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Are there memory effects on greenhouse gas emissions (CO_2, N_2O and CH_4) following grassland restoration?

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Table S1: Detailed management information for the two parcels under investigation at the Chamau research station. Data are based on fieldbooks provided by the farm personnel as well as in-situ measurements. Organic fertilizer samples were sent to a central laboratory for nutrient content analysis (Labor fuer Boden- und Umweltanalytik, Eric Schweizer AG, Thun, Switzerland). Destructive harvests (n = 10) of biomass were carried out in the years 2010, 2011, 2013 and 2014. Harvest estimates are based on values derived from the in-situ measurements and data provided by the farm personnel. Detailed information on the grazing regime was furthermore provided by the farm personnel in hand-written form (not shown).

Year	Mgmt. start (yyyy-mm-dd)	Mgmt. end (YYYY-MM-DD)	Regrowth	Mgmt. type	Characteristics	amt/ha	unit	N avail. (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	Mg (kg/ha)	DM (%)	N total (g/kg DM)	N-NH_4 (g/kg DM)	C org (g/kg DM)	C/N	C (kg/ha)	N (kg/ha)
2010																		
Parcel A, 1.4 ha																		
	2010-03-18			organic fertilizer	slurry	26	m^3	28.7	17.2	52.1	2.6	2.3	63.0	26.1	406.6	6.5	244	37.8
	2010-05-27			organic fertilizer	slurry	48	m^3	52.7	31.6	95.8	4.8	2.6	97.7	32.8	401.6	4.1	498	121.2
	2010-07-06			organic fertilizer	slurry	25	m^3	17.7	15.2	65.9	2.5	2.8	37.8	15.3	446.5	11.8	311	26.4
	2010-08-25			organic fertilizer	slurry	27	m^3	30.2	18.1	54.9	2.7	1.4	65.4	30.2	375.8	5.7	140	24.4
	2010-10-28			organic fertilizer	slurry	40	m^3	44.2	26.5	80.3	4.0	1.5	72.5	32.2	388.2	5.4	232	43.4
	2010-05-22	2010-05-24	1	mowing	silage	4	waggon					37.0					1598	102.8
	2010-06-28	2010-06-29	2	mowing	small bales (pressed)	99	piece					86.0					919	59.1
	2010-08-20	2010-08-22	3	mowing	rowen	1	waggon					70.0					605	38.9
	2010-10-08	2010-10-12	4	mowing	silage bales	4	piece					37.0					328	21.1
	2010-08-25				organically farmed land													
	2010-09-29				organically farmed land													
amount of nutrient needed according to fertilization plan								130.0	80.0	240.0	30.0							
balance of nutrient at the end of the year							2	-43.5	-28.6	-109.0	13.3							31
Parcel B, 3.3 ha																		
	2010-03-18			organic fertilizer	slurry	26	m^3	28.7	17.2	52.1	2.6	2.3	62.2	26.5	404.0	6.5	242	37.3
	2010-05-27			organic fertilizer	slurry	12	m^3	13.5	8.1	24.5	1.2	1.7	141.3	52.1	371.3	2.6	76	29.0
	2010-07-06			organic fertilizer	slurry	25	m^3	17.8	15.3	66.2	2.5	5.8	29.2	7.9	487.9	16.7	719	43.0
	2010-08-25			organic fertilizer	slurry	28	m^3	30.7	18.4	55.8	2.8	1.4	67.9	30.7	374.8	5.5	143	26.0
	2010-10-28			organic fertilizer	slurry	40	m^3	44.5	26.7	81.0	4.0	1.9	77.3	30.7	400.1	5.2	306	59.1
	2010-04-06	2010-05-03	1	grazing	sheep	18	piece										305	19.6
