

Appendix A Chemical and physical properties of paddy soils with different parent materials and fertility levels

Soil ¹⁾	pH	SOC g kg ⁻¹	TN g kg ⁻¹	TP g kg ⁻¹	TK g kg ⁻¹	AN mg kg ⁻¹	AP mg kg ⁻¹	AK mg kg ⁻¹	Sand %	Silt %	Clay %	C:N	C:P	N:P	Rice yield kg ha ⁻¹ yr ⁻¹
RCH	4.94 b	35.3 b	2.16 b	0.730 a	6.67 a	193 b	46.5 a	133 a	29.6 c	47.3 a	23.2 b	19.0 bc	125 c	6.56 b	16500 a
RCL	5.34 a	12.4 d	0.803 d	0.433 c	6.75 a	81.8 c	6.99 c	102 b	22.3 d	34.9 b	42.8 a	17.9 c	73.7 d	4.11 d	10500 c
RSH	5.05 b	38.8 a	2.23 a	0.473 b	6.70 a	211 a	13.2 b	73.3 c	47.6 b	33.9 b	18.4 c	20.3 ab	212 a	10.5 a	16500 a
RSL	5.01 b	16.4 c	0.897 c	0.367 d	4.75 b	93.4 c	15.3 b	40.8 d	60.7 a	20.1 c	19.2 c	21.3 a	115 b	5.41 c	12000 b
<i>F</i> value															
Parent material	7.22*	42.2***	42.2***	523***	1033***	16.1**	269***	2103***	740***	603***	228***	22.8**	422***	713***	4.62
Fertility	30.2***	1555***	1555***	813***	373***	960***	605***	593***	7.79*	525***	119***	0.00235	560***	1481***	227***
Interaction	19.6**	0.243	0.243	181***	1045***	0.796	748***	0.100	96.0***	1.67	101***	5.09	51.7***	176***	4.62
% of total variance															
Parent material	12.4	2.64	2.64	34.4	42.1	1.65	16.6	78.0	87.6	53.3	50.8	79.0	40.8	30.1	1.95
Fertility	52.1	97.3	97.3	53.6	15.2	98.2	37.3	22.0	0.921	46.5	26.5	0.0081	54.1	62.5	95.7
Interaction	33.7	0.0152	0.0152	11.9	42.6	0.0814	46.1	0.00370	11.4	0.148	22.5	17.7	5.00	7.41	1.95
Error	1.72	0.0626	0.0626	0.0659	0.0408	0.102	0.0616	0.0371	0.118	0.0884	0.223	3.47	0.0967	0.0422	0.420

¹⁾RCH, soils with quaternary red clay parent materials and high fertility; RCL, soils with quaternary red clay parent materials and low fertility; RSH, soils with tertiary sandstone parent materials and high fertility; RSL, soils with tertiary sandstone parent materials and low fertility; SOC, soil organic carbon; TN, total nitrogen; TP, total phosphorus; TK, total potassium; AN, available nitrogen; AP, available phosphorus; AK, available potassium; Sand, 0.02–2 mm; Silt, 0.002–0.02 mm; Clay, <0.002 mm; C:N, carbon to nitrogen ratio; C:P, carbon to phosphorus ratio; N:P, nitrogen to phosphorus ratio. Different lowercase letters in the same column indicate a significant difference at $P < 0.05$. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Appendix B Difference in bacterial community compositions of paddy soils with different parent materials and fertility levels by two-way PERMANOVA analysis

Source	Mean square	<i>F</i>	<i>P</i>	% of total variance
Parent	0.496	3.57	<0.01	23.9
Fertility	0.943	6.80	<0.001	45.4
Interaction	0.500	3.60	<0.01	24.1
Error	0.139			6.7

Appendix C Topological parameters of bacterial network¹⁾

Nodes	Edges	avgCC	BC	CC	Number of genera positively related to SOC	Number of genera negatively related to SOC
21	114	0.774	4.52	0.703	11	8
					Proportion of positive/negative Edges (%)	Proportion of positive/negative Edges (%)
					33.0/26.6	16.0/21.3

¹⁾avgCC, average clustering coefficient; BC, betweenness centrality; CC, closeness centrality; SOC, soil organic carbon.

Appendix D Path analysis of soil property effects on bacterial Chao1 index¹⁾

	Standard coefficient			Correlations
	pH	Sand	Clay	
pH	0.120	0.121	-0.948	-0.707
Sand	-0.060	-0.243	0.875	0.572
Clay	0.101	0.189	-1.123	-0.832

¹⁾Sand, 0.02–2 mm; Clay, <0.002 mm. Bold and non-bold numbers indicated direct and indirect effects of soil properties on Chao1 index respectively.

Appendix E Path analysis of soil property effects on bacterial Shannon index¹⁾

		Standard coefficient					Correlations
	pH	AP	Sand	Clay	C:N		
pH	0.166	-0.431	-0.299	-0.399	0.052		-0.912
AP	-0.109	0.652	-0.129	0.159	0.006		0.579
Sand	-0.082	-0.139	0.602	0.368	-0.096		0.652
Clay	0.140	-0.220	-0.469	-0.473	0.083		-0.938
C:N	-0.076	-0.035	0.508	0.346	-0.114		0.630

¹⁾AP, available phosphorus; Sand, 0.02–2 mm; Clay, <0.002 mm; C:N, carbon to nitrogen ratio. Bold and non-bold numbers indicated direct and indirect effects of soil properties on Shannon index respectively.