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Mechanisms of enhancing soil fertility without obviously elevating global warming potential under an optimal rice straw incorporation rate in a paddy soil

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Table S1 Primer sets and thermal programs for qPCR

Target gene		Primers (5'→3')	Length bp	Ta °C	Primer μM	Reference
Bacterial 16S rRNA	1369F	CGGTGAATACGTTCYCGG	123	58	0.3	(Eden et al., 1991; Weisburg et al., 1991; Suzuki et al., 2000)
	1492R	GGWTACCTTGTTACGACT				
Fungal 18S rRNA	nu-SSU-0817	TTAGCATGGAATAATRRAATAGGA	382	56	1.2	(Borneman and Hartin, 2000)
	nu-SSU-1196	TCTGGACCTGGTGAGTTTCC				
mcrA	mcrAF	GGTGGTGTMGGATTCACACARTAYGCWACAGC	491	56	0.3	(Springer et al., 1995; Luton et al., 2002)
	mcrAR	TTCATTGCRTAGTTWGGRTAGTT				
pmoA	A189F	GGNGACTGGGACCTTCTGG	470	56	0.3	(Holmes et al., 1995; Costello and Lidstrom, 1999)
	mb661R	CCGGMGCAACGTCYTTACC				
nirK	876F	ATYGGCGGVCAYGGCGA	180	60	0.3	(Henry et al., 2004; Chen et al., 2010)
	1055R	GCYTCGATCAGRTTRTGGTT				
nirS	cd3aF	GTSAACGTSAAGGARACSGG	423	60	0.3	(Michotey et al., 2000; Throbäck et al., 2004)
	R3cd	GASTTCGGRTGSGTCTTGA				
*nosZ*I	nosZI-1126F	GGGCTBGGGCRTTGCA	256	60	0.3	(Chen et al., 2012)
	nosZI-1381R	GAAGCGRTCCTTSGARAACTTG				
*nosZ*II	nosZII-F	CTIGGICCIYTKCAYAC	748	56	1.0	(Jones et al., 2013)
	nosZII-R	GCIGARCARAAITCBGTRC				

Ta, annealing temperature. Thermal program: Step 1, pre-denaturation, 95℃, 2 min. Step 2, denaturation, 95℃, 15 s; annealing, Ta, 30 s; extension, 72℃, 30 s (for bacterial 16S rRNA, denaturation, 95℃, 5 s; annealing, Ta, 20 s; extension, 72℃, 20 s). Step 3, melting curve, 95℃, 15 s; 60 or 65℃, 15 s; 95℃ continuous.

Table S2 Cumulative emissions and global warming potential in three phases

Period	Treatment	Cumulative emissions			Global warming potential (g CO_2 equivalent·m^{-2})
		CO_2 (g·m^{-2})	CH_4 (g·m^{-2})	N_2O (g·m^{-2})	
Phase I	CK	112.52±6.85c	0.02±0.00d	1.43±0.21a	504.00±63.50bc
	ST1	166.97±24.87bc	2.14±0.19c	0.59±0.20b	386.54±78.54c
	ST2	223.69±31.19ab	16.41±0.31b	0.22±0.10b	741.59±58.71b
	ST3	274.41±10.47a	25.19±0.68a	0.24±0.08b	1041.96±37.83a
Phase II	CK	53.30±3.38c	0.04±0.00c	0.03±0.00b	63.20±3.93d
	ST1	105.91±1.73b	2.17±0.51c	0.10±0.04ab	192.64±4.88c
	ST2	134.51±8.58a	6.51±1.30b	0.16±0.02a	360.84±37.59b
	ST3	115.35±2.15ab	12.34±0.50a	0.10±0.00ab	488.09±16.16a
Phase III	CK	114.37±7.71d	0.29±0.02a	1.15±0.17bc	436.29±52.09c
	ST1	192.78±10.61c	0.09±0.03a	0.95±0.10c	455.76±34.49c
	ST2	247.72±0.72b	0.30±0.08a	1.65±0.17b	707.62±50.12b
	ST3	305.94±7.38a	0.48±0.16a	2.46±0.15a	991.43±45.55a

Phase I, Phase II, and Phase III represent the flooding, the early drained, and the late drained period, respectively. CK, ST1, ST2, and ST3 received 0, 50%, 100%, and 150% of the local harvested rice straw, respectively. Different lower-case letters indicate significant differences between treatments ($\alpha = 0.05$). Data are given in average ± standard error ($n = 3$).

