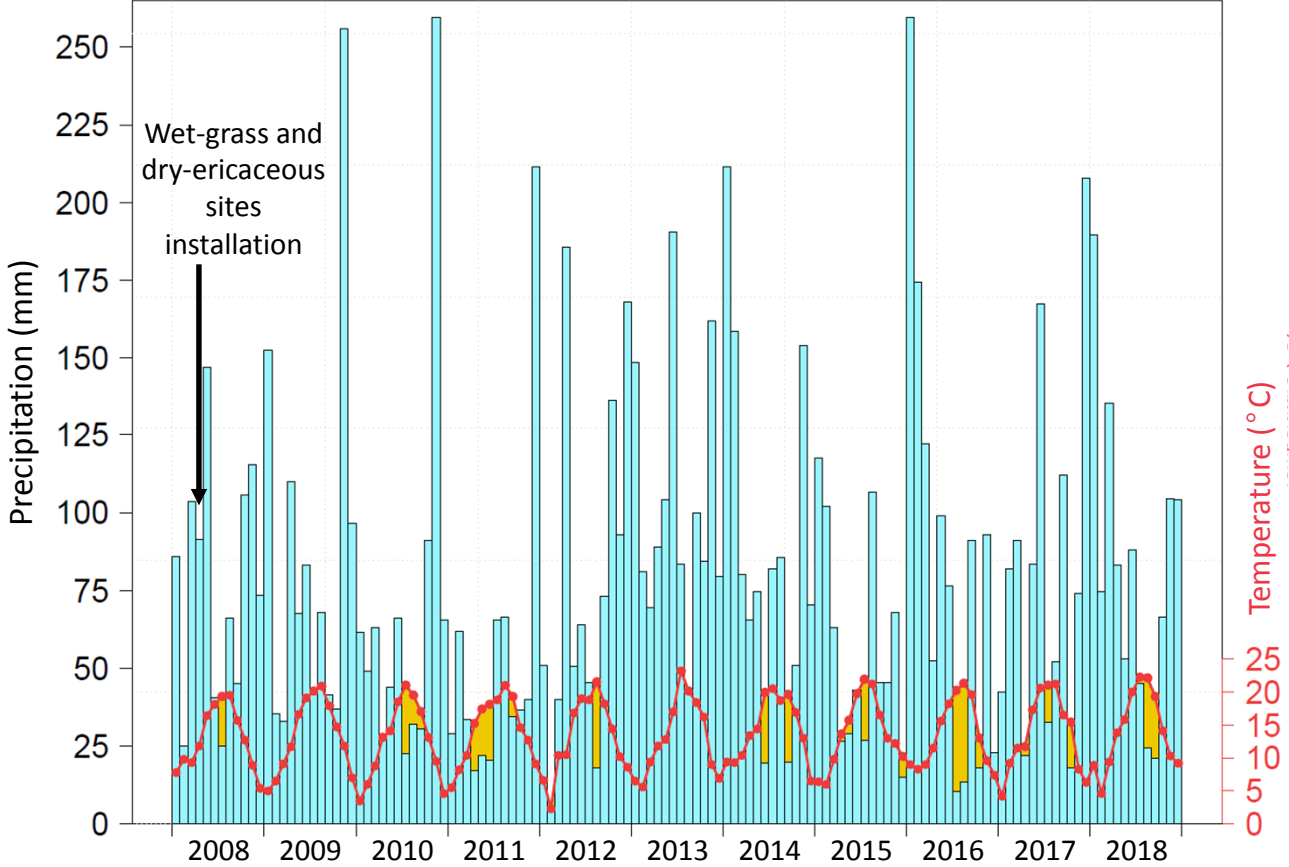


Figure S5: Effects of site characteristics on (a) nitrogen (N), (b) phosphorus (P), and (c) N:P concentrations ( $P = 0.017$  for P,  $P < 0.001$  for N:P) of green gorse twigs at the wet-gorse site (sampled in 2018 when stand age was seven,  $n = 72$  gorse shrubs). For each site modality, the upper letters represent the level of fertilisation (C = control; N = nitrogen addition; P = phosphorus; NP = nitrogen plus phosphorus) and the lower letters the type of site undertsory (C = control and G = gorse addition). Different letters indicate significant differences between modalities (Tukey post-hoc test).

