Supplement of

Can controlled drainage control agricultural nutrient emissions? Evidence from a BACI experiment combined with a dual isotope approach

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Table S1. Texture of IP1-2 (impacted) and CP1-2 (control plots) following USDA classification.

Plot	Horizon	Clay (< 2 µm) g/100 g	Silt (2-50 µm) g/100 g	Sand (50-2000 µm) g/100 g	Humus g/100 g	Soil type
IP1	Ap	14.9	47.8	34.2	3.1	Silt loam
	Ap2	15.5	49.4	32.6	2.6	Silt loam
	Beg	17.1	55.5	26.9	0.5	Silt loam
	Btg	25.9	50.9	22.7	0.5	Silt loam
	Lq	33.1	41.9	13.8	11.2	Silty clay loam
IP2	Ap	13.4	49.1	34.5	3.1	Silt loam
	Beg	12.5	74.8	12.4	0.3	Silt loam
	Btg	14.5	37.9	47.3	0.3	Loam
CP1	Ap	13.4	47.7	36.0	2.9	Silt loam
	Beg	14.5	44.2	41.0	0.3	Loam
	Cg	11.0	32.7	40.7	0.3	Loam
CP2	Ap	14.1	41.3	41.7	2.9	Loam
	Be	14.9	45.4	39.2	0.5	Loam
	Btg	17.1	42.6	32.6	0.3	Silt loam
	Ccg	10.4	30.9	43.0	0.3	Loam

Table S2. $CaCO_3$, total C, total N, and C:N for IP1-2 (impacted) and CP1-2 (control plots)

Plot	Horizon	$CaCO_3$	Total C	Total N	C:N
		g/100 g	g/100 g	g/100 g	N/A
IP1	Ap	b.d.l.	1.83	0.19	10
	Ap2	b.d.l.	1.50	0.16	9
	Beg	b.d.l.	0.28	0.03	9
	Btg	b.d.l.	0.31	0.03	10
	Lq	b.d.l.	6.57	0.19	35
IP2	Ap	b.d.l.	1.84	0.17	11
	Beg	b.d.l.	0.16	0.02	8
	Btg	b.d.l.	0.16	0.01	16
CP1	Ap	b.d.l.	1.68	0.16	11
	Beg	b.d.l.	0.20	0.02	10
	Cg	15.43	2.02	0.01	202
CP2	Ap	b.d.l.	1.70	0.17	10
	Be	b.d.l.	0.29	0.03	10
	Btg	7.34	1.06	0.02	53
	Ccg	15.51	2.03	0.01	203

*b.d.l.=Below Detection Limit

Table S3. BACI test of the spatially monitored groundwater levels in Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

Location at plot	Compared periods	n	BE (cm)	t value	p
Center of plots	Y0/Y1	69	-0.3	0.2	0.8
	Y0/Y2	68	-2.8	-0.1	0.9
Northeast of well	Y0/Y1	69	-7.0	1.7	0.09
	Y0/Y2	68	-20.5	4.5	<0.001
Northwest of well	Y0/Y1	69	5.3	-1.7	0.09
	Y0/Y2	68	5.6	-2.9	<0.05
Southwest of well	Y0/Y1	69	-2.6	0.8	0.4
	Y0/Y2	68	-2.8	-0.4	0.7
Closest to well	Y0/Y1	69	-6,3	1,2	0.22
	Y0/Y2	68	-18,4	6,0	<0.001
East of the plot	Y0/Y1	69	-9.6	5,3	<0.001
	Y0/Y2	68	-12.0	5,7	<0.001
South of the plot	Y0/Y1	69	-7.5	1,2	0.25
	Y0/Y2	68	-11.4	2,8	<0.05