	2010-04-15	2010-05-03	1	grazing	sheep	15	piece										169	10.9
	2010-05-14	2010-05-27	2	grazing	sheep	12	piece										98	6.3
	2010-05-15	2010-05-19	2	grazing	sheep	18	piece										45	2.9
	2010-06-03	2010-06-06	2	grazing	sheep	49	piece										90	5.8
	2010-06-21	2010-06-22	2	grazing	sheep	49	piece										30	1.9
	2010-09-30	2010-10-01	4	grazing	sheep	31	piece										19	1.2
	2010-05-22	2010-05-24	1	mowing	silage	1	waggon					37.0					278	17.9
	2010-06-28	2010-06-29	2	mowing	small bales (pressed)	25	piece					86.0					229	14.7
	2010-08-20	2010-08-22	3	mowing	rowen	1	waggon					70.0					527	33.9
	2010-10-08	2010-10-12	4	mowing	silage bales	2	piece					37.0					228	14.7
	2010-09-29				organically farmed land													
	2010-07-14			herbicide	herbicide tabs (Ally)													
	2010-03-24			rolling	roller													
	2010-03-20			resowing	* OH-440 RenoTurbo	7	kg											
	2010-04-12			resowing	* OH-440 RenoTurbo	9	kg											
	2010-04-19			resowing	* OH 440 Reno	6	kg											
	2010-04-23			resowing	* OH-240 Reno	3	kg											
	2010-04-28			resowing	* OH-240 Reno	3	kg											
amount of nutrient needed according to fertilization plan								130.0	80.0	240.0	30.0							
balance of nutrient at the end of the year								-5.2	-5.7	-39.7	16.8							64.5
2011																		
Parcel A, 1.5 ha																		
	2011-03-10			organic fertilizer	slurry	25.3	m^3	45.4	34.5	152.5	9.6	1.5	72.1	35.7	360.6	5.0	140.7	28.1
	2011-04-28			organic fertilizer	slurry	27.0	m^3	34.9	33.7	75.5	6.7	1.8	63.1	26.7	383.7	6.1	182.2	29.9
	2011-06-22			organic fertilizer	slurry	21.9	m^3	39.3	29.8	132.1	8.3	1.94	89.7	52.6	383.0	4.3	163.0	38.2
	2011-07-18			organic fertilizer	slurry	27.3	m^3	48.9	37.1	164.1	10.4	2.78	84.5	43.5	412.9	4.9	312.9	64.1
	2011-08-29			organic fertilizer	slurry	30.0	m^3	53.8	40.8	180.6	11.4	1.82	90.7	56.6	356.3	3.9	194.5	49.5
	2011-10-13			organic fertilizer	slurry	39.4	m^3	70.7	53.6	237.3	15.0	1.5	74.7	40.0	387.0	5.2	228.8	44.2
	2011-05-20	2011-05-22		grazing	sheep	12.2	piece										15.0	1.0
	2011-12-17	2011-12-31		grazing	sheep	10.2	piece										87.6	5.6
	2011-04-21	2011-04-21	1	mowing	silage	35.1	dt DM					37					530.7	34.1
	2011-06-15	2011-06-15	2	mowing	silage	21.4	dt DM					37					324.2	20.9
	2011-07-12	2011-07-12	3	mowing	silage	60.0	dt DM					37					907.8	58.4
	2011-08-26	2011-08-26	4	mowing	rowen	15.6	dt DM					70					445.4	28.6
	2011-10-01	2011-10-01	5	mowing	silage	17.2	dt DM					37					259.6	16.7
amount of nutrient needed according to fertilization plan								0.0	80.0	240.0	30.0							
balance of nutrient at the end of the year								NA	NA	NA	NA							88.7
Parcel B, 3.4ha																		
	2011-03-10			organic fertilizer	slurry	24.7	m^3	44.3	33.6	148.7	9.4	1.55	71.0	33.5	365.0	5.1	139.8	27.2
	2011-04-28			organic fertilizer	slurry	27.0	m^3	34.9	33.7	75.5	6.7	1.8	61.1	25.6	386.5	6.3	187.6	29.7
	2011-06-22			organic fertilizer	slurry	21.9	m^3	39.3	29.8	132.1	8.3	3.05	50.5	32.5	436.6	8.7	292.1	33.8
