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Author Correction: Soil carbon maintained by perennial grasslands over 30 years but lost in field crop systems in a temperate Mollisol

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The original version of this article contained errors as a result of mislabeled GPS locations in a dataset used to spatially krige, or interpolate, the 1989 data. Specifically, northern sampling points within some field plots were labeled as southern sampling points, and vice versa. As a result, when SOC stocks at specific locations in 2009 and 2019 were compared to SOC stocks at those locations in 1989, they were not compared with the spatially closest point, but instead another point from within the same plot.

In correcting this error and reanalyzing the data, we found trends consistent with our original manuscript, but with reduced variability. The most notable change was in the organic maize-soy-wheat rotation (org. MSW), which lost SOC at a higher rate (-0.93 Mg ha^{-1} yr^{-1}, $p < 0.001$) than originally estimated (-0.90 Mg ha^{-1} yr^{-1}, $p < 0.001$). Figure 1, Figure 2, Table 1, Table S1, Table S2, and Table S3, as well as the HTML and PDF versions of the manuscript, have been updated to reflect this correction.

Corrections are listed in detail below:

The original version of this Article contained an error in the Abstract, which incorrectly read '-0.82 (± 0.12) and -0.64 (± 0.17)'. The corrected version instead states '-0.80 (± 0.12) and -0.54 (± 0.13)'.

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read '(-0.90 Mg ha-1 yr-1, -0.79 Mg ha-1 yr-1, and -0.77 Mg ha-1 yr-1, respectively) (Table 1).' The corrected version instead states '(-0.78 Mg ha-1 yr-1, -0.70 Mg ha-1 yr-1, and -0.93 Mg ha-1 yr-1, respectively) (Table 1).'

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read 'We found evidence for SOC loss in all depths in Maize, although evidence for surface 0–15 cm losses was weaker ($p = 0.09$) than losses deeper in the soil ($p < 0.05$). In MS we found evidence ($p < 0.05$) for SOC losses at every depth. Within org. MSW, we found no evidence for SOC gain or loss in the 0–15 cm depth but found strong evidence ($p < 0.005$) for losses below.' The corrected version states 'We found evidence for SOC loss in all depths in Maize, MS, and MSW ($p < 0.005$).'

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read 'The alfalfa-based dairy-forage systems lost SOC at similar annual loss rates of -0.68 Mg ha -1 yr-1 ($p < 0.001$) and -0.60 Mg ha-1 yr-1 ($p = 0.003$)'. The corrected version states 'The alfalfa-based dairy-forage systems lost SOC slower than the annual systems with rates of -0.56 Mg ha-1 yr-1 ($p = 0.0004$) and -0.52 Mg ha-1 yr-1 ($p = 0.0053$)'.

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read '(0.16 Mg ha-1 yr-1, $p = 0.7$ and -0.02 Mg ha-1 yr-1, $p = 0.91$, respectively)'. The corrected version states '($+0.11$ Mg ha-1 yr-1, $p = 0.7$ and $+0.24$ Mg ha-1 yr-1, $p = 0.55$, respectively)'.

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read '(0.23 Mg ha-1 yr-1, $p = 0.05$)'. The corrected version states '(0.25 Mg ha-1 yr-1, $p = 0.0086$)'.

The original version of this Article contained an error in the Results 'SOC change from baseline in years 20 and 30' section (paragraph 1), which incorrectly read '(0.26 Mg ha-1 yr-1, $p = 0.04$)'. The corrected version states '(0.35 Mg ha-1 yr-1, $p = 0.024$)'.