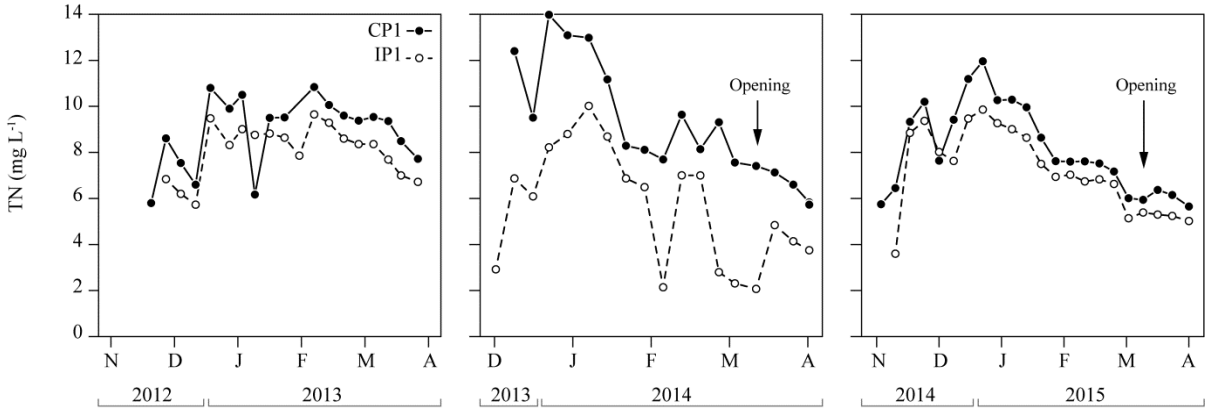

Figure S1. TN at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

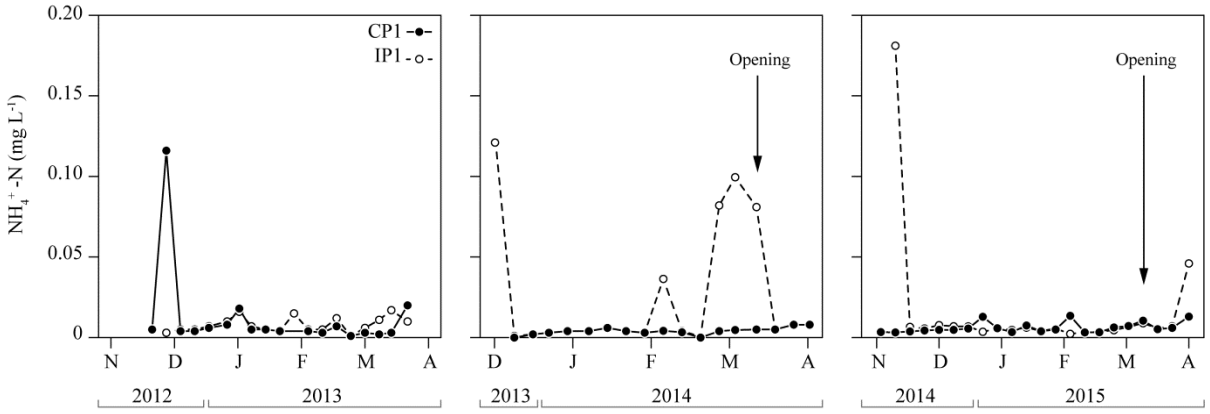

Figure S2. NH_4^+-N at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

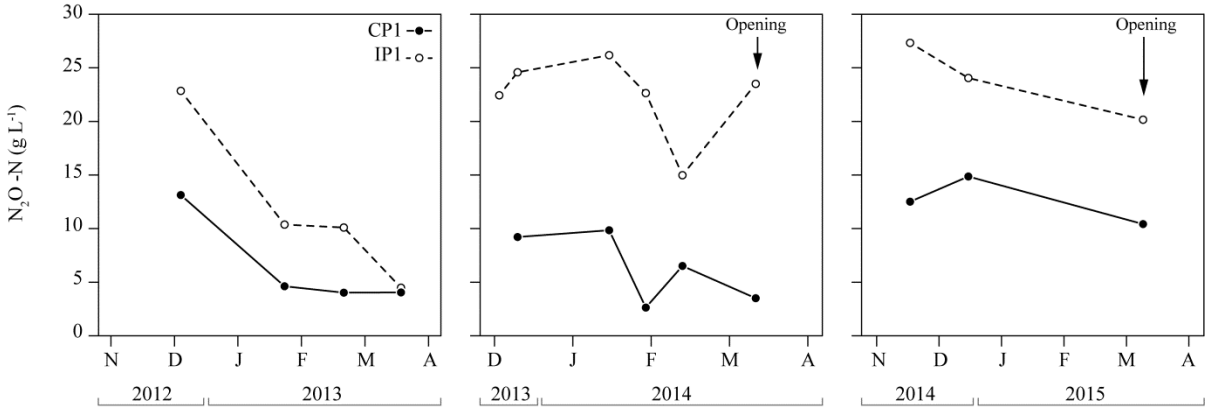