	2011-07-18			organic fertilizer	slurry	27.3	m^3	48.9	37.1	164.1	10.4	1.76	106.8	59.1	375.5	3.5	180.2	51.2
	2011-08-29			organic fertilizer	slurry	30.0	m^3	53.8	40.8	180.6	11.4	2.57	75.9	43.6	399.4	5.3	308.0	58.5
	2011-10-13			organic fertilizer	slurry	39.4	m^3	70.7	53.6	237.3	15.0	2.79	52.7	23.3	365.7	6.9	402.2	57.9
	2011-05-20	2011-05-22		grazing	sheep	12.2	piece										15.0	1.0
	2011-12-17	2011-12-31		grazing	sheep	10.2	piece										87.6	5.6
	2011-04-21	2011-04-21	1	mowing	silage	35.1	dt DM					37					530.8	34.1
	2011-06-15	2011-06-15	2	mowing	silage	21.4	dt DM					37					324.2	20.9
	2011-07-12	2011-07-12	3	mowing	silage	19.1	dt DM					37					289.7	18.6
	2011-08-26	2011-08-26	4	mowing	rowen	15.6	dt DM					70					445.4	28.6
	2011-10-01	2011-10-01	5	mowing	silage	17.2	dt DM					37					259.6	16.7
amount of nutrient needed according to fertilization plan								0.0	80.0	240.0	30.0							
balance of nutrient at the end of the year								291.9	228.6	938.3	61.2							132.8
2012																		
Parcel A, 1.5 ha																		
	2012-03-28			harrowing	harrow													
	2012-02-02			ploughing	plough													
	2012-03-29			rolling	roller													
	2012-04-25			mineral fertilizer	**calcium carbonate & ammonium nitrate	100.0	kg	27.5	0.0	0.0	0.0	100	275.0	270.0	0.0	0.0	0.0	27.5
	2012-01-16	2012-01-18		organic fertilizer	manure	20.4	t	27.5	46.9	173.3	16.9	16.71	32.1	3.6	458.6	14.3	1563.9	109.4
	2012-06-26			organic fertilizer	slurry	18.8	m^3	29.1	20.7	52.6	4.7	0.98	100.2	69.5	321.7	3.2	59.2	18.4
	2012-07-13			organic fertilizer	slurry	18.8	m^3	29.1	20.7	52.6	4.7	1.82	92.9	46.2	372.0	4.0	127.1	31.7
	2012-08-16			organic fertilizer	slurry	19.6	m^3	30.4	21.6	54.9	4.9	2.81	79.8	40.3	381.2	4.8	209.8	43.9
	2012-09-05			organic fertilizer	slurry	19.6	m^3	30.4	21.6	54.9	4.9	3.55	57.8	31.0	406.3	7.0	282.5	40.2
	2012-01-01	2012-01-08		grazing	sheep	10.2	piece										43.8	2.8
	2012-06-18	2012-06-18	1	mowing	silage	13.5	dt DM					37					203.7	13.1

2012-07-10	2012-07-10	2	mowing	silage	13.5	dt DM					37					203.7	13.1
2012-07-12	2012-07-12	2	mowing	silage	6.1	dt DM					37					92.6	6.0
2012-08-09	2012-08-09	3	mowing	rowen	24.5	dt DM					70					700.9	45.1
2012-08-28	2012-08-28	4	mowing	silage	19.9	dt DM					37					301.1	19.4
2012-10-06	2012-10-06	5	mowing	silage	9.2	dt DM					37					139.0	8.9
2012-07-17			herbicide	*** Harmony tablets	2.7	tablets											
2012-09-06			herbicide	**** Asulam	4.0	l											
2012-06-19			pesticide	***** snail bait	7.0	kg											
2012-03-28			resowing	* OH-440 Extra	32.0	kg											
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							NA	NA	NA	NA							162.8
Parcel B, 3.4ha																	
2012-03-28			harrowing	harrow													
2012-02-02			ploughing	plough													
2012-03-29			rolling	roller													
2012-04-25			mineral fertilizer	**calcium carbonate & ammonium nitrate	45.0	kg	27.5	0.0	0.0	0.0	100	275.0	270.0	0.0	0.0	0.0	12.4
