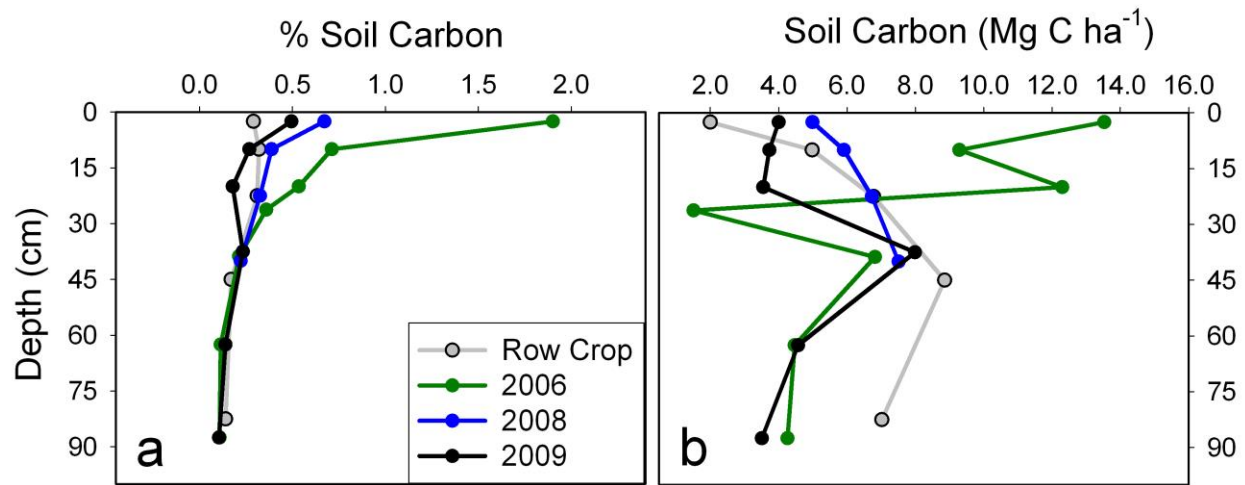
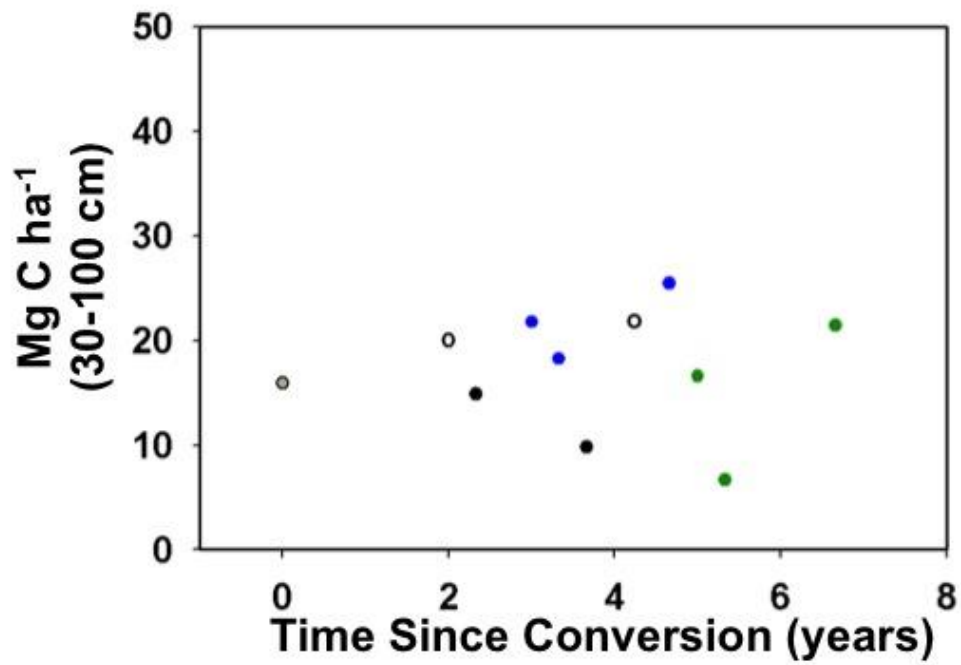
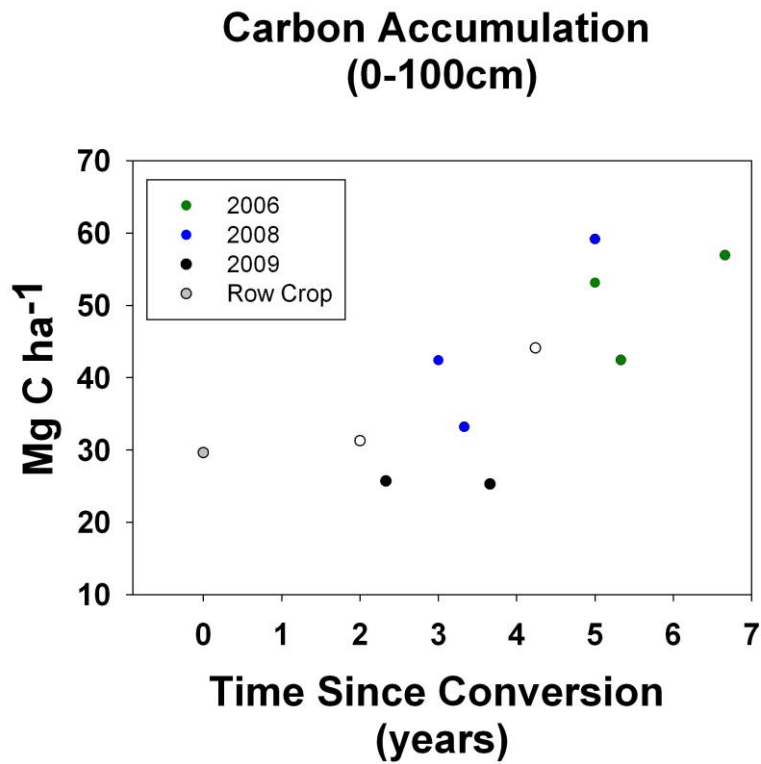