Figure S3. N_2O-N at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

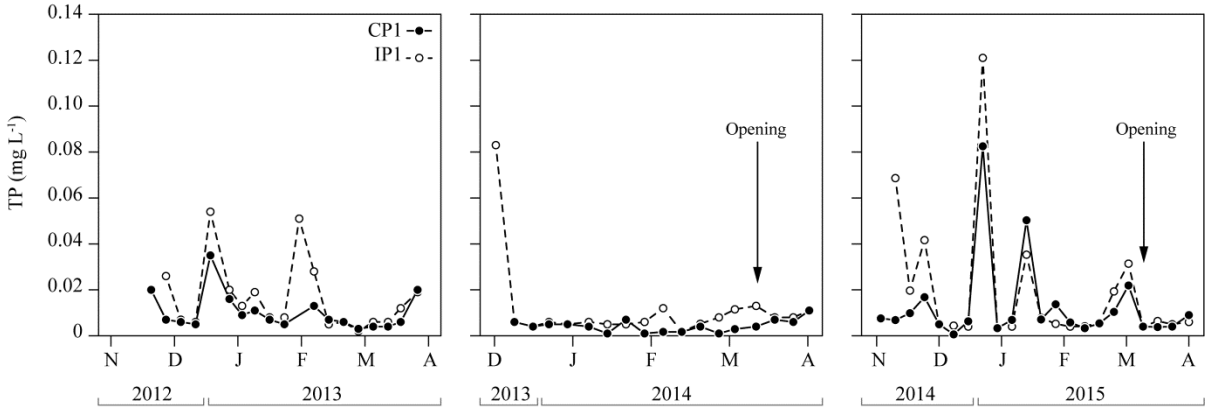

Figure S4. TP at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

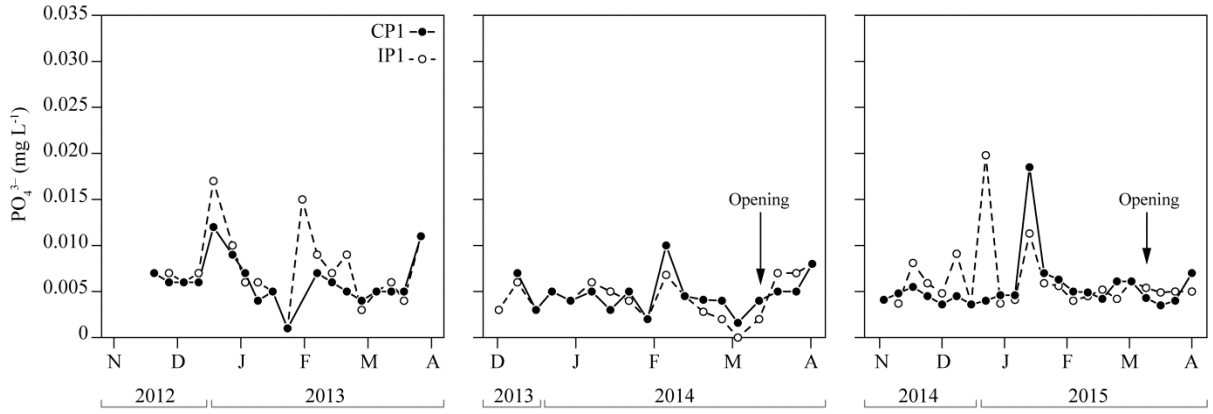

Figure S5. PO_4^{3}- at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

