

[Supplemental figures and tables]

Table S1. Chemical properties of the surface soil (0–10 cm) in the experimental plots after the first year of soybean cultivation (2008)

Plot	pH (H ₂ O)	CEC (cmol _c kg ⁻¹)	Total N (g kg ⁻¹)	Total carbon (g kg ⁻¹)	available N [†] (mg N kg ⁻¹)	Available P [‡] (mg P ₂ O ₅ kg ⁻¹)
C	5.6	21.8	1.7	18.0	90	173
I	5.8	22.3	2.0	25.0	133	182
M	6.0	23.9	2.1	26.4	136	233

After Takakai *et al.* [17]. [†]Ammonium–nitrogen for 4-week incubation of air-dried soil under flooded conditions at 30°C. [‡]Truog–phosphorus. C, control; CEC, cation-exchange capacity; I, immature compost, M, mature compost; N, nitrogen; P, phosphorous.

Table S2. Monthly air temperature and precipitation.

Month	Air temperature (°C)								Precipitation (mm)							
	2008	2009	2010	2011	2012	2013	2014	Ave. [†]	2008	2009	2010	2011	2012	2013	2014	Ave. [†]
Jan.	-1.7	0.0	-0.3	-2.5	-2.4	-2.3	-1.4	-0.7	93	199	165	93	54	71	129	135
Feb.	-1.3	0.0	-0.9	-0.1	-2.5	-1.8	-1.4	-0.4	67	140	73	67	64	51	67	90
Mar.	4.2	2.8	1.8	0.9	2.0	2.1	2.0	2.4	66	124	119	82	180	80	126	101
Apr.	10.4	8.8	6.8	7.4	8.4	7.0	8.4	8.3	39	121	142	155	103	141	26	119
May	14.2	15.0	13.4	13.5	14.2	13.5	14.5	14.2	90	82	154	181	85	64	127	114
Jun.	18.3	18.8	19.6	18.3	18.3	20.2	20.1	19.0	53	110	174	294	69	22	174	118
Jul.	23.0	21.7	23.8	24.0	22.4	22.3	23.0	21.9	155	342	246	81	176	544	152	197
Aug.	22.6	22.6	25.8	24.2	25.3	24.0	23.3	23.7	246	169	234	243	64	250	277	211
Sep.	19.6	18.1	20.1	20.3	22.6	19.7	18.2	19.6	62	80	207	386	76	184	155	150
Oct.	13.8	12.9	13.6	13.2	13.8	14.3	12.1	13.1	165	167	143	147	190	241	213	169
Nov.	6.6	7.5	7.1	8.1	6.5	5.6	7.5	7.3	240	232	243	139	388	358	130	209
Dec.	2.6	1.7	2.5	0.4	-0.1	1.5	0.0	1.9	153	138	161	124	158	174	221	162
Annual [‡]	11.0	10.8	11.1	10.6	10.7	10.5	10.5	10.9	1426	1903	2059	1989	1605	2178	1794	1775
May-Sep. [‡]	19.5	19.2	20.5	20.0	20.6	20.0	19.8	19.7	605	782	1015	1184	470	1063	884	791

After Takakai *et al.* [18]. [†]2003-2010 (8 years). [‡]Average for air temperature and total for precipitation.

Table S3. Changes in soil carbon (C) storage in soil (0–30 cm).

Plot	Depth	Bulk density [†] (Mg m ⁻³)	Layer thickness (cm)	T-C (g kg ⁻¹)			Soil C storage (kg C m ⁻²)			Decrease in soil C storage (g C m ⁻² y ⁻¹)	
				BS	AS	AR	BS	AS	AR	BS to AS (Soybean)	AS to AR (Rice)
C	0–10	1.12	10.0	18.0	18.3	19.2	2.01	2.05	2.15	110	58
	10–20	1.19	10.0	18.4	17.2	15.9	2.19	2.04	1.89		
	20–30	1.19	10.0	18.5	16.7	15.6	2.20	1.98	1.85		
	Total	-	-	-	-	-	6.40	6.07	5.90		
I	0–10	1.01	10.0	25.0	20.1	20.5	2.51	2.02	2.06	350	79
	10–20	1.11	10.0	20.8	18.3	17.4	2.31	2.02	1.93		
	20–30	1.11	12.4 [‡]	19.8	17.8	16.5	2.73	2.46	2.28		
	Total	-	-	-	-	-	7.56	6.51	6.27		
M	0–10	1.08	10.0	26.4	21.5	22.5	2.85	2.32	2.42	315	83
	10–20	1.14	10.0	21.4	19.6	18.3	2.45	2.24	2.09		
	20–30	1.14	11.1 [‡]	19.0	17.4	15.8	2.42	2.22	2.01		
	Total	-	-	-	-	-	7.72	6.78	6.53		

[†]Measured in May 2008. [‡]Adjusted based on a soil mass basis to make the dry soil mass of the immature and mature compost plots equal to that of the control plot (0–30 cm). AR, after rice (April 2014); AS, after soybean (May 2011); BS, before study (November 2007); C, control; I, immature compost; M, mature compost; T-C, total carbon.

Table S4. Comparison of net greenhouse gas (GHG) balance in soybean (upland) and rice (paddy) cultivation field.

Crop	Plot	GHG balance (Mg CO ₂ -eq ha ⁻¹ y ⁻¹)			
		CH ₄ [†]	N ₂ O [†]	CO ₂ [‡]	Total
Soybean (2008–2010)	C	0.12	0.78	4.0	4.9
	I	0.06	1.12	12.8	14.0
	M	0.11	0.64	11.5	12.3
Rice (2011-2013)	C	8.4	0.07	1.5	9.9
	I	6.9	0.32	2.3	9.6
	M	12.0	0.16	2.1	14.3

Positive values indicate net emissions to the atmosphere. [†]Obtained by the closed chamber method (Table 1 and 2). [‡]Calculated by subtracting annual CH₄-C emission from the annual rate of decrease in soil carbon storage. C, control; I, immature compost; M, mature compost.