

Supplementary Materials

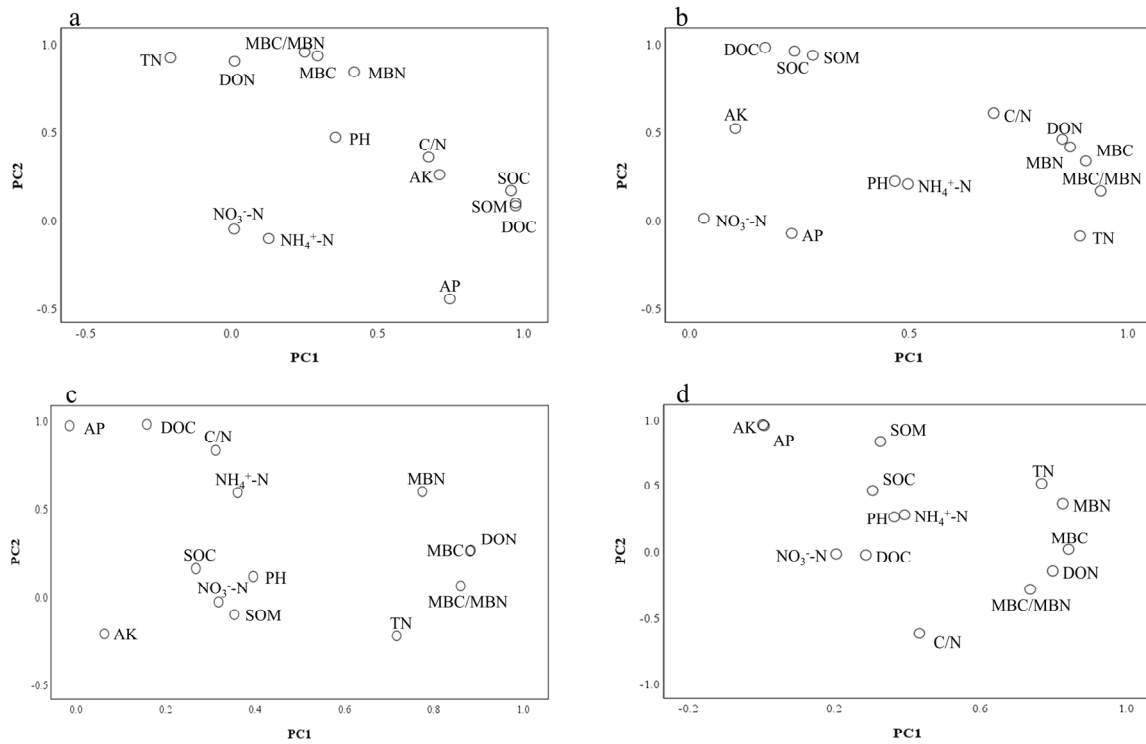


Figure S1. Principal component analysis for (a) F3, (b) C3, (c) C7 and (d) F7. Abbreviations refer to Figure 1. C/N: SOC/TN.

Table S1. Correlation coefficients and sum of correlation coefficients of high weight indicators under different treatments.

F3				C3				C7				F7						
PC1	MBC	TN	MBC/ MBN	DON	MBC	TN	MBN	MBC/ MBN	MBC	MBC/ MBN	DON	MBC	TN	MBN	DON			
Correlation coefficient																		
t																		
MBC	1.00	0.74	1.00	0.80	MBC	1.00	0.83	0.99	0.97	MBC	1.00	0.97	1.00	MBC	1.00	0.81	0.91	0.98
TN	0.74	1.00	0.79	0.82	TN	0.83	1.00	0.76	0.93	MBC/ MBN	0.97	1.00	0.97	TN	0.81	1.00	0.98	0.68
MBC/MBN	1.00	0.79	1.00	0.82	MBN	0.99	0.76	1.00	0.94	DON	1.00	0.97	1.00	MBN	0.91	0.98	1.00	0.81
DON	0.80	0.82	0.82	1.00	MBC/ MBN	0.97	0.93	0.94	1.00					DON	0.98	0.68	0.81	1.00
Sum of correlation coefficient	3.54	3.35	3.60	3.43		3.79	3.52	3.69	3.85	2.97	2.94	2.97		3.70	3.46	3.70	3.47	
ts																		
PC2	DOC	SO C	SOM		DOC	DO M	SOC	SOM		SOC	SOM	AK						

Correlation												
n												
coefficient												
t												
DOC	1.00	0.99	1.00	DOC	1.00	0.98	0.99	1.00	SOC	1.00	0.95	0.80
SOC	0.99	1.00	0.99	DOM	0.98	1.00	1.00	1.00	SOM	0.95	1.00	0.87
SOM	1.00	0.99	1.00	SOC	0.99	1.00	1.00	1.00	AK	0.80	0.87	1.00
				SOM	0.97	1.00	1.00	1.00				
Sum of												
correlation												
n												
coefficient	2.99	2.98	2.99		3.94	3.98	3.98	3.96		2.74	2.82	2.66
ts												

Abbreviations refer to Figure 1.

Table S2. Correlation of high factor load indicators under different treatments.

Treatments	F3		C7				F7			
	PC3		PC3		PC4		PC2		PC4	
		NO ₃ ⁻ -N		AP		pH		AK		