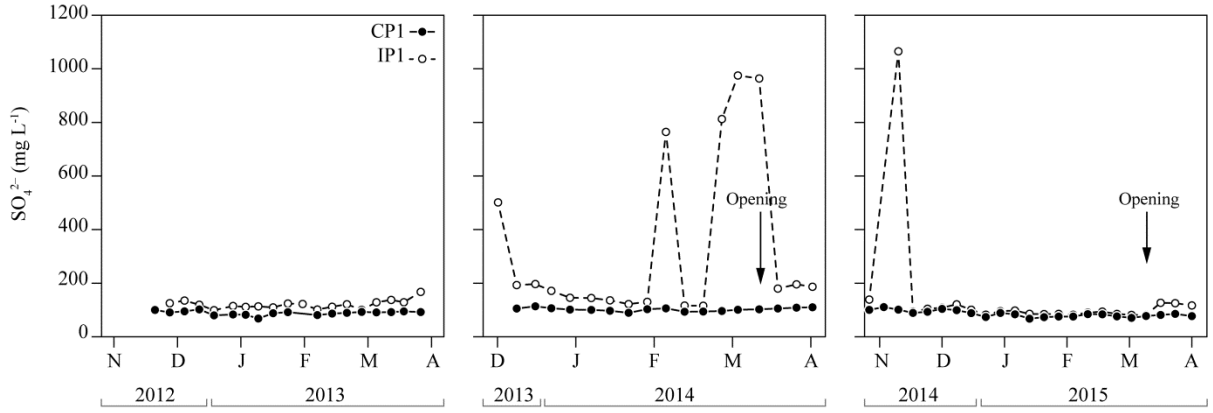

Figure S6. SO_4^{2-} at CP1 and IP1 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

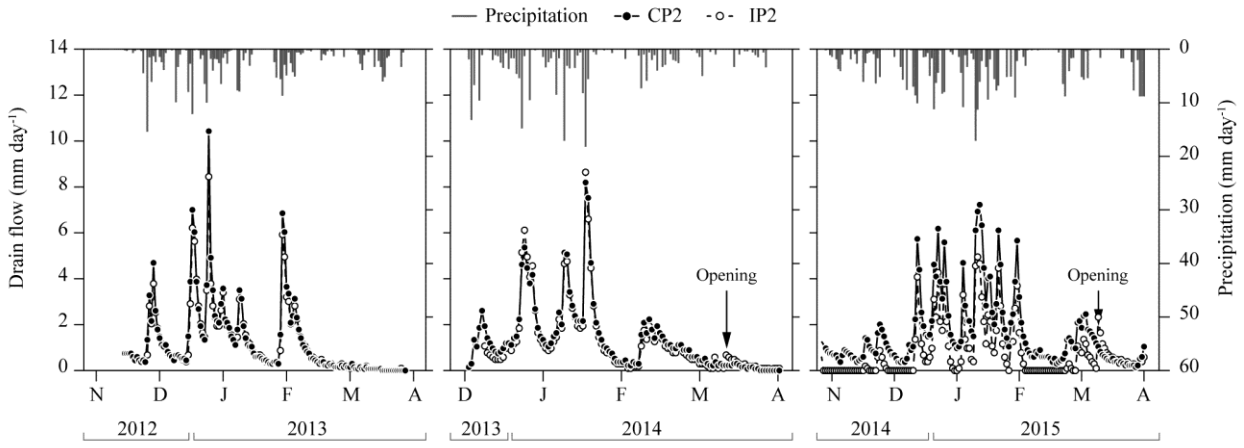

Figure S7. Drain flow and precipitation at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