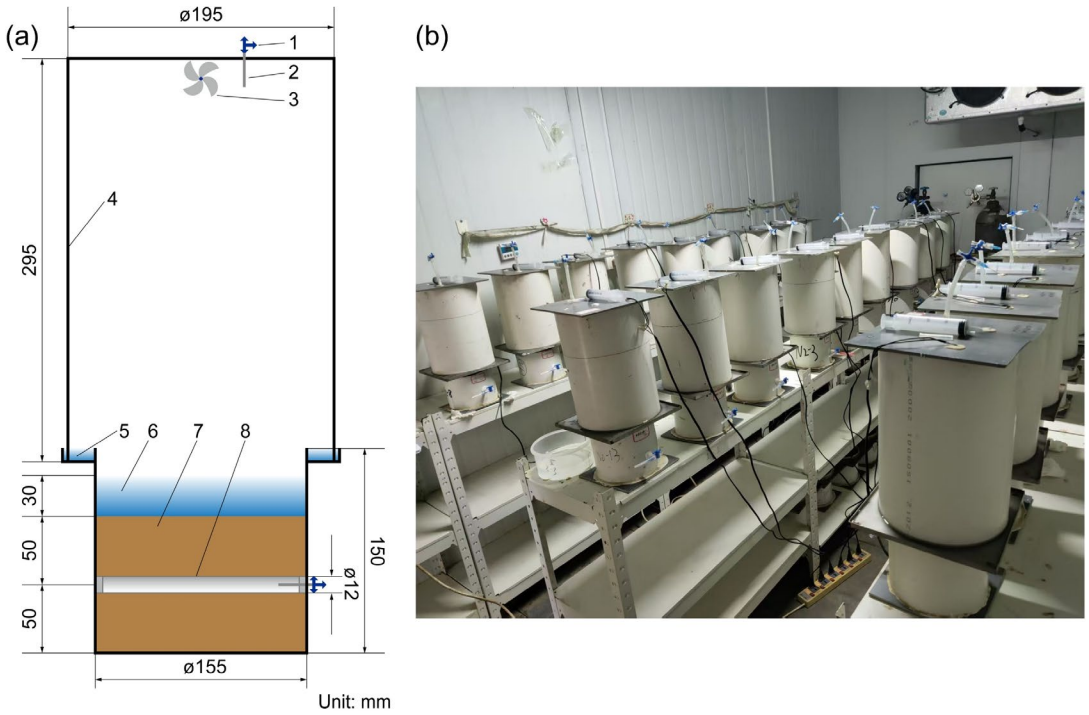

Fig. S1 (a) Simplified diagram of the gas sampling pot: 1, three-way stopcock; 2, stainless steel tube; 3, electric fan; 4, static chamber; 5, water for sealing; 6, overlying water (during flooding); 7, soil; 8, gas–permeable silicone tube (with silicone rubber stoppers at both ends). (b) Photograph of the pots during headspace gas sampling.

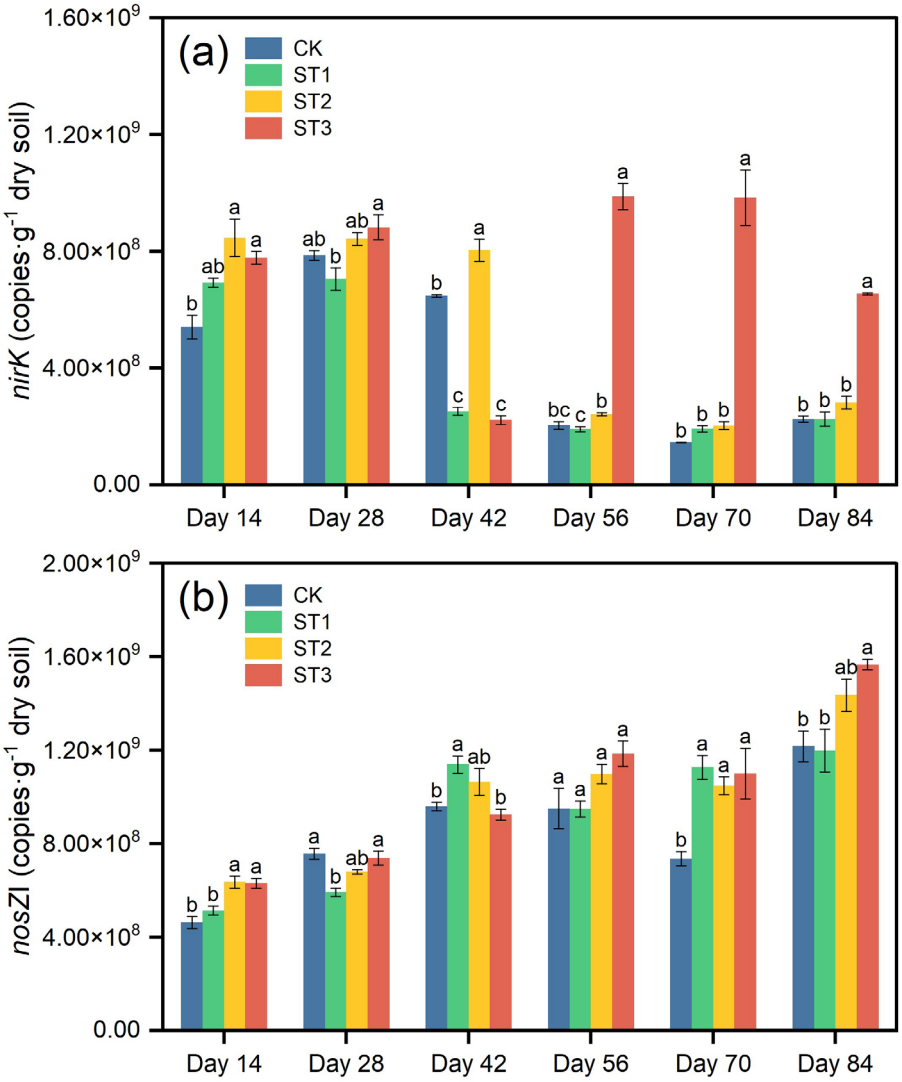

Fig. S2 Dynamics of *nirK* abundance (a) and *nosZ*I abundance (b) during the incubation. CK, ST1, ST2, and ST3 received 0, 50%, 100%, and 150% of the local harvested rice straw, respectively. Different lower-case letters denote significant differences between treatments ($\alpha = 0.05$). Data are given in average ± standard error ($n = 3$). Days 14 and 28 correspond to the flooding period, days 42 and 56 to the early drained period, and days 70 and 84 to the late drained period, respectively.

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