

Supplementary material

Table S1. Characteristics of the upper soil layer, generally the O-horizon, at nine experimental sites depending on treatment. Data represents annual mean values and standard error in brackets is an indication of the spatial variability at the sites.

Site	Treatment	Depth cm	Bulk density g cm ⁻³	pH(H ₂ O) ^a	Total C % by weight	Total N % by weight	Soil water NH ₄ ⁺ mg N L ⁻¹	Soil water NO ₃ ⁻ mg N L ⁻¹	Soil NH ₄ ^{+b} μg N g ⁻¹ dry soil	Soil NO ₃ ⁻ μg N g ⁻¹ dry soil	Microbial biomass C mg C g ⁻¹ dry soil
EE-Män	Control	0-15	0.01	3.4	53	0.6	4.07 (2.70)	2.55 (0.23)	3.5 (2.4)	2.2 (0.2)	na
	Drainage		na	2.2	43	1.2	4.25 (1.10)	1.28 (1.11)	3.4 (0.9)	1.0 (0.9)	na
SE-Sto	Control	0-10	0.10	4.0	50	1.2	na	na	na	na	na
SE-Fäj	Control	0-10	0.02	3.9	40	1.5	0.63 (0.55)	0.52 (0.19)	na	na	na
	NH ₄ NO ₃		na	3.9	na	na	na	0.92 (0.31)	na	na	na
UK-Whi	Control	0-10	0.08	3.7	46	1.1	0.17 (0.22)	0.05 (0.09)	26.3 (6.9)	0.16 (0.02)	na
	NH ₄		0.12	3.7	47	1.3	0.87 (0.37)	0.12 (0.13)	85.9 (42.4)	0.07 (0.02)	na
	NO ₃		0.11	4.0	49	1.4	0.29 (0.34)	0.44 (0.51)	63.1 (7.8)	0.21 (0.05)	na
UK-Clo	Control	0-9	0.09	3.9	45	1.2	0.23 (0.17)	0.09 (0.06)	5.0 (2.8)	0.4 (0.7)	2.2 (0.7)
	Drought		na	3.9	na	na	0.32 (0.25)	0.15 (0.16)	3.1 (1.7)	0.3 (0.4)	4.0 (1.8)
	Warming		na	3.9	na	na	0.17 (0.11)	0.03 (0.03)	5.9 (3.0)	0.4 (0.6)	2.5 (0.4)
DK-Mol	Control	0-3	0.21	3.7	20	1.1	0.87 (0.44)	1.55 (0.69)	10.1 (8.0)	2.4 (2.7)	0.6 (0.2)
	Drought		0.20	na	21	1.1	1.26 (0.67)	1.24 (0.83)	5.6 (2.7)	2.8 (2.7)	0.6 (0.2)
	Warming		0.23	na	19	1.0	1.59 (0.78)	1.66 (1.29)	8.3 (4.8)	4.0 (4.0)	0.5 (0.2)
DK-Bra	Control	0-2	0.08	3.1	23	1.2	7.45 (3.76)	6.79 (3.77)	10.8 (3.9)	2.3 (1.7)	1.1 (0.2)
	Drought		na	na	na	na	9.91 (5.95)	5.52 (3.95)	na	na	na
	Warming		na	na	na	na	8.46 (5.12)	6.55 (2.54)	na	na	na
NL-Old	Control	0-4	0.21	4.2	45	1.9	1.13 (0.30)	1.10 (0.29)	72.9 (20.3)	11.4 (2.9)	1.3 (0.1)
	Drought		0.21	na	42	1.8	na	na	62.5 (15.8)	7.7 (2.4)	na
	Warming		0.27	na	45	2.0	na	na	69.6 (20.9)	12.8 (3.2)	na
ES-Gar	Control	0-12	1.20	8.1	1	0.1	0.11 (0.06)	< 0.02	0.77 (0.17)	0.12 (0.03)	0.21 (0.03)
	Drought		1.29	na	1	0.1	0.12 (0.04)	< 0.02	0.71 (0.22)	0.09 (0.02)	0.20 (0.04)
	Warming		1.14	na	1	0.1	0.16 (0.07)	< 0.02	0.84 (0.16)	0.07 (0.03)	0.21 (0.01)

na, not assessed

^a Soil pH was measured in 1 M KCl at EE-Män and in 0.01 M CaCl₂ at DK-Mol and DK-Bra. These extraction agents result in lower pH values compared to soil suspended in water.