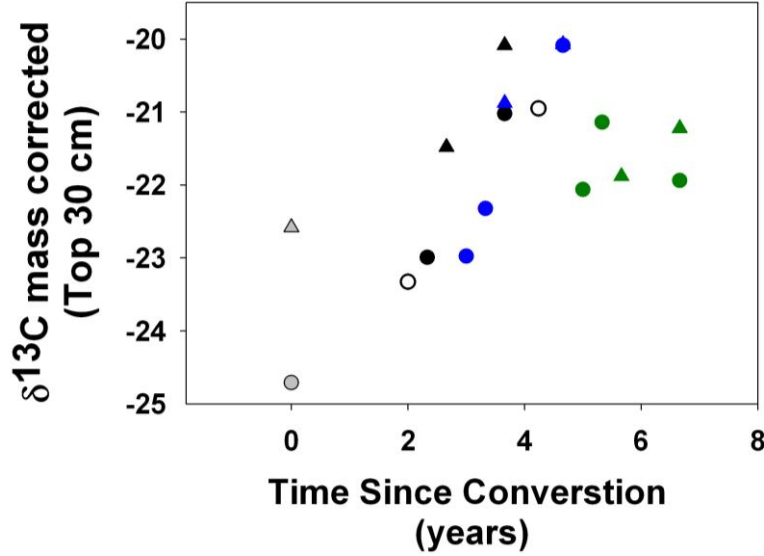
Supplementary Figure 1: Soil carbon concentrations vary with soil depth. Soil carbon (C) concentrations with depth sampled in April 2011 in each farm across the chronosequence (labeled with year of conversion), including C concentrations of a representative row crop sampled in July 2013 (a) and C concentrations corrected by bulk density at each depth (b).