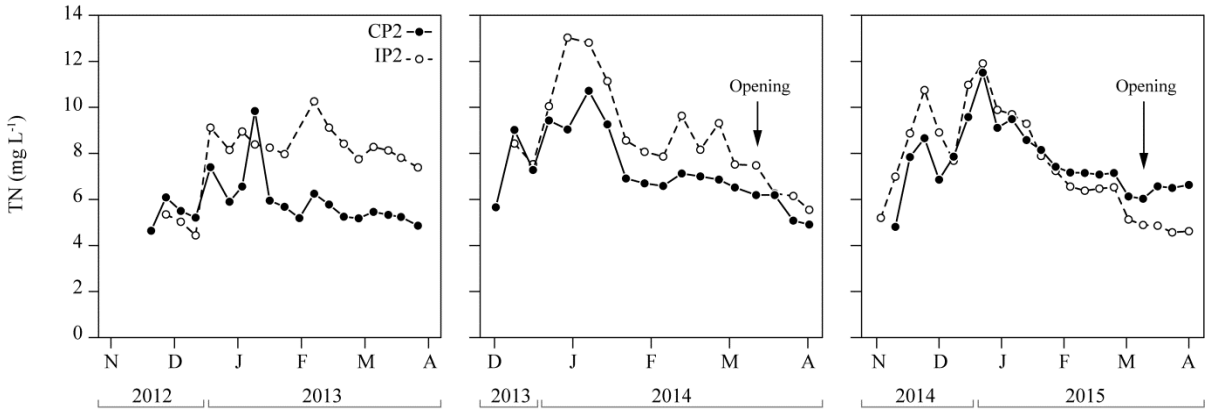

Figure S8. TN at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

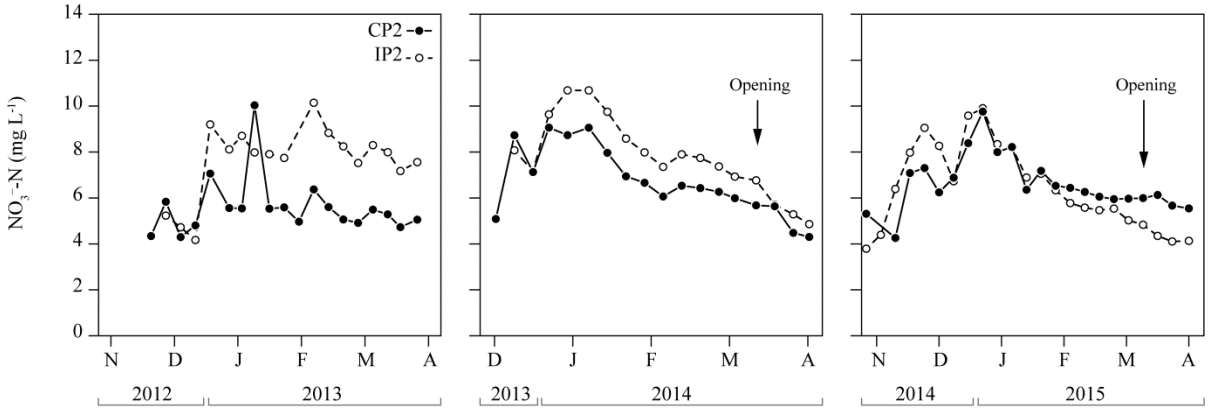

Figure S9. NO_3^--N at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

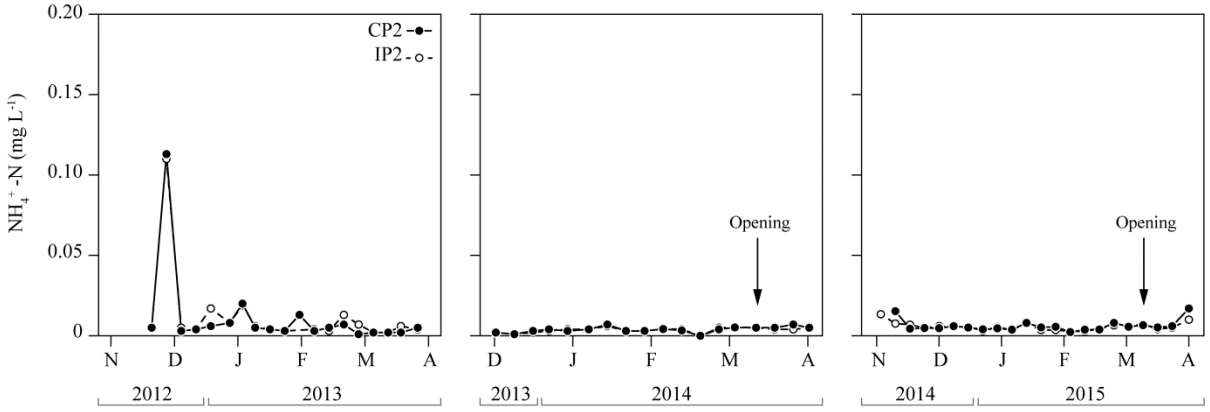

Figure S10. NH_4^+-N at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

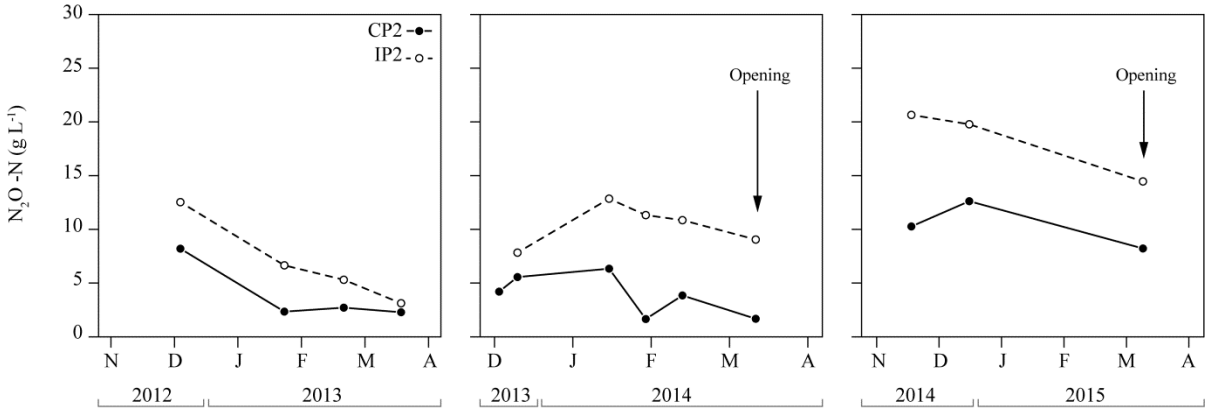