^b The extraction agent varied with site, thus soil NH₄⁺ data should only be used to compare treatments at the site level

Table S2. Characteristics of the lower soil layer, generally below the O-horizon, in untreated control plots at seven experimental sites.

Site	Bulk density g cm ⁻³	pH(H₂O) ^a	Total C % by weight	Total N % by weight
EE-Män	1.22	3.4	44	0.64
UK-Whi	0.08	3.7	46	0.98
UK-Clo	0.86	4.0	19	0.51
DK-Mol	1.41	4.3	1	0.06
DK-Bra	1.17	3.5	3	0.18
NL-Old	1.14	3.9	2	0.08
ES-Gar	na	8.3	na	na

na, not assessed

^a Soil pH was measured in 1 M KCl at EE-Män and in 0.01 M CaCl₂ at DK-Mol and DK-Bra. These extraction agents result in lower pH values compared to soil suspended in water.

Table S3. Aboveground biomass C and N, total N deposition, nitrate leaching and mean annual water table depth at nine experimental sites depending on treatment.

Site	Treatment	Aboveground biomass C	Aboveground biomass N	Total N deposition ^a	NO ₃ ⁻ leaching	Water table depth
		g C m ⁻²	g N m ⁻²	g N m ⁻² yr ⁻¹	g N m ⁻² yr ⁻¹	cm below surface
EE-Män	Control	na	na	0.8	na	15
	Drainage	na	na	na	na	38
SE-Sto	Control	na	na	0.2	na	22
	NH ₄ NO ₃	na	na	4.2	na	na
SE-Fäj	Control	na	na	1.5	na	4
	NH ₄ NO ₃	na	na	5.5	na	na
UK-Whi	Control	2684	49.8	0.8	na	12
	NH ₄	2435	59.2	6.4	na	na
	NO ₃	2354	54.6	6.4	na	na
UK-Clo	Control	1790	34	1.8	0.4	30
	Drought	na	na	na	0.3	na
DK-Mol	Control	650	9	0.9	1.2	na
	Drought	na	na	0.9	0.8	na
	Warming	na	na	na	0.5	na
DK-Bra	Control	343	11	1.7	0.3	na
	Drought	na	na	na	0.3	na
	Warming	na	na	na	0.2	na
NL-Old	Control	584	10	2.2	1.5	na
	Drought	na	na	na	1.5	na
	Warming	na	na	na	2.7	na
ES-Gar	Control	360	5	0.8	na	na

na, not assessed

^a Total N deposition was derived from Williams et al. (1999) at EE-Män, Persson et al. (2004) at SE-Sto and SE-Fäj, Bealey et al. (2003) at UK-Clo, Avila et al. (2009) at ES-Gar and bulk deposition collectors at UK-Whi, DK-Mol, DK-Bra, NL-Old and ES-Gar

References

- Avila, A., Molowny-Horas, R., Gimeno, B. S., and Peñuelas, J.: Analysis of decadal time series in wet N concentrations at five rural sites in NE Spain, *Water Air Soil Poll.*, 207, 123-138, 2010.
- Bealey, W. J., Sheppard, L. J., Malcolm, H., Cape, J. N., Davison, A., Carvalho, L., Dragosits, U., Harding, K., Hall, J., Fowler, D., Osborn, D., and Sutton, M. A.: Development of the UK air pollution information system (APIS), contract report to the JNCC (No. F90-01-538), 52 pp., 2003.
- Persson, C., Ressner, E., and Klein, T.: Nationell miljöövervakning - MATCH-Sverige modellen, SMHI, Norrköping, Sweden, 46 pp., 2004.
- Williams, B. L., Buttler, A., Grosvernier, P., Francez, A. J., Gilbert, D., Ilomets, M., Jauhiainen, J., Matthey, Y., Silcock, D. J., and Vasander, H.: The fate of NH_4NO_3 added to *Sphagnum magellanicum* carpets at five European mire sites, *Biogeochemistry*, 45, 73-93, 1999.