Supplementary Figure 2: Lack of deep soil carbon accumulation. Soil carbon (Mg C ha⁻¹) from 30 – 100 cm depth in the different farms across the chronosequence taken from soil pit samples. Grey points represent data from farm in row crop, black color farm converted in 2009, blue in 2008, and green in 2006. Black open circles represent samples collected from different location as filled black circles.



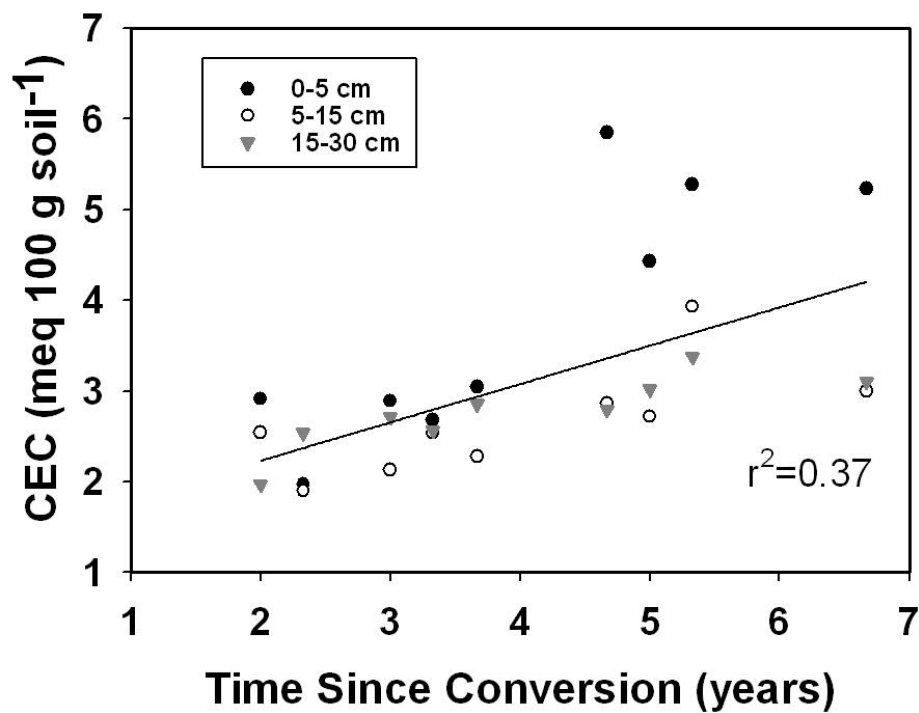
Supplementary Figure 3: Soil carbon accumulation in the top 100 cm. Integrating the top 1 m of soil, carbon (Mg C ha⁻¹) accumulated at a rate of 7.1 ± 2.7 Mg C ha⁻¹yr⁻¹ ($r^2=0.50$, $p=0.034$) for data between 2 and 6 years after conversion. Grey points represent data from farm in row crop, black color farm converted in 2009, blue in 2008, and green in 2006. Black open circles represent samples collected from different location as filled black circles.