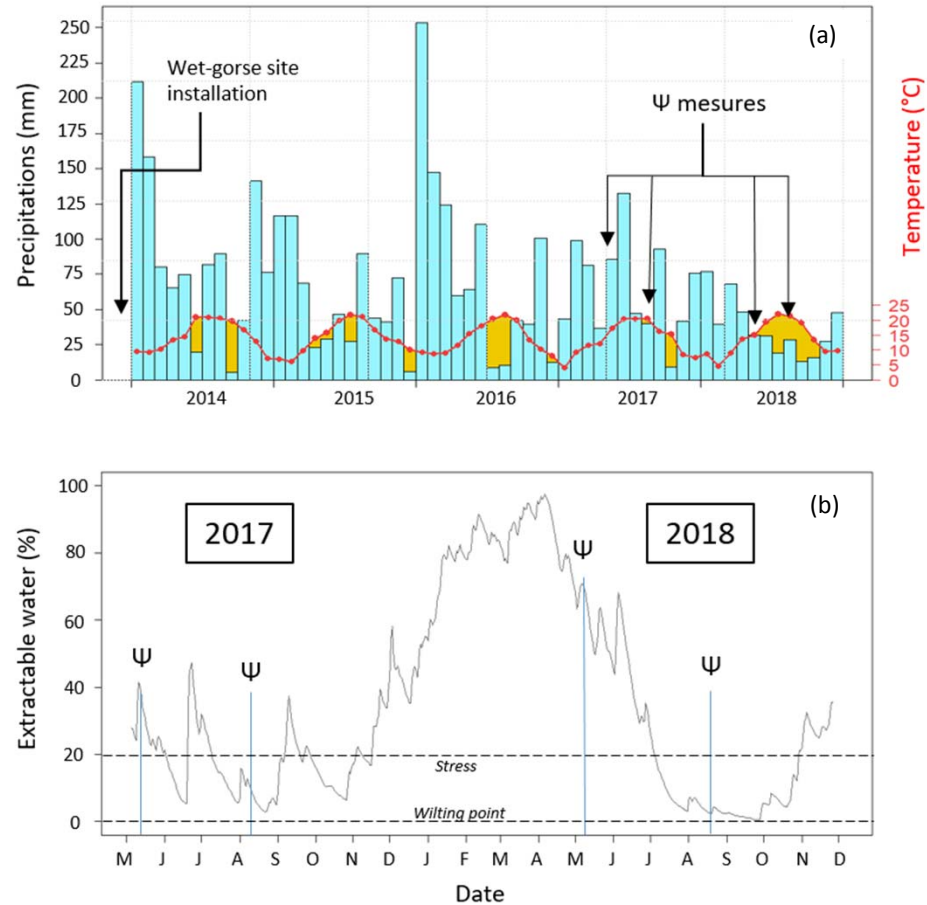
**Supplementary Information Figure S6**



**Figure S6:** Walter-Lieth climate (ombrothermic) diagram showing the monthly variations in precipitation (blue) and air temperature (red) at the wet-grass site and the dry-ericaceous sites from 2008 to 2018. Areas shaded in yellow indicate that mean temperatures were higher than twice the monthly precipitation and represent drought periods.



## Supplementary Information Figure S7



**Figure S7:** (a) Monthly variations in precipitation (blue bars) and temperature (red line) at the wet-gorse site. This ombrothermic diagram is presented from the first year after site establishment and treatment applications (2014) to the last monitoring year (2018). Areas shaded in yellow indicate that mean monthly temperatures were higher than twice the monthly precipitations and represent drought periods. In (b) the relative extractable water (REW) averaged over the 70 cm of soil is presented from May 2017 to December 2018, when ecophysiological measurements were performed ( $\Psi$  symbols; Figure S1). REW thresholds for the onset of water stress (20% REW equivalent to 9% soil moisture) and for the soil wilting point (0% REW or 4% soil moisture) are also indicated.