Figure S11. N_2O-N at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

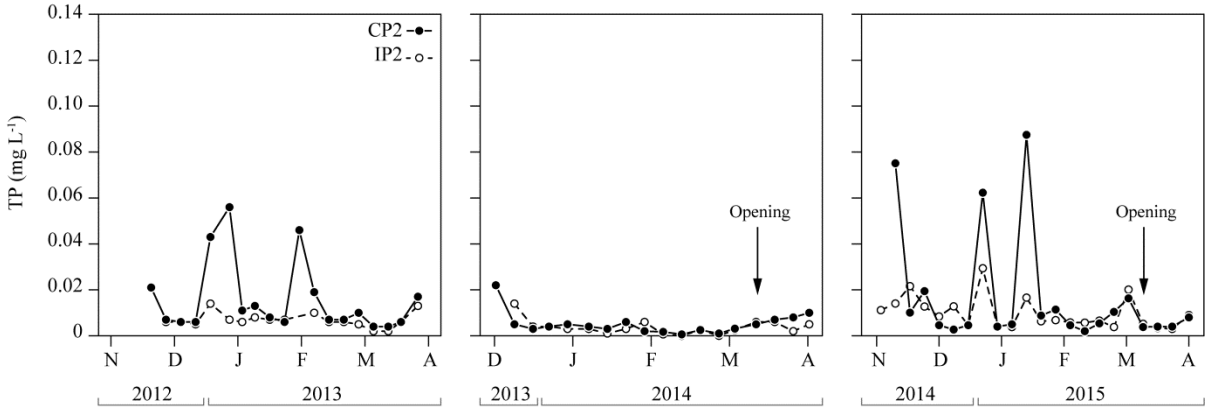

Figure S12. TP at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

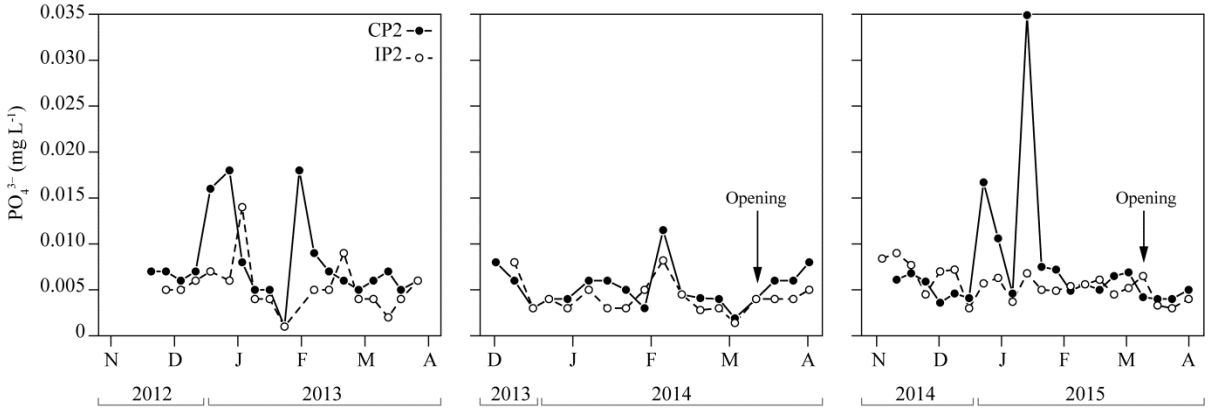

Figure S13. PO_4^{3-} at CP2 and IP2 during Y0 (2012/13), Y1 (2013/14), and Y2 (2014/15).

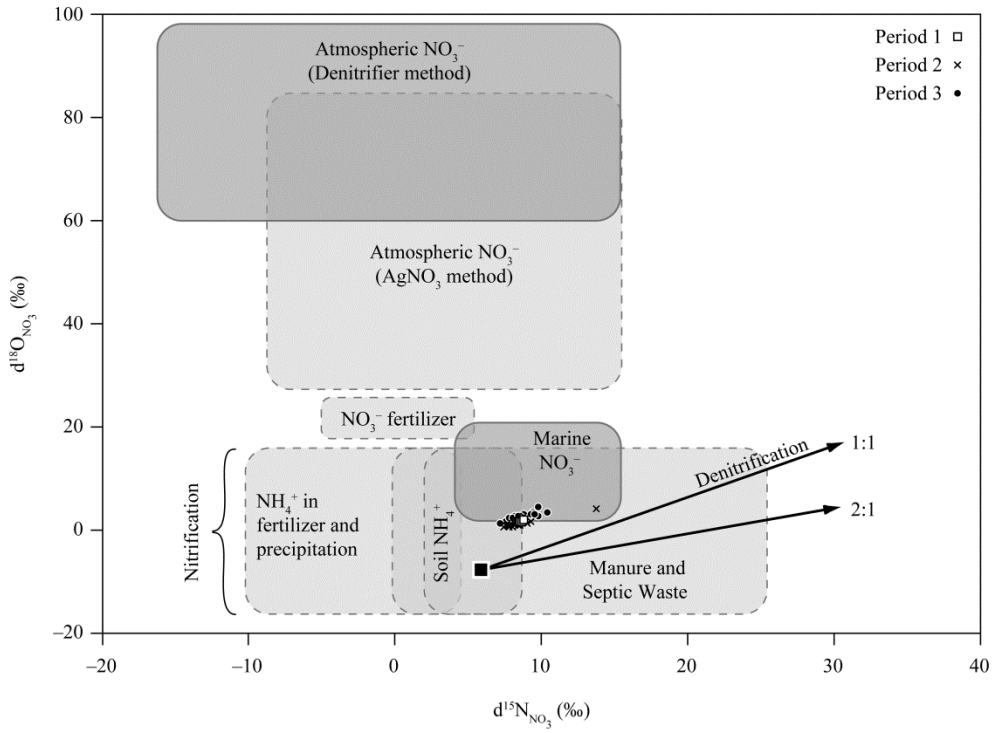

Figure S14. Measured ranges of $\delta^{15}N$ and $\delta^{18}O$ of NO_3^--N from IP1, IP2, CP1, and CP2 in Y1 (2013/14) and Y2 (2014/15) plotted with typical ranges of $\delta^{15}N$ and $\delta^{18}O$ from NO_3^--N sources adopted from Kendall et al. (2007).

References

Kendall, C., Elliott, E. M., and Wankel, S. D.: Tracing anthropogenic inputs of nitrogen to ecosystems, in: Stable Isotopes in Ecology and Environmental Science, 2nd edition ed., Blackwell Publishing, p. 375-449., 2007.