Supplementary Information 2 Land use description and soil parameters

Table SI2 A Land use history of the crop fields (all the experimental plots were managed identically, the only difference between the treatments was the lime doses - that created the pH gradient)

			Furrow fertilization		**Broadcast fertilization**	
Year	**Crop**	**Season**	**Source (N-P_2O_5-K_2O)**	**Dose (kg ha^{-1})**	**Source**	**Dose (kg ha^{-1})**
2010	Black Oat	Winter	12-52-00	200	-	-
2010/11	Corn	Spring/Summer	14-34-00	350	22-00-21 and Urea	225 and 435
2011	Black Oat	Winter	14-34-00	313	-	-
2011/12	Soybean	Spring/Summer	-	-	KCl	125
2012	Black Oat	Winter	19-38-00	260	KCl	120
2012/13	Soybean	Spring/Summer	-	-	-	-
2013	Black Oat	Winter	14-34-00	337	KCl	170
2013/14	Soybean	Spring/Summer	-	-	-	-

Table SI2 B Soil chemical parameters, and plant yield, and greenhouse gas fluxes according to different soil pH ($CaCl_2$) ranges

Parameter	(unit)	pH range 4.0-4.4		4.5-5.0		5.1-5.5		5.6-6.2	
Soil Chemistry									
pH ($CaCl_2$)		4.1 ± *0.1*	d[1]	4.7 ± *0.2*	c	5.2 ± *0.1*	b	6.1 ± *0.1*	a
pH (H_2O)		5.2 ± *0.1*	d	5.6 ± *0.2*	c	6.0 ± *0.1*	b	6.7 ± *0.1*	a
H+Al	$cmol_c.dm^3$	97.6 ± *14.4*	a	57.3 ± *11.0*	b	39.0 ± *4.1*	c	21.0 ± *1.4*	d
Al	$cmol_c.dm^3$	13.1 ± *3.1*	a	2.1 ± *1.5*	b	0.1 ± *0.1*	c	0.0 ± *0.0*	c
K	$cmol_c.dm^3$	4.4 ± *0.5*	a	4.0 ± *0.9*	a	4.5 ± *0.3*	a	3.9 ± *0.5*	a
Ca	$cmol_c.dm^3$	19.1 ± *2.5*	d	48.3 ± *14.4*	c	74.1 ± *18.4*	b	128.5 ± *14.8*	a
Mg	$cmol_c.dm^3$	6.8 ± *1.2*	b	16.1 ± *7.6*	a	24.4 ± *17.8*	ab	15.5 ± *4.9*	a
CEC	$cmol_c.dm^3$	128 ± *15*	b	126 ± *10*	b	142 ± *27*	ab	169 ± *21*	a
P	$mg.dm^3$	38.8 ± *6.0*	b	52.5 ± *13.0*	a	44.6 ± *8.4*	ab	49.0 ± *25.5*	ab
B	$mg.dm^3$	0.45 ± *0.08*	a	0.39 ± *0.05*	ab	0.38 ± *0.05*	ab	0.31 ± *0.06*	b
Fe	$mg.dm^3$	89 ± *36*	a	70 ± *20*	ab	59 ± *16*	b	39 ± *0*	b
Mn	$mg.dm^3$	4.0 ± *0.6*	a	3.5 ± *0.8*	ab	3.3 ± *0.5*	b	3.5 ± *0.4*	ab
Cu	$mg.dm^3$	1.6 ± *0.3*	a	1.4 ± *0.2*	ab	1.4 ± *0.2*	ab	1.2 ± *0.0*	b
Zn	$mg.dm^3$	0.60 ± *0.34*	a	0.45 ± *0.09*	a	0.59 ± *0.23*	a	0.45 ± *0.07*	a
SOM	$g.dm^3$	55 ± *7*	a	50 ± *7*	a	52 ± *4*	a	46 ± *3*	a
NO_3	$mg.kg^{-1}$	6.6 ± *0.8*	a	6.2 ± *1.4*	a	7.1 ± *0.4*	a	5.6 ± *0.3*	a
Plant Yield									
Soy Yield	$kg.ha^{-1}$	4104 ± *311*	b	4334 ± *293*	ab	4425 ± *538*	ab	4717 ± *19*	a
Litter	$g.m^2$	85 ± *22*	a	88 ± *44*	a	96 ± *47*	a	77 ± *41*	a
Greenhouse gas									
CO_2 flux	$mg.m^2.h^{-1}$	65 ± *57*	a	122 ± *110*	a	130 ± *75*	a	104 ± *51*	a
CH_4 flux	$ug.m^2.h^{-1}$	-8 ± *14*	a	-4 ± *22*	a	-8 ± *21*	a	-24 ± *4*	a
N_2O flux	$ug.m^2.h^{-1}$	4 ± *49*	a	25 ± *63*	a	-7 ± *64*	a	74 ± *62*	a