2012-01-16	2012-01-18		organic fertilizer	manure	20.4	t	27.5	46.9	173.3	16.9	16.71	32.1	3.6	458.6	14.3	1564.0	109.4
2012-06-26			organic fertilizer	slurry	18.8	m^3	29.1	20.7	52.6	4.7	1.55	125.7	60.6	367.2	2.9	106.9	36.6
2012-07-13			organic fertilizer	slurry	18.8	m^3	29.1	20.7	52.6	4.7	1.65	119.2	54.5	371.4	3.1	115.1	36.9
2012-08-16			organic fertilizer	slurry	19.6	m^3	30.4	21.6	54.9	4.9	3.13	68.6	38.3	400.8	5.8	245.8	42.1
2012-09-05			organic fertilizer	slurry	19.6	m^3	30.4	21.6	54.9	4.9	2.52	113.1	52.4	399.5	3.5	197.3	55.8
2012-01-01	2012-01-08		grazing	sheep	10.2	piece										43.8	2.8
2012-06-18	2012-06-18	1	mowing	silage	13.5	dt DM					37					203.8	13.1
2012-07-10	2012-07-10	2	mowing	silage	6.1	dt DM					37					92.6	6.0
2012-08-09	2012-08-09	3	mowing	rowen	24.5	dt DM					70					701.0	45.1
2012-08-28	2012-08-28	4	mowing	silage	19.9	dt DM					37					301.0	19.4
2012-10-06	2012-10-06	5	mowing	silage	9.2	dt DM					37					138.9	8.9
2012-07-17			herbicide	*** Harmony tablets	1.2	tablets											
2012-09-06			herbicide	**** Asulam	4.0	l											
2012-06-19			pesticide	***** snail bait	7.0	kg											
2012-03-28			resowing	* OH-440 Extra	32.0	kg											
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							NA	NA	NA	NA							197.9
2013																	
Parcel A, 1.5ha																	
2013-03-07			organic fertilizer	slurry	24.5	m^3	38.0	26.9	68.6	6.1	3.5	96.7	69.3	397.2	4.1	340.5	82.9
2013-06-11			organic fertilizer	slurry	20.0	m^3	31.1	22.0	56.0	5.0	1.7	61.2	37.6	378.3	6.2	128.6	20.8
2013-07-19			organic fertilizer	slurry	26.7	m^3	41.5	29.4	74.9	6.7	2.4	93.6	59.4	377.4	4.0	242.1	60.0
2013-08-27			organic fertilizer	slurry	29.0	m^3	45.0	31.9	81.1	7.2	1.9	89.8	56.2	391.6	4.4	215.6	49.4
2013-06-07	2013-06-07	1	mowing	silage	27.6	dt DM					37					416.9	26.8
2013-06-08	2013-06-08	1	mowing	hay	56.0	dt DM					37					847.2	54.5
2013-07-12	2013-07-12	2	mowing	rowen	18.4	dt DM					70					525.7	33.8
2013-08-22	2013-08-22	3	mowing	silage	49.0	dt DM					37					741.0	47.7
2013-10-19	2013-10-19	4	mowing	silage	49.0	dt DM					37					741.0	47.7
2013-06-18			herbicide	*** Harmony tablets	2.0	tablets											
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							155.6	110.2	280.6	25.1							
Parcel B, 3.4ha																	
2013-03-07			organic fertilizer	slurry	24.5	m^3	38.0	26.9	68.6	6.1	3.3	106.0	74.3	396.2	3.7	320.2	85.7
2013-06-11			organic fertilizer	slurry	20.0	m^3	31.0	22.0	56.0	5.0	2	62.9	37.7	390.9	6.2	156.4	25.2
2013-07-19			organic fertilizer	slurry	26.7	m^3	41.5	29.4	74.9	6.7	2.8	105.0	59.0	401.8	3.8	300.8	78.6
2013-08-27			organic fertilizer	slurry	29.0	m^3	45.0	31.9	81.1	7.2	2	87.2	51.3	386.0	4.4	223.7	50.5
2013-12-06	2013-12-07		grazing	sheep	20.6	piece										12.6	0.8
2013-06-07		1	mowing	silage	27.5	dt DM					37					416.8	26.8
2013-06-08		1	mowing	hay	49.4	dt DM					86					1737.6	111.8
2013-07-12		2	mowing	rowen	18.4	dt DM					70					525.7	33.8
