

## Supplemental Tables

1 **Supplemental Table S1:** All Experiments. Soil analyses for incubation microcosms.

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Soil	Sand	Silt	Clay	Fe (hydroxylamine hydrochloride) mg/g	Fe (dithionite) mg/g	Fe (oxalate) mg/g	%C
SCL	60	15	24	0.39 ± 0.02	2.2 ± 0.28	2.5 ± 0.10	2.08 ± 0.01
SL	74	11	15	0.18 ± 0.01	0.29 ± 0.04	0.79 ± 0.03	0.61 ± 0.02

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## Supplemental Tables

**Supplemental Table S3.** Percent of hydroxylamine hydrochloride extractable iron ( $\text{Fe}_{\text{HHCl}}$ ) measured in the liquid phase at the end of the incubation period (Experiment 1).

Treatment	SCL				SL			
	$\text{Fe}^{2+}$ (mg/L)	stdev	% $\text{Fe}_{\text{HHCl}}$ used	stdev	$\text{Fe}^{2+}$ (mg/L)	stdev	% $\text{Fe}_{\text{HHCl}}$ used	stdev
Control	69.8	50.2	1.7%	1.2%	67.6	2.6	20%	0.8%
B1	45.5	30.6	1.5%	1.0%	80.8	8.0	27%	2.0%
B3	40.6	7.2	1.9%	0.3%	62.1	11.0	28%	4.6%
B6	32.1	19.9	3.3%	2.5%	38.8	2.8	34%	9.7%
M1	75.8	25.2	2.1%	0.6%	109.5	4.3	40%	2.2%
M3	85.4	7.5	3.1%	0.3%	95.6	22.9	50%	3.0%
M6	62.4	22.1	19%	13%	54.0	26.7	61%	11%
L1	49.1	31.7	9.9%	6.5%	22.9	9.2	8%	2.9%
L3	17.9	9.0	4.1%	1.9%	8.3	2.3	4%	1.1%
L6	26.0	9.5	8.6%	3.0%	6.9	0.6	5%	0.4%
W1	62.7	11.5	1.7%	0.4%	75.6	11.1	25%	2.7%
W3	63.8	9.2	2.3%	0.4%	60.5	6.7	28%	4.0%
W6	38.7	18.6	2.3%	1.0%	44.8	1.1	42%	8.4%
H1	220.6	75.5	43%	14%	158.1	8.2	58%	5.1%
H3	523.8	199.8	79%	74%	214.4	77.9	109%	39%
H6	466.8	154.1	155%	47%	268.6	70.9	236%	53%

## Supplemental Tables

**Supplemental Table S4.** MANOVA summary table for Fe<sup>2+</sup> production in Experiment 1 considering organic amendment type and dose (OM), pH (as continuous variable), and soil type (SL and SCL).

Factor	DF	Exp. DF	F Value	p
OM	28	63	17.44	< 0.0001
pH	1	63	1.09	0.30
Soil	1	63	0.06	0.81

## Supplemental Tables

**Supplemental Table S2. Experiment 1.** Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and total gas production for Phase 1 and Phase 2 periods. The Break Point represents an abrupt shift from Phase 1 to Phase 2 gas production. The r<sup>2</sup> value, generated using the Segmented function in R, applies to both Phases. All ratio values (e.g. % CH<sub>4</sub>) are based on calculated gas production rates, not total values, so it is possible to have CH<sub>4</sub> + CO<sub>2</sub> > Total.

