

## Supplementary materials

**Table S1.** Above-ground mass and fractions of green material, flower and dead material, and relative abundance of functional groups, the ten most abundant species and other species (< 15%) in plant community subjected to two levels of CO<sub>2</sub> concentration (390 and 520 ppm) with or without extreme climatic event (ECE) at three different **cutting dates**

CO <sub>2</sub> (ppm)	Cut April		Cut June		Cut November		ECE	
	390	520	390	520	Control		390	520
					390	520		
Above-ground mass (g/m <sup>2</sup> )	109 ± 24	124 ± 25	195 ± 41	175 ± 21	116 ± 33	148 ± 63	152 ± 39	169 ± 76
<i>Fractions (%)</i>								
Green material	83 ± 6	80 ± 5	59 ± 14	68 ± 15	50 ± 10 <sup>b</sup>	65 ± 14 <sup>ab</sup>	76 ± 12 <sup>ab</sup>	78 ± 3 <sup>a</sup>
Flower	9 ± 5	14 ± 4	39 ± 14	31 ± 14	3 ± 3	1 ± 1	0 ± 0	0 ± 0
Dead material	8 ± 6	6 ± 3	1 ± 1	1 ± 0	46 ± 7	34 ± 15	24 ± 12	22 ± 3
<i>Relative abundance of functional groups (%)</i>								
Grasses	89 ± 7	89 ± 11	87 ± 5	86 ± 11	81 ± 22	88 ± 14	97 ± 4	77 ± 17
Legumes	1 ± 1	1 ± 1	3 ± 6	3 ± 5	12 ± 20	1 ± 1	0 ± 0	1 ± 1
Forbs	10 ± 7	11 ± 10	10 ± 5	11 ± 8	7 ± 2	12 ± 14	3 ± 4	22 ± 17
<i>Relative abundance of species (%)</i>								
<i>Agrostis spp</i>	14 ± 8	9 ± 6	11 ± 5	12 ± 11	13 ± 6 <sup>ab</sup>	22 ± 7 <sup>a</sup>	13 ± 9 <sup>ab</sup>	3 ± 1 <sup>b</sup>
<i>Arrhenaterum elatius</i>	2 ± 4	8 ± 12	6 ± 9	11 ± 18	1 ± 1	0 ± 0	0 ± 0	11 ± 20
<i>Alopecurus pratensis</i>	11 ± 9	7 ± 4	11 ± 10	6 ± 3	7 ± 5	6 ± 2	34 ± 29	5 ± 2
<i>Dactylis glomerata</i>	11 ± 12	11 ± 10	16 ± 17	9 ± 9	17 ± 24	7 ± 6	20 ± 27	32 ± 25
<i>Holcus lanatus</i>	32 ± 15	28 ± 12	30 ± 12	30 ± 14	24 ± 10 <sup>a</sup>	24 ± 18 <sup>a</sup>	0 ± 0 <sup>b</sup>	3 ± 2 <sup>ab</sup>
<i>Lolium perenne</i>	7 ± 6	9 ± 6	5 ± 4	5 ± 5	3 ± 5	3 ± 2	1 ± 2	2 ± 3
<i>Poa angustifolia</i>	3 ± 4	3 ± 2	4 ± 7	3 ± 2	6 ± 5	16 ± 9	13 ± 21	10 ± 8
<i>Poa pratensis</i>	3 ± 3	4 ± 4	1 ± 1	1 ± 1	9 ± 5	2 ± 1	13 ± 18	9 ± 13
<i>Trisetum flavescens</i>	3 ± 2	3 ± 2	3 ± 2	5 ± 6	0 ± 1	1 ± 0	2 ± 2	1 ± 1
<i>Ranunculus acris</i>	3 ± 3	2 ± 1	5 ± 2	2 ± 1	5 ± 2	2 ± 1	1 ± 1	1 ± 0
Other species	10 ± 6	16 ± 9	8 ± 6	14 ± 11	15 ± 25	17 ± 14	3 ± 3	22 ± 18

Data shown are mean ± standard deviation. <sup>a,b</sup> For the cut of November and annual data, means in a same row with different letters are **significantly different** (p < 0.05). n=6 for April and June cuts; n=3 for November cut

**Table S2.** Effects of **cutting date** and its interaction with CO<sub>2</sub> (*p*-values) on above-ground mass yield, fractions of green material, flower and dead material, and relative abundance of functional groups, the ten most abundant species and other species (< 15%) in plant community subjected to two levels of CO<sub>2</sub> concentration (390 and 520 ppm) with or without extreme climatic event (ECE) at three different cuts