2013-08-22		3	mowing	silage	49.0	dt DM					37					741.0	47.7
2013-10-19		4	mowing	silage	49.0	dt DM					37					741.0	47.7
2013-06-18			herbicide	*** Harmony tablets	2.0	tablets											
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							155.6	110.2	280.6	25.1							-28.5
2014																	
Parcel A, 2.2ha																	
2014-04-22			mineral fertilizer	**calcium carbonate & ammonium nitrate	68.2	kg	18.8	0.0	0.0	0.0	100	275.0	270.0	0.0	0.0	0.0	18.8
2014-06-05			mineral fertilizer	**calcium carbonate & ammonium nitrate	68.2	kg	18.8	0.0	0.0	0.0	100	275.0	275.0	0.0	0.0	0.0	18.8
2014-03-12			organic fertilizer	slurry	27.3	m^3	54.9	32.7	76.4	6.8	2.8	87.2	56.1	394.6	4.5	301.3	66.6
2014-09-09			organic fertilizer	slurry	28.2	m^3	56.7	33.8	78.9	7.0	0.8	79.8	44.9	371.3	4.7	83.7	18.0
2014-02-08	2014-02-15		grazing	sheep	20.9	piece										89.8	5.8
2014-03-31	2014-04-15	1	grazing	cattle	12.5	piece										917.9	59.0
2014-05-12	2014-06-03	2	grazing	cattle	5.3	piece										598.3	16.3
2014-09-04		3	mowing	silage	76.4	dt DM					37					1233.6	41.1
2014-10-19		4	mowing	silage	41.7	dt DM					37					662.6	36.9
2014-12-24	2015-01-07	5	grazing	sheep	19.1	piece										163.9	10.5
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							149.1	66.5	155.3	13.9							-47.5
Parcel B, 2.7ha																	
2014-03-12			organic fertilizer	slurry	28.1	m^3	56.6	33.8	78.8	7.0	3.5	71.6	44.5	367.9	5.1	362.4	70.5
2014-05-26			organic fertilizer	slurry	25.9	m^3	52.2	31.1	72.6	6.5	2.7	76.9	45.7	394.8	5.1	276.4	53.8
2014-06-25			organic fertilizer	slurry	20.7	m^3	41.7	24.9	58.1	5.2	1.6	93.7	55.6	377.3	4.0	125.2	31.1
2014-09-09			organic fertilizer	slurry	31.1	m^3	62.6	37.3	87.1	7.8	1.8	49.6	23.5	415.6	8.4	232.7	27.8
2014-02-15	2014-02-18		grazing	sheep	17.0	piece										31.3	2.0
2014-12-16	2014-12-23		grazing	sheep	15.6	piece										66.8	4.3
2014-05-20		1	mowing	hay	83.3	dt DM					86					3117.8	91.3
2014-06-20		2	mowing	rowen	38.9	dt DM					70					1173.7	56.2
2014-09-04		3	mowing	silage	83.3	dt DM					37					1342.9	54.8
2014-10-19		4	mowing	silage	77.1	dt DM					37					1237.6	67.4
amount of nutrient needed according to fertilization plan							0.0	96.0	288.0	36.0							
balance of nutrient at the end of the year							213.2	127.1	296.6	26.5							-92.8

*Grass-white clover mixture 'OH 440 Extra/OH 240' (Otto Hauenstein Samen AG) consisting of red clover (Trifolium pratense), white clover (Trifolium repens), english ryegrass (Lolium perenne), common meadow grass (Poa pratensis), red fescue (Festuca rubra) and common timothy (Phleum pratense).
**Calcium ammonium nitrate fertilizer - 13.5% nitrate, 13.5% ammonium (Flora Duengemittel, Hanweller, Saar, Germany).
*** Harmony tablet, 12 % Thifensulfuron-Methyl (Bayer AG, CropScience, 3052, Zollikofen, Switzerland).
****ASULAM (Agro Seller Discount AG, St. Gallen, Switzerland).
*****Snail bait (Steiner Ultra W-4935, Omya AG, Switzerland).