[1] Values with the same letter in one row are not different by Tukey's post-hoc test ($p<0.05$).

Table SI2 C Soil chemical parameters, plant yield, and greenhouse gas fluxes according to the lime doses

Parameter	(unit)	Lime Dose (kg.ha^{-1}) 0	2250	4500	6750
Soil Chemistry					
pH ($CaCl_2$)		4.2 ± 0.3	4.6 ± 0.2	5.0 ± 0.2	5.3 ± 0.5
pH (H_2O)		5.3 ± 0.3	5.5 ± 0.1	5.8 ± 0.1	6.1 ± 0.4
H+Al	$cmol_c.dm^3$	79 ± 22	62 ± 8	45 ± 5	38 ± 12
Al	$cmol_c.dm^3$	11.7 ± 4.9	3.1 ± 1.3	0.5 ± 0.3	0.5 ± 0.8
K	$cmol_c.dm^3$	4.4 ± 0.4	4.1 ± 0.9	4.3 ± 0.7	4.0 ± 0.7
Ca	$cmol_c.dm^3$	22.9 ± 10.9	42.8 ± 13.7	62.0 ± 11.5	81.4 ± 31.8
Mg	$cmol_c.dm^3$	9.6 ± 8.0	11.9 ± 2.4	20.7 ± 8.6	21.3 ± 14.8
CEC	$cmol_c.dm^3$	128 ± 13	123 ± 9	133 ± 8	145 ± 28
P	$mg.dm^3$	38.9 ± 5.3	50.9 ± 13.8	51.7 ± 14.7	48.9 ± 9.3
B	$mg.dm^3$	0.4 ± 0.1	0.4 ± 0.0	0.4 ± 0.0	0.4 ± 0.1
Fe	$mg.dm^3$	85 ± 34	74 ± 21	59 ± 9	61 ± 21
Mn	$mg.dm^3$	3.9 ± 0.6	3.8 ± 0.5	3.4 ± 0.3	3.1 ± 0.7
Cu	$mg.dm^3$	1.6 ± 0.2	1.5 ± 0.2	1.5 ± 0.2	1.3 ± 0.2
Zn	$mg.dm^3$	0.6 ± 0.3	0.5 ± 0.1	0.5 ± 0.1	0.5 ± 0.2
SOM	$g.dm^3$	54 ± 7	49 ± 5	55 ± 3	48 ± 7
NO_3	$mg.kg^{-1}$	6.7 ± 0.7	6.6 ± 1.3	5.9 ± 1.5	6.5 ± 0.8
Plant Yield					
Soy Yield	$kg.ha^{-1}$	4061 ± 300	4206 ± 189	4578 ± 156	4510 ± 436
Litter	$g.m^2$	79 ± 18	94 ± 44	66 ± 26	81 ± 39
Gas fluxes					
CO_2 flux	$mg.m^2.h^{-1}$	63 ± 51	112 ± 81	94 ± 61	153 ± 114
CH_4 flux	$ug.m^2.h^{-1}$	-12 ± 17	0 ± 27	-2 ± 7	-10 ± 15
N_2O flux	$ug.m^2.h^{-1}$	1 ± 44	37 ± 70	-16 ± 43	24 ± 62
WC (soil)	**(%)**	26.6 ± 1.1	26.7 ± 1.0	26.3 ± 1.1	26.5 ± 0.8
Temperature	(C)	25.8 ± 2.3	24.7 ± 3.4	25.4 ± 2.7	26.3 ± 2.6