The original version of this Article contained errors in the Results 'SOC change between years 20 and 30' section (entire paragraph), which incorrectly read 'Total 0–90 cm SOC did not significantly change in any of the systems between 2009 and 2019 (Supplementary Information, Table S1). However, there were changes within depths. In MS, losses continued in the 15–30 cm depth (-0.29 Mg ha-1 yr-1, $p = 0.008$). Org. MSW lost 0.47 Mg ha-1 yr-1 ($p = 0.06$) in the 30–60 cm depth. In org. Mo/aA, there was weak evidence for surface 0–15 cm gains (0.22 Mg ha-1 yr-1, $p = 0.096$). In MIRG, there was strong evidence for gains in the 60–90 cm depth (0.32 Mg ha-1 yr-1, $p < 0.001$). Finally, in Prairie, the 0–15 cm depth gained SOC at a rate of 0.77 Mg ha -1 yr-1 ($p = 0.01$).' The corrected version states 'Total 0–90 cm SOC did not significantly change between 2009 and 2019 (Supplementary Information, Table S1) with the exception of org. CSW which experienced continued system wide loss of SOC (-0.71 Mg ha-1 yr-1, $p = 0.0389$). Other systems experience changes within depths. In both Maize and MS, losses continued in the 15–30 cm depth (-0.74 Mg ha-1 yr-1, $p = 0.0244$, and -0.24 Mg ha-1 yr-1, $p = 0.0348$ respectively). Surface gains (0–15 cm) occurred in both the org. Mo/aA and Prairie systems (0.24 Mg ha-1 yr-1, $p = 0.044$ and 0.79 Mg ha-1 yr-1, $p = 0.0067$ respectively). No horizon-specific significant changes were detected below 30 cm for any of the systems'.

The original version of this Article contained an error in the Results 'Effects of alternative methods' section (paragraph 1), which incorrectly read '−0.13–0.49, 0.02–0.47, and −0.07–0.13 Mg ha−1 yr−1'. The corrected version states '−0.35–0.62, 0.08–0.58, and −0.10–0.16 Mg ha −1 yr−1'.

The original version of this Article contained an error in the Results 'Effects of alternative methods' section (paragraph 2), which incorrectly read 'Maize and MaAA were no longer statistically different from zero (a change of 0.49 and 0.54 Mg ha−1 yr−1, respectively), and gains in MIRG became statistically significant (a change of 0.43 Mg ha−1 yr−1)'. The corrected version states 'Maize,MaAA, and org. Mo/aA were no longer statistically different from zero (a change of 0.62, 0.58, and 0.33 Mg ha−1 yr−1, respectively), and gains in MIRG appeared statistically significant (a change of 0.57 Mg ha−1 yr−1)'.

The original version of this Article contained an error in the Results 'Effects of alternative methods' section (paragraph 2), which incorrectly read '0.35 Mg ha−1 yr−1'. The corrected version states '0.33 Mg ha−1 yr−1'.

The original version of this Article contained an error in the Results 'Effects of alternative methods' section (paragraph 2), which incorrectly read 'Within the 0–15 cm depth, losses in Maize and MS and gains in Prairie were no longer evident in the depth-based scenario (a change of 0.12, 0.11, and −0.15 Mg ha−1 yr−1, respectively) while gains in org. MSW became statistically significant (a change of 0.08 Mg ha−1 yr−1).' The corrected version states 'Within the 0–15 cm depth, losses in Maize, MS, and org. MSW, as well as gains in MIRG were no longer evident in the depth-based scenario (a change of 0.16, 0.08, 0.12, and −0.02 Mg ha−1 yr−1, respectively).'

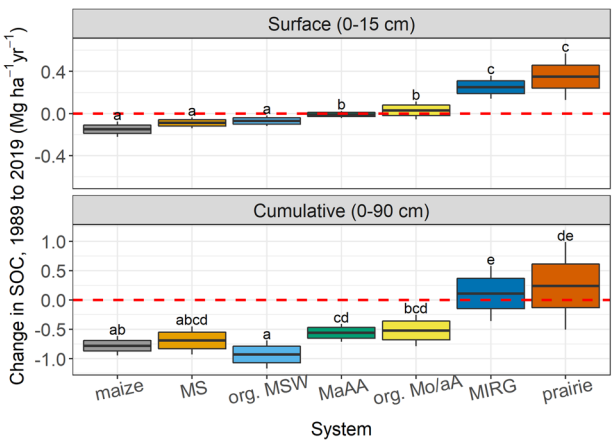
The original version of this Article contained an error in the Discussion section (paragraph 6), which incorrectly read '−0.68 Mg ha−1 yr−1'. The corrected version states '−0.56 Mg ha−1 yr−1'.