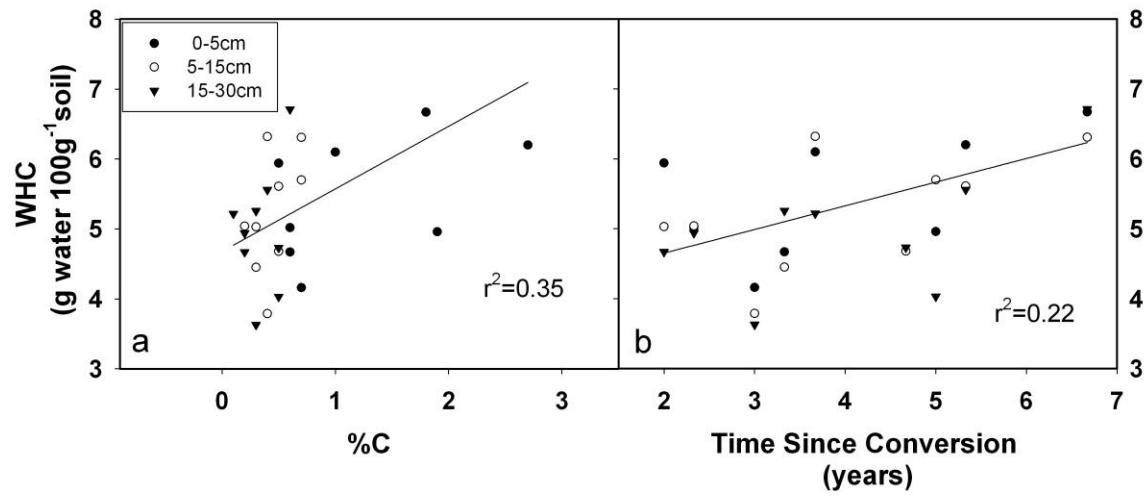
Supplementary Figure 4: Soil $\delta^{13}\text{C}$ enrichment with conversion age. Mass corrected $\delta^{13}\text{C}$ summed for the top 30cm in each farm across the chronosequence in both pit samples (circles) and cores (triangles). Potential source materials: manure ($\delta^{13}\text{C} = -14.9$) and roots ($\delta^{13}\text{C} = -20.03$). Grey points represent data from the row crop farm; black points represent data from the farm converted in 2009; blue points represent data from the farm converted in 2008; and green points represent data from the farm converted in 2006. Black open circles represent samples collected from secondary pastures in the farm converted in 2009. $\delta^{13}\text{C}$ Mass correction was performed by the following equation (1):

$$(1) \quad \frac{\alpha_1\beta_1 + \alpha_2\beta_2 + \alpha_3\beta_3}{\alpha_1 + \alpha_2 + \alpha_3}$$

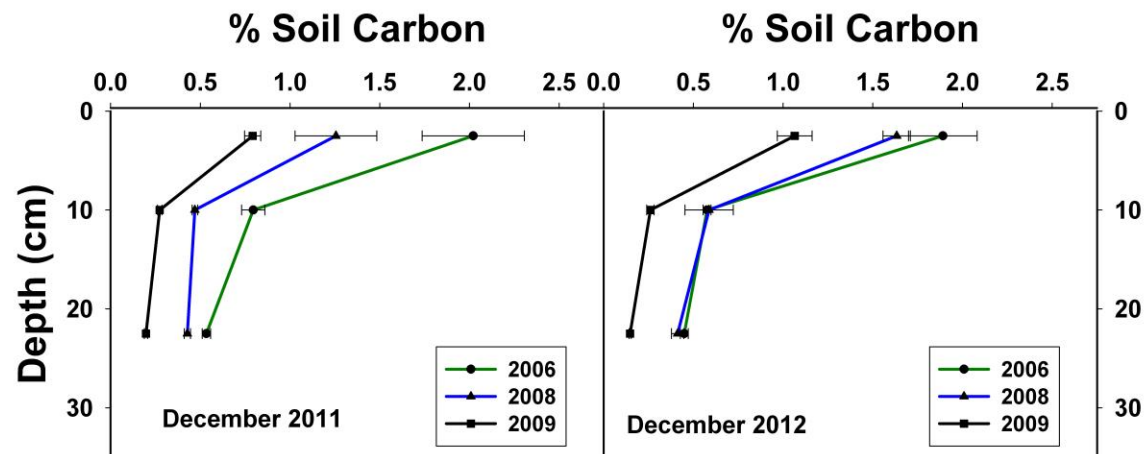
Where α is the amount of carbon (g C kg soil^{-1}) at each soil depth (1, 2, 3, etc.) down to 30 cm and β is the $\delta^{13}\text{C}$ (permil) that corresponds to each soil depth.



Supplementary Figure 5: Soil cation exchange capacity (CEC) as a function of conversion age at different depths in the soil profile. CEC increases as conversion age increases. Line indicates significant ($p < 0.05$) linear regression using all data points.