			Phase 1								Phase 2										
			CO <sub>2</sub>		CH <sub>4</sub>		Total Gas				CO <sub>2</sub>		CH <sub>4</sub>		Total Gas						
Soil	Treatment	Soil (g)	cc/day	cc/Kg/day	cc/day	cc/Kg/day	cc/day	cc/Kg/day	% CH <sub>4</sub>	CH <sub>4</sub> + CO <sub>2</sub> % of total	cc/day	cc/Kg/day	cc/day	cc/Kg/day	cc/day	cc/Kg/day	% CH <sub>4</sub>	CH <sub>4</sub> + CO <sub>2</sub> % of total	Break Point	r^2	Ph 2: Ph1
SCL	Control	621.63	0.97	1.56	0.002	0.003	0.99	1.59	0.2%	99%	2.06	3.31	1.20	1.94	2.54	4.09	47%	128%	40.0 ± 4.5	0.959	2.57
SCL	B1	425.24	1.53	3.61	0.08	0.18	4.13	9.70	2%	39%	5.58	13.13	1.47	3.45	5.49	12.91	27%	128%	29.3 ± 1.9	0.987	1.33
SCL	B3	544.53	1.50	2.76	0.44	0.80	3.85	7.06	11%	50%	3.74	6.86	4.45	8.17	9.48	17.40	47%	86%	20.1 ± 3.4	0.974	2.46
SCL	B6	468.02	2.09	4.46	0.06	0.13	3.53	7.55	2%	61%	7.42	15.85	10.90	23.29	18.20	38.89	60%	101%	10.3 ± 2.4	0.994	5.15
SCL	M1	583.40	0.74	1.27	0.02	0.04	1.33	2.27	2%	58%	2.26	3.88	1.29	2.22	5.82	9.97	22%	61%	40.2 ± 2.1	0.997	4.39
SCL	M3	495.56	1.79	3.61	0.32	0.64	2.05	4.13	15%	103%	4.64	9.37	5.39	10.89	10.69	21.58	50%	94%	20.8 ± 0.8	0.997	5.23
SCL	M6	394.39	1.49	3.77	0.12	0.30	4.35	11.03	3%	37%	5.85	14.83	10.91	27.67	19.69	49.93	55%	85%	22.1 ± 3.2	0.956	4.53
SCL	L1	586.46	0.83	1.42	0.001	0.001	0.85	1.45	0.1%	98%	3.85	6.57	0.05	0.090	3.96	6.76	1%	99%	32.2 ± 1.6	0.966	4.67
SCL	L3	516.34	0.89	1.72	0.01	0.01	0.91	1.77	1%	98%	4.21	8.16	0.39	0.75	4.54	8.79	9%	101%	32.0 ± 2.2	0.983	4.97
SCL	L6	410.17	0.67	1.63	0.04	0.09	0.80	1.95	5%	88%	5.90	14.39	0.92	2.24	6.95	16.95	13%	98%	32.0 ± 3.7	0.923	8.68
SCL	W1	593.36	1.00	1.68	0.01	0.01	0.92	1.56	1%	109%	1.56	2.63	0.27	0.460	3.22	5.42	8%	57%	34.0 ± 3.7	0.986	3.48
SCL	W3	539.61	0.98	1.81	0.10	0.19	1.39	2.58	7%	77%	1.93	3.58	1.90	3.52	4.51	8.35	42%	85%	24.2 ± 3.1	0.989	3.23
SCL	W6	457.42	1.03	2.25	0.11	0.24	1.29	2.81	9%	89%	2.19	4.79	2.36	5.15	6.22	13.60	38%	73%	13.0 ± 2.4	0.981	4.84
SL	Control	634.60	0.50	0.79	0.03	0.04	0.56	0.88	5%	94%	1.00	1.58	1.16	1.82	3.11	4.91	37%	69%	40.0 ± 3.2	0.957	5.55
SL	B1	606.80	1.25	2.06	0.02	0.04	4.13	6.80	1%	31%	4.44	7.31	5.16	8.50	10.19	16.79	51%	94%	8.6 ± 3.0	0.880	2.47
SL	B3	551.50	1.57	2.84	0.44	0.79	2.92	5.29	15%	69%	8.76	15.89	8.42	15.28	16.12	29.23	52%	107%	4.7 ± 1.8	0.989	5.53
SL	B6	467.87	2.08	4.44	0.59	1.27	3.81	8.15	16%	70%	12.61	26.96	20.15	43.07	40.39	86.33	50%	81%	9.1 ± 1.2	0.992	10.59
SL	M1	619.92	2.62	4.22	0.58	0.93	3.49	5.63	17%	92%	8.64	13.93	13.03	21.02	19.41	31.30	67%	112%	16.7 ± 0.7	0.998	5.56
SL	M3	588.37	4.48	7.61	3.44	5.85	9.42	16.02	37%	84%	15.23	25.88	34.77	59.10	50.79	86.33	68%	98%	17.2 ± 1.5	0.992	5.39
SL	M6	540.93	8.63	15.95	8.59	15.87	17.92	33.13	48%	96%	29.50	54.53	34.62	64.00	84.92	156.98	41%	76%	29.4 ± 1.4	0.974	4.74
SL	L1	600.10	0.35	0.58	0.02	0.03	0.73	1.22	2%	50%	1.35	2.24	1.71	2.85	3.76	6.26	45%	81%	38.3 ± 1.2	0.992	5.12
SL	L3	530.30	0.61	1.15	0.02	0.03	0.78	1.46	2%	81%	2.27	4.27	1.86	3.50	4.82	9.09	39%	86%	40.5 ± 2.0	0.977	6.22
SL	L6	425.87	0.62	1.47	0.11	0.26	1.66	3.89	7%	44%	4.25	9.99	3.07	7.21	7.15	16.78	43%	102%	44.8 ± 1.3	0.988	4.31
SL	W1	603.27	0.98	1.62	0.06	0.10	1.55	2.56	4%	67%	2.10	3.48	1.32	2.19	3.47	5.76	38%	98%	25.6 ± 7.6	0.762	2.25
SL	W3	538.77	1.42	2.64	0.20	0.36	2.14	3.98	9%	76%	6.58	12.22	4.05	7.51	9.46	17.56	43%	112%	23.2 ± 2.3	0.974	4.41
SL	W6	442.57	3.05	6.88	0.24	0.54	3.23	7.31	7%	102%	10.10	22.83	8.23	18.60	16.22	36.65	51%	113%	23.2 ± 1.1	0.991	5.02
								AVERAGE	8.7%	75.4%							40.2%	93.3%			4.7
								STDEV	11.3%	23.1%							17.5%	18.1%			1.9
Sigmoidal curve values		Soil (g)	cc/day (max)	cc/Kg/day	cc/day (max)	cc/Kg/day	cc/day (max)	cc/Kg/day	% CH <sub>4</sub>	CH <sub>4</sub> + CO <sub>2</sub> % of total											
SCL	H1	573.03	9.70	16.93	10.40	18.15	18.40	32.11	57%	109%											
SCL	H3	477.85	7.50	15.70	0.02	0.04	9.90	20.72	0.2%	76%											
SCL	H6	334.20	6.60	19.75	0.09	0.27	6.70	20.05	1%	100%											
SL	H1	582.57	8.90	15.28	16.20	27.81	18.40	31.58	88%	136%											
SL	H3	478.00	20.80	43.51	12.20	25.52	36.80	76.99	33.2%	90%											
SL	H6	321.13	14.70	45.78	13.20	41.10	35.60	110.86	37%	78%											

## Supplemental Tables

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