	Cutting date effect	Cutting date × CO <sub>2</sub> effect
Above-ground mass	<b>0.025</b>	0.258
<i>Fractions</i>		
Green material	< <b>0.001</b>	0.376
Flower	< <b>0.001</b>	0.188
Dead material	< <b>0.001</b>	0.409
d.f (num/den)	3/24	4/15
Grasses	0.807	0.390
Legumes	0.370	0.856
Forbs	0.971	<u>0.097</u>
d.f (num/den)	2/18	3/12
<i>Agrostis spp</i>	0.854	0.577
<i>Arrhenaterum elatius</i>	<u>0.061</u>	0.840
<i>Alopecurus pratensis</i>	0.113	<u>0.060</u>
<i>Dactylis glomerata</i>	<u>0.087</u>	0.686
<i>Holcus lanatus</i>	< <b>0.001</b>	0.684
<i>Lolium perenne</i>	< <b>0.001</b>	0.677
<i>Poa angustifolia</i>	<b>0.002</b>	0.495
<i>Poa pratensis</i>	<b>0.003</b>	0.227
<i>Trisetum flavescens</i>	<b>0.003</b>	0.606
<i>Ranunculus acris</i>	0.140	<u>0.067</u>
Other species	0.725	0.308
d.f (num/den)	2/18	3/14

d.f (num/den), degrees of freedom (numerator and denominator). In bold:  $p < 0.05$ ; Underlined:  $0.05 < p < 0.1$

**Table S3.** Effects of **cutting date** and its interaction with CO<sub>2</sub> (*p*-values) on chemical composition and *in vitro* rumen fermentation parameters of plant community subjected to two levels of CO<sub>2</sub> concentration (390 and 520 ppm) with or without extreme climatic event (ECE) at three different **cutting dates**

	<b>Cutting date</b> effect	<b>Cutting date</b> × CO <sub>2</sub> effect
<i>Chemical composition</i>		
OM	<b>0.009</b>	0.254
C	0.166	0.413
N	< <b>0.001</b>	< <b>0.001</b>
C:N ratio	< <b>0.001</b>	< <b>0.001</b>
NDF	< <b>0.001</b>	0.130
NDF:N ratio	< <b>0.001</b>	< <b>0.001</b>
WSC	< <b>0.001</b>	0.186
Glucose	< <b>0.001</b>	0.108
Sucrose	< <b>0.001</b>	0.811
Fructose	< <b>0.001</b>	0.206
Fructans	<b>0.002</b>	0.119
Condensed tanins	<b>0.012</b>	0.753
Pepsin-cellulase OM digestibility	< <b>0.001</b>	0.304
d.f (num/den)	2/24	3/24
<i>In vitro rumen fermentation parameters</i>		
Acidification (dpH)	< <b>0.001</b>	<u>0.059</u>
IVDMD	< <b>0.001</b>	0.104
NH <sub>3</sub>	< <b>0.001</b>	< <b>0.001</b>
Total VFA	< <b>0.001</b>	0.294
Acetate	<b>0.022</b>	0.557
Propionate	<b>0.003</b>	<u>0.057</u>
Butyrate	<b>0.011</b>	0.951
Valerate	<b>0.003</b>	<b>0.016</b>
Iso-butyrate	0.273	<u>0.095</u>
Iso-valerate	<b>0.010</b>	<b>0.031</b>
Acetate:propionate ratio	<b>0.003</b>	0.148

Total gas	< <b>0.001</b>	0.759
CH <sub>4</sub>	< <b>0.001</b>	0.702
CO <sub>2</sub>	< <b>0.001</b>	0.686
CO <sub>2</sub> :CH <sub>4</sub> ratio	<u>0.094</u>	0.856
d.f (num/den)	2/24	3/24

OM, organic matter; C, carbon; N, nitrogen; NDF, neutral detergent fiber; WSC: water-soluble carbohydrates; CT, condensed tannins; IVDMD, *in vitro* dry matter degradability, VFA, volatile fatty acids; d.f (num/den), degrees of freedom (numerator and denominator). In bold:  $p < 0.05$ ; Underlined:  $0.05 < p < 0.1$

**Table S4.** Spearman correlation coefficients of i) above-ground biomass characteristics against chemical composition (first excel sheet), ii) *in vitro* rumen fermentation parameters against chemical composition (second excel sheet) and iii) *in vitro* rumen fermentation parameters against above-ground biomass characteristics (third excel sheet) (n = 36 with  $p$ -value < 0.001 in red,  $p$ -value < 0.01 in orange and  $p$ -value < 0.05 in yellow).

See supplementary Excel file

**Figure S1.** Relationships between the abundance of selected plant species (*Lolium perenne*, *Holcus lanatus* and *Alopecurus pratensis*), chemical parameters (fructan content in g.kg<sup>-1</sup> DM, NDF:N ratio and N content in g.kg<sup>-1</sup> DM), and *in vitro* rumen fermentation parameters (IVDMD in g.kg<sup>-1</sup>, iso-valerate in % and NH<sub>3</sub> in mmol.L<sup>-1</sup>). The lines indicate linear relationships for significant Spearman correlation (Table S4; p<0.05; n = 36)