Supplementary Figure 6: Water holding capacity (WHC) as a function of soil carbon (C) concentration and conversion age at different depths. WHC increases with increasing %C (a) and time since conversion (b). Line indicates significant ($p<0.05$) linear regression using all data points.



Supplementary Figure 7: Soil carbon (C) spatial variability. Soil C concentrations and variability (standard error of the mean) in the top 30 cm determined from composited soil cores (5 cores composited and replicated six times).

Supplementary Table 1: Root standing stock across the chronosequence

August 2011 Sampling			April 2011 Sampling		
Site ID - year of conversion (age since conversion)	Depth (cm)	Root Mass (g 100 g ⁻¹ soil)	Site ID (age since conversion)	Depth (cm)	Root Mass (g 100 g ⁻¹ soil)
2006 (5 yr)	0-5	4.589	2006 (5.5 yr)	0-5	5.253
	5-15	0.224		5-15	0.070
	15-25	0.036		15-30	0.021
	25-27.5	0.006		30-50	0.021
	27.5-50	0.004		50-75	0.003
	50-75	0.004			
	75-100	0.005			
2008 (3 yr)	0-5	0.323	2008 (3.5 yr)	0-5	1.921
	5-15	0.049		5-15	0.100
	15-30	0.005		15-35	0.025
	30-50	0.000		35-50	0.018
	50-75	-		50-75	0.030
2009 (2 yr)	0-5	0.199	2009 (2.5 yr)	0-5	1.234
	5-15	0.106		5-15	0.151
	15-25	0.017		15-35	0.022
	25-50	0.004		35-45	0.001
	50-75	0.001		45-60	0.015
	75-100	0.004			

Root standing stock (g root per 100 g soil) of chronosequence pit samples (n=1) from each farm in the study, identified by the year of conversion of row crop to intensive grazing system (e.g. 2006, 2008, 2009) and age since conversion at the time of sampling. Data included are from two sampling periods in August and April 2011.

Supplementary Table 2: Soil properties

Site ID-Year of Conversion	Depth	pH ¹	CEC ²	Bulk Density	Water Holding Capacity	Ca	Fe	K	Mg	Na	P	Zn
(years since conversion at time of sampling)	(cm)	(CaCl ₂)	(meq 100 g ⁻¹)	(g cm ⁻³)	(g H ₂ O 100 g ⁻¹ soil)	(mg kg ⁻¹)						
April 2011 Sampling												
2006 (5yr)	0-5	5.39	4.43		4.96	476.9	25.49	157.3	129.4	9.83	63.65	11.21
	5-15	4.97	2.72	1.86	5.70	320.2	19.42	82.8	53.0	8.1	55.11	6.75
	15-25	5.07	3.02		4.03	342.9	9.59	90.8	41.9	8.95	53.77	5.46
	25-27.5	-	-	1.60	-	210.2	6.84	76.2	78.9	10.06	12.18	1.05
	27.5-50	5.32	-	1.69	-	193.8	6.91	102.2	82.1	12.09	4.01	0.87
	50-75	5.10	-	-	-	300.5	8.43	110.9	121.1	13.63	4.05	0.89
	75-100	5.61	-	1.58	-	-	-	-	-	-	-	-
2008 (3 yr)	0-5	5.39	2.89	1.74	4.16	357.3	7.88	63.5	42.0	7.68	43.81	3.90
	5-15	4.90	2.13	1.79	3.79	203.3	9.04	28.1	24.0	8.06	26.27	1.30
	15-30	5.06	2.71	1.62	3.63	1.6	10.61	33.4	38.2	8.76	15.16	0.98
	30-50	4.21	-	1.99	-	1.0	8.25	137.9	39.5	11.23	2.10	0.83
	50-75	-	-	1.57	-	-	-	-	-	-	-	-
2009 (2 yr)	0-5	5.60	2.91		5.94	250	8.71	270.3	29.8	38.23	35.83	4.26
	5-15	5.19	2.54	1.85	5.03	153.3	10.7	147.4	23.1	32.98	21.78	1.98
	15-25	4.97	1.97		4.67	150.9	9.56	62	14.4	6.94	16.48	1.97
	25-50	6.37	-	1.56	-	456.8	7.84	144.3	165.0	12.87	6.45	0.85
	50-75	5.75	-	1.75	-	344.9	6.70	74.0	127.3	10.19	5.12	0.80
	75-100	4.61	-	-	-	249.0	4.42	35.9	83.2	9.49	4.05	0.77
August 2011 Sampling												
2006 (5.33 yr)	0-5	4.79	5.28	1.42	6.2	789.7	18.38	78.4	167.6	17.63	64.87	12.21
	5-15	6.14	3.93	1.3	5.61	513.7	8.89	31.4	116.3	9.83	38.34	3.95
	15-30	5.81	3.38	1.54	5.56	365.9	8.65	52.5	82.1	10.13	29.59	3.80
	30-50	5.72	-	1.68	-	295.7	8.75	74.8	133.8	16.14	5.58	1.07
	50-75	5.69	-	1.43	-	413.7	8.91	71.2	136.0	25.63	4.72	0.97
2008	0-5	5.41	2.68	1.48	4.67	323.1	7.14	83.5	33.6	7.28	21.08	2.25