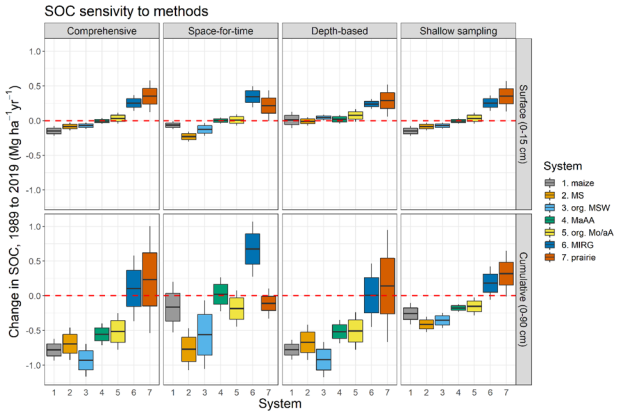
The original version of this Article contained an error in the Discussion section (paragraph 7), which incorrectly read '−0.35 Mg ha−1 yr−1'. The corrected version states '−0.258 Mg ha−1 yr−1'.

The original version of this Article contained an error in the Discussion section (paragraph 8), which incorrectly read '−0.10 Mg ha−1 yr−1 in MIRG to 0.13 Mg ha^{-1} yr^{-1} in MaAA'. The corrected version states '−0.10 Mg ha−1 yr−1 in MIRG to 0.04 Mg ha^{-1} yr^{-1} in MaAA'.

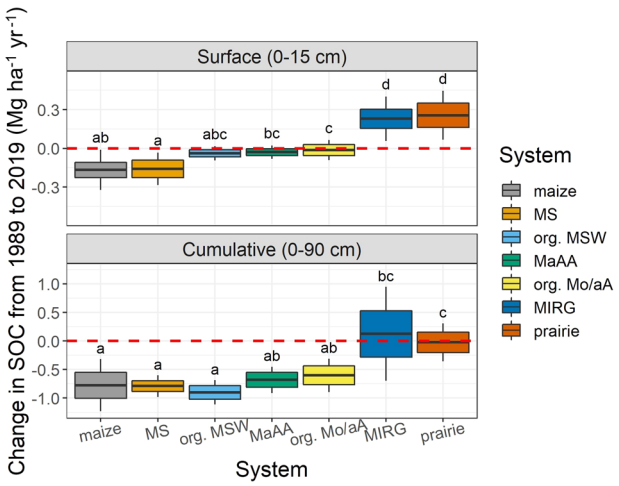
The original version of this Article contained errors in the caption for Fig. 2, which incorrectly read 'maize' and 'prairie'. The corrected version states 'Maize' and 'Prairie'.

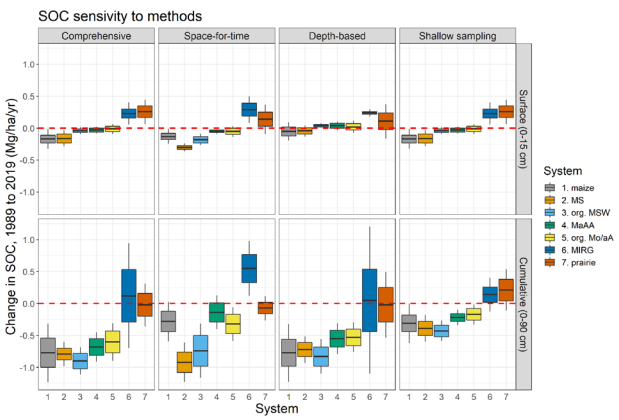
The original version of this Article contained an error in Figs. 1–2 because of mislabelled data. The correct version of Figs. 1–2 are:





which replaces the previous incorrect versions:





The mislabeled data used in the original version of this Article led to errors in Table 1, in which many of the values need to be corrected. The correct version of Table 1 is:

Cropping system[a]	Depth	ΔSOC 1989 to 2009 ± SE (Mg ha^{-1} yr^{-1})		Pr > *t*	ΔSOC 1989 to 2019 ± SE (Mg ha^{-1} yr^{-1})		Pr > *t*
maize	0–15	−0.26	±0.14	0.2202	−0.15	±0.04	0.0150
	15–30	−0.63	±0.11	0.0058	−0.14	±0.05	0.0294
	30–60	−0.33	±0.01	0.0190	−0.22	±0.02	0.0427
	60–90	−0.4	±0.19	0.2889	−0.23	±0.04	0.0046
	Cumulative	−1.22	±0.26	0.0249	−0.78	±0.09	0.0228
MS	0–15	−0.21	±0.06	0.0086	−0.09	±0.03	0.0297
	15–30	−0.32	±0.15	0.0599	−0.25	±0.04	0.0003
	30–60	−0.24	±0.02	0.0646	−0.25	±0.06	0.0014
	60–90	−0.33	±0.07	0.0015	−0.18	±0.04	0.0127
	Cumulative	−1.12	±0.24	0.0118	−0.69	±0.14	0.0007
org. MSW	0–15	−0.14	±0.06	0.0330	−0.07	±0.03	0.0287
	15–30	−0.39	±0.12	0.0153	−0.3	±0.06	0.0002
	30–60	−0.27	±0.09	0.1982	−0.33	±0.04	<0.0001
	60–90	−0.35	±0.06	0.0019	−0.24	±0.04	0.0040
	Cumulative	−1.09	±0.37	0.0123	−0.93	±0.14	<0.0001
MaAA	0–15	−0.02	±0.05	0.6503	−0.01	±0.02	0.8219
	15–30	−0.26	±0.12	0.0619	−0.18	±0.03	0.0005
	30–60	−0.07	±0.13	0.6822	−0.26	±0.03	<0.0001
	60–90	−0.23	±0.07	0.0077	−0.18	±0.04	0.0060
	Cumulative	−0.47	±0.32	0.1712	−0.56	±0.09	0.0004
org. Mo/aA	0–15	−0.11	±0.05	0.0632	0.03	±0.05	0.5052
	15–30	−0.26	±0.12	0.0648	−0.21	±0.05	0.0008
	30–60	−0.27	±0.08	0.1862	−0.29	±0.05	<0.0001
	60–90	−0.35	±0.07	0.0011	−0.22	±0.05	0.0022
	Cumulative	−0.98	±0.29	0.0122	−0.52	±0.16	0.0053
MIRG	0–15	0.25	±0.1	0.0575	0.25	±0.06	0.0086
	15–30	0.07	±0.22	0.7462	−0.07	±0.07	0.4037
	30–60	−0.13	±0.11	0.4433	−0.08	±0.12	0.5523
	60–90	−0.3	±0.07	0.0080	−0.06	±0.04	0.2194
	Cumulative	0.46	±0.72	0.5573	0.11	±0.26	0.7005
prairie	0–15	0	±0.09	0.9907	0.35	±0.11	0.0240
	15–30	−0.26	±0.13	0.1109	−0.03	±0.11	0.7708
	30–60	−0.51	±0.14	0.1670	−0.15	±0.23	0.5501
	60–90	−0.2	±0.1	0.1028	0.06	±0.16	0.7013
	Cumulative	−1.39	±0.3	0.0155	0.24	±0.37	0.5496

[a]Treatment abbreviations are as follows: maize cropping system of continuous maize, MS minimum tillage cropping rotation of maize to soybean, org. MSW organic cropping rotation of maize to soybean to winter wheat with cover crop, MaAA cropping rotation of maize followed by 3 years of conventional alfalfa, org. Mo/aA organic cropping rotation of maize followed by oats/alfalfa followed by alfalfa, MIRG management intensive rotationally grazed pasture seeded to red clover, timothy grass, smooth bromegrass, and orchardgrass, prairie cool-season grassy waterways established in 1990 planted to soy in 1998 and to native warm-season grass mixes in 1999.

which replaces the previous incorrect version:

Cropping system[a]	Depth	ΔSOC 1989 to 2009 ± SE (Mg ha^{-1} yr^{-1})		Pr > *t*	ΔSOC 1989 to 2019 ± SE (Mg ha^{-1} yr^{-1})		Pr > *t*
maize	0–15	−0.27	±0.16	0.204	−0.17	±0.06	0.087
	15–30	−0.35	±0.10	0.018	−0.19	±0.06	0.036
	30–60	−0.32	±0.15	0.128	−0.29	±0.12	0.07
	60–90	−0.40	±0.14	0.03	−0.26	±0.05	0.003
	Cumulative	−1.23	±0.34	0.067	−0.77	±0.23	0.019
MS	0–15	−0.22	±0.06	0.009	−0.16	±0.07	0.047
	15–30	−0.43	±0.15	0.02	−0.28	±0.07	0.007
	30–60	−0.18	±0.06	0.018	−0.28	±0.05	0.001
	60–90	−0.41	±0.09	0.007	−0.19	±0.03	0.003
	Cumulative	−0.96	±0.26	0.011	−0.79	±0.09	<0.001
org. MSW	0–15	−0.11	±0.06	0.116	−0.04	±0.03	0.219
	15–30	−0.43	±0.10	0.003	−0.30	±0.08	0.004
	30–60	−0.34	±0.08	0.001	−0.34	±0.05	<0.001
	60–90	−0.37	±0.08	0.015	−0.24	±0.03	0.001
	Cumulative	−1.32	±0.33	0.002	−0.90	±0.12	<0.001
MaAA	0–15	−0.02	±0.06	0.714	−0.03	±0.03	0.305
	15–30	−0.23	±0.11	0.063	−0.17	±0.06	0.032
	30–60	−0.06	±0.14	0.678	−0.23	±0.06	0.001
	60–90	−0.25	±0.08	0.038	−0.19	±0.04	0.001
	Cumulative	−0.53	±0.28	0.091	−0.68	±0.13	<0.001
org. Mo/aA	0–15	−0.12	±0.05	0.045	−0.01	±0.04	0.76
	15–30	−0.31	±0.10	0.014	−0.18	±0.06	0.03
	30–60	−0.33	±0.08	0.001	−0.28	±0.05	<0.001
	60–90	−0.35	±0.08	0.016	−0.21	±0.05	0.001
	Cumulative	−0.95	±0.23	0.007	−0.60	±0.17	0.003
MIRG	0–15	0.2	±0.08	0.09	0.23	±0.07	0.052
	15–30	0	±0.18	0.995	−0.09	±0.08	0.324
	30–60	0.06	±0.16	0.728	−0.11	±0.21	0.654
	60–90	−0.30	±0.07	0.038	−0.03	±0.03	0.307
	Cumulative	0.28	±0.39	0.509	0.12	±0.41	0.771
prairie	0–15	0.04	±0.08	0.666	0.26	±0.09	0.041
	15–30	−1.01	±0.15	<0.001	−0.04	±0.11	0.725
	30–60	−0.84	±0.11	0.084	−0.09	±0.21	0.672
	60–90	−0.09	±0.17	0.633	−0.15	±0.19	0.478
	Cumulative	−2.22	±0.40	<0.001	−0.02	±0.18	0.896

[a]Treatment abbreviations are as follows: maize cropping system of continuous maize, MS minimum tillage cropping rotation of maize to soybean, org. MSW organic cropping rotation of maize to soybean to winter wheat with cover crop, MaAA cropping rotation of maize followed by 3 years of conventional alfalfa, org. Mo/aA organic cropping rotation of maize followed by oats/alfalfa followed by alfalfa, MIRG management intensive rotationally grazed pasture seeded to red clover, timothy grass, smooth bromegrass, and orchardgrass, prairie cool-season grassy waterways established in 1990 planted to soy in 1998 and to native warm-season grass mixes in 1999.

The original version of the Supplementary Information associated with this Article contained errors in Supplementary Tables S1–S3. The HTML has been updated to include a corrected version of the Supplementary Information; the original incorrect version can be found as Supplementary Information associated with this Correction.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1038/s43247-024-01770-4.

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