

Online resource 1: Variables used to calculate ^{15}N recovery and variables used in the PLS-R analysis for all sites, the organic (org) and mineral (min) soil layers and for the N treatments. Samples were taken in 2015 (SP, KH and GD) and in 2016 (AL). The YS site was sampled in 2012 by Wessel et al (unpublished).

		Speuld		Alptal		Klosterhede		Ysselsteyn		Gardsjon
N deposition level (kg N ha ⁻¹ yr ⁻¹)		5	50	17	47	20	55	5	55	48
$\delta^{15}\text{N}$ excess (‰)	org.	7.3±1.2	**18.3±1.8	12.3±1.5	11.1±1.2	*25.4±1.9	21.1±1	18.9±3.1	14.1±1.1	22.2±1.3
	min.	3.9±0.4	4.6±0.7	3.6±0.4	**5.7±0.8	6.5±0.6	5.6±0.4	***7.9±2	3.7±0.4	10.9±1.2
N (%)	org.	1.8±0.1	1.8±0	1.5±0.1	1.9±0.1	1.6±0.1	1.7±0.1	1.7±0.1	1.8±0.1	1.6±0
	min.	0±0	0.1±0	0.7±0.1	0.8±0.1	0.1±0	0.1±0	0.1±0	0.1±0	0.2±0
C (%)	org.	41.4±2	45±0.8	40.3±1.7	40±1.5	44.8±0.6	44.9±0.5	44.1±1.6	43.6±1.2	45.2±0.3
	min.	1±0.1	1.3±0.2	12.9±1.7	13.6±1.2	2.4±0.2	2.2±0.2	2.8±0.4	3.1±0.2	6.1±0.5
C:N ratio	org.	22.6±0.5	*24.6±0.8	***26.8±0.8	21.8±0.6	**29±1.1	27.1±0.6	26.2±0.7	24.1±0.9	28.2±0.5
	min.	26.3±1.9	26.4±1.3	17.3±0.5	17.3±0.6	27.3±0.7	29.4±1	31.9±0.3	**35.7±1	26.7±0.8
C stock (t ha ⁻¹)	org.	27.3±4.1	29.0±2.6	31.0±6.4	27.3±5.4	**24.0±1.7	17.5±1.5	26.4±7.2	31.2±4.4	79.5±3.7
	min.	62.0±3.9	77.6±10.1	77.6±11.0	88.0±11.5	116.4±6.8	104.7±12.8	152.6±14.1	170.4±10.5	96.9±12.6
N stock (t ha ⁻¹)	org.	1.2±0.2	1.2±0.1	1.2±0.3	1.3±0.2	0.8±0.1	0.6±0.1	1±0.3	1.4±0.2	2.9±0.1
	min.	2.4±0.1	3.1±0.3	4.4±0.6	5.0±0.7	4.2±0.3	3.3±0.4	5.4±0.6	4.8±0.3	3.9±0.6
Bulk density	org.	0.08±0.004	0.08±0.004	0.11±0.01	0.15±0.03	0.06±0.01	0.06±0.01	0.12±0.03	0.14±0.02	0.13±0.01

(g cm ⁻³)	min.	1.22±0.03	1.19±0.02	0.44±0.04	0.42±0.03	1.01±0.07	0.96±0.07	1.25±0.04	1.15±0.04	0.82±0.02
Mass (t ha ⁻¹)	org.	65±9	64±5	74±14	76±21	53±4	39±3	58±14	71±9	177±9
	min.	5974±166	5775±154	743±106	702±88	4924±353	4875±307	5513±399	5508±243	2137±404
Org. thickness (cm)	org.	10.6±1.9	10.3±1.0	**7±0.7	4.6±0.5	**9.7±0.8	7.0±0.8	5.4±1.2	5.4±0.6	15.0±0.8
Moisture content (% moist)	org.	*56.9±3.6	66.4±1.5	72.5±2.5	61.5±6.5	70.8±1.1	68.4±0.6	52.8±4.3	54.4±2.9	67.0±2.5
	min.	**9.5±0.5	10.9±0.1	*59.7±2.7	56.1±2.4	15.6±1.1	13.7±0.9	10.2±1.8	11.4±0.5	41.0±2.4
EC (μS cm ⁻¹)	org.	319.9±15.3	**376.9±8.4	276.9±15.5	295.6±20.5	337.2±18.7	291.6±25.8	232.9±50.2	275.3±25.8	260.7±5.4
	min.	100.4±7.5	87.1±4.1	190.4±15.5	193.9±16.2	100.7±15.5	70.0±6.0	88.5±7.6	100.9±6.6	108.5±6.2
pH	org.	3.3±0.03	3.2±0.04	3.9±0.1	4.2±0.1	**3.5±0.03	3.4±0.02	4.2±0.12	4.3±0.1	3.5±0.02
	min.	*3.9±0.05	3.8±0.02	4.7±0.2	4.7±0.2	**4.2±0.04	4.1±0.04	3.7±0.04	3.6±0.03	4.0±0.04
ECEC (mmol kg ⁻¹)	min.	1.6±0.0	1.4±0.1	31.2±1.6	36.2±1.6	3.3±0.2	4.0±0.2	2.3±0.2	2.6±0.1	5.2±0.2
NH ₄ (mg kg ⁻¹ soil)	min.	10.2±1	12.4±1	87.3±15.6	62.2±13.1	13.6±1.2	14.0±1.5	26.3±6.5	29.8±2.9	36.4±2.5
δ ¹⁵ N ref (‰)	org.	-5.7±0.04	-5.7±0.04	-3.11	-3.11	-2.1±1.8	-2.1±1.8	-2.4±1.2	-2.4±1.2	-0.7±0.2
	min.	1.1±1.3	1.1±1.3	0.2±0.1	0.2±0.1	6.3±0.9	6.3±0.9	1.3±1.6	1.3±1.6	4.2±0.1
atom% ¹⁵ N tracer	total	12.58	1.43	99	0.88	30.37	30.37	13.43	1.42	0.95

N tracer (mmol m ²)	total	16.02	158.81	0.87	219	7.58	7.58	24.19	209.02	354.12
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Note: Average values for sites, N treatments and organic (org) and mineral (min) soil layers. At SP, KH and YS the mineral soil was 0-50 cm for all soil cores. At GD the mineral soil cores ranged between 0 -100 cm and at AL between 0-25 cm. Standard error (se)

with n= 5 at SP and KH, 21 at AL and 52 at GD. Significant differences between the N treatments are given at levels: *** (P < 0.01), ** (P < 0.05) or * (P < 0.1). $\delta^{15}\text{N} \%$ excess is the measured $\delta^{15}\text{N} \%$ in the sample - $\delta^{15}\text{N} \%$ natural abundance background in a specific soil layer.