(3.33 yr)	5-15	5.66	1.3	1.53	4.45	313.1	8.42	41.6	35.9	7.79	20.02	1.81
	15-35	6.05	2.56	1.38	5.26	366	8.73	23.1	45.1	8.26	24.95	1.88
	35-50	6.53	-	1.7	-	453.7	6.45	101.5	100.3	13.49	4.24	0.92
	50-75	5.78	-	1.34	-	358	6.23	113.4	92	16.36	2.96	0.92
2009§	0-5	5.96	1.97	1.62	5.02	252.5	9.36	77.1	35.7	6.46	31.17	4.22
(2.33 yr)	5-15	4.29	1.90	1.39	5.04	70.5	16.71	46.3	11.0	8.13	22.04	1.54
	15-35	4.73	2.53	1.33	4.94	101.4	15.69	58.5	11.2	7.99	24.84	2.72
	35-45	4.97	-	1.37	-	136.8	14.15	81.2	20.4	11.78	10.54	1.27
	45-60	5.92	-	1.32	-	358.9	9.93	109	101.1	37.93	5.48	0.9
December 2012 Sampling												
2006	0-5	5.40	5.23	1.07	6.67	884.9	25.16	84.0	196.4	24.73	60.99	15.69
(6.67 yr)	5-15	5.90	3.00	1.57	6.31	473.8	11.95	24.1	74.5	15.78	35.23	4.92
	15-25	6.12	3.10	1.55	6.71	442.0	8.39	20.3	71.0	12.37	24.10	4.17
	25-27	6.20	-	-	-	330.7	8.19	43.3	122.5	15.27	9.14	1.93
	27-50	6.13	-	1.41	-	280.1	7.45	50.6	113.0	14.46	5.34	0.93
	50-75	5.73	-	1.51	-	419.9	7.83	55.5	114.4	18.64	3.83	0.94
	75-100	6.14	-	1.57	-	488.2	7.43	29.3	96.0	25.4	3.14	0.97
2008	0-5	6.72	5.85	1.1	8.48	891.1	3.58	204.2	174.5	12.73	48.64	8.28
(4.67 yr)	5-15	6.20	2.86	1.63	4.68	316.3	6.13	187.3	53.6	9.53	13.95	2.00
	15-30	6.45	2.79	1.54	4.73	341.8	6.8	146.8	46.5	9.14	17.57	2.37
	30-50	6.45	-	1.44	-	475.6	6.82	96.1	103	13.32	3.47	1.07
	50-75	5.82	-	1.55	-	385.8	4.77	92.6	92.9	16.06	3.49	1.04
	75-100	5.96	-	1.5	-	390.7	4.1	79.2	99.5	16.83	3.68	1.04
2009§	0-5	5.42	3.05	1.21	6.10	323.4	22.04	47.5	28.5	10.2	29.38	5.56
(3.67 yr)	5-15	5.70	2.28	1.67	6.32	200.9	28.01	78.9	15.3	7.73	25.27	1.78
	15-30	5.58	2.86	1.54	5.22	166.2	24.21	44.2	15.9	8.36	25.22	2.13
	30-50	5.73	-	1.46	-	326.0	6.67	105.8	46.4	24.25	9.36	1.05
	50-75	4.53	-	1.34	-	287.7	6.60	59.6	94.5	27.42	4.32	0.90
	75-100	4.46	-	1.15	-	198.3	3.88	39.1	68.5	20.41	3.47	0.92

¹pH was measured in a 1:1 soil:water mixture of 0.01 M CaCl₂

²CEC was determined by unbuffered salt extraction.

-Data not collected

§Samples taken from a different paddock within the same farm

Soil characteristics of chronosequence pit samples (n=1) from each farm in the study, identified by the year of conversion of row crop to intensive grazing system (e.g. 2006, 2008, 2009). Data represents soil sampled in April, August 2011 and December 2012.

Supplementary Table 3: Soil carbon stocks

Farm	Sampling Method	Date	Years since conversion at time of sampling	Mg C ha⁻¹ Top 50cm	Mg C ha⁻¹ Top 30cm	Mg C ha⁻¹ Top 15cm
7 Oaks	Pit	Apr-11	2	20.59	11.28	7.73
7 Oaks	Pit	Aug-11	2.33	11.92	10.85	7.39
7 Oaks	Cores	Dec-11	2.66		14.14	10.22
7 Oaks	Cores	Dec-12	3.66		14.17	10.77
7 Oaks	Pit	Dec-12	3.66	19.79	19.79	12.07
Girard	Pit	Apr-11	3	25.15	17.64	10.90
Girard	Pit	Aug-11	3.33	21.36	14.97	8.82
Girard	Cores	Dec-11	3.66		25.34	16.49
Girard	Cores	Dec-12	4.66		28.04	18.52
Girard	Pit	Dec-12	4.66	44.98	33.72	22.85
Greenstone	Pit	Apr-11	5	44.40	35.11	22.81
Greenstone	Pit	Aug-11	5.33	40.98	35.78	25.61
Greenstone	Cores	Dec-11	5.66		37.05	24.75
Greenstone	Cores	Dec-12	6.66		29.59	19.12
Greenstone	Pit	Dec-12	6.66	43.12	35.52	19.80
Row Crop	Pit	May-12	0		13.76	6.98
Row Crop	Cores	May-12	0		14.16	7.30

Soil carbon (C) stock data (Mg C ha⁻¹) including each farm along the chronosequence, sampling method, date of sampling, and time since conversion. Soil pits were sampled at depth by horizon (n=1 per horizon) and soil cores were sampled at depths 0-5, 5-15, and 15-30 cm. Data from soil cores represent an average of six composite samples of five random soil samples within each farm. Soil C stocks were calculated by taking the sum of all depths.

Supplementary Table 4: Soil properties: particle size analysis from soil pit samples

Site ID-Year of Conversion (age since conversion)	Depth (cm)	sand (%)	silt (%)	clay (%)
April 2011 Sampling				
2006 (5yr)	0-5	90.93	7.07	2.00
	5-15	87.87	9.40	2.73
	15-25	84.07	10.13	5.80
	25-27.5	79.47	9.40	11.13
	27.5-50	74.80	9.13	16.07
	50-75	69.40	7.67	22.93
	75-100	61.87	6.07	32.07
2008 (3 yr)	0-5	90.80	6.60	2.60
	5-15	89.00	8.20	2.80
	15-30	85.67	8.53	5.80
	30-50	66.80	8.60	24.60
	50-75	58.61	12.60	28.79
2009§ (2 yr)	0-5	83.27	12.20	4.53
	5-15	83.80	12.47	3.73
	15-25	82.40	13.00	4.60
	25-50	59.53	12.13	28.33
	50-75	59.20	9.47	31.33
	75-100	61.67	10.00	28.33
December 2012 Sampling				
2006 (6.67 yr)	0-5	93.15	5.40	1.45
	5-15	86.59	10.67	2.75
	15-25	85.97	11.40	2.63
	25-27.5	72.29	14.15	13.56
	27.5-50	68.51	13.95	17.54
	50-75	54.31	11.37	34.32
	75-100	50.54	8.63	40.83
2008 (4.67 yr)	0-5	92.24	4.72	3.04
	5-15	85.61	9.05	5.33
	15-30	89.10	7.72	3.18
	30-50	55.83	11.63	32.54
	50-75	52.27	9.48	38.25
	75-100	50.30	9.03	40.67
2009§ (3.67 yr)	0-5	90.89	8.19	0.92
	5-15	87.88	10.98	1.14
	15-25	86.51	12.00	1.49

	25-50	71.38	14.23	14.39
	50-75	66.85	10.30	22.86
	75-100	70.99	9.50	19.51
July 2013 Sampling				
2009	0-5	91.13	5.43	3.44
(4.25 yr)	5-15	89.43	8.24	2.33
	15-25	80.73	11.14	8.14
	25-50	64.97	10.38	24.66
	50-75	64.45	8.49	27.06
	75-100	57.71	7.10	35.18

§Samples taken from a different paddock within the same farm

Particle size analysis from soil pit samples (n=1) from each farm in the study, identified by the year of conversion of row crop to intensive grazing system (e.g. 2006, 2008, 2009) and age since conversion at time of sampling.

Supplementary Table 5: Soil properties: particle size analysis from soil cores

Site ID-Year of Conversion (age since conversion)	Depth (cm)	sand (%) Average (STDEV)		silt (%) Average (STDEV)		clay (%) Average (STDEV)	
<u>December 2011 Sampling</u>							
2006 (5yr)	0-5*	92.16	0.76	6.70	0.61	1.15	0.27
	5-15	85.67	1.86	11.60	0.09	2.72	1.77
	15-30	80.71	3.48	13.92	0.87	5.37	2.77
2008 (3 yr)	0-5	91.36	1.35	6.47	0.85	2.17	0.50
	5-15	88.11	1.24	9.00	0.83	2.89	0.42
	15-30	84.89	3.67	10.28	1.53	4.83	2.17
2009§ (2 yr)	0-5	91.13	1.61	8.10	1.47	0.77	0.17
	5-15	88.57	0.76	10.54	0.62	0.89	0.15
	15-30	86.65	1.09	12.09	1.02	1.26	0.15
<u>December 2012 Sampling</u>							
2006 (6.67 yr)	0-5	92.44	1.74	6.28	1.22	1.28	0.54
	5-15	87.24	1.41	10.54	0.76	2.22	0.91
	15-30	78.75	4.91	13.49	0.93	7.77	3.98
2008 (4.67 yr)	0-5	88.51	6.39	6.95	2.25	4.54	4.24
	5-15	84.95	1.12	9.92	0.77	5.13	1.00
	15-30	78.25	7.70	11.28	2.10	10.47	5.60
2009§ (3.67 yr)	0-5	91.76	1.13	7.42	1.01	0.81	0.12
	5-15	88.41	1.96	10.44	1.77	1.15	0.23
	15-30	85.94	1.95	12.28	1.60	1.78	0.55
<u>July 2013 Sampling</u>							
2009 (4.25 yr)	0-5	87.10	3.98	8.44	2.39	4.46	1.67
	5-15	80.80	4.38	11.68	1.55	7.52	2.95
	15-30	74.13	9.45	13.42	4.77	12.45	6.48

*One sample was analyzed twice and incorporated within this average

§Samples taken from a different paddock than original 2009 sample, but within the same farm.

Particle size analysis from composite soil core samples (n=6) from each farm along the chronosequence, identified by the year of conversion of row crop to intensive grazing system (e.g. 2006, 2008, 2009) and the age since conversion at time of sampling. Each average represents six composite samples of five random soil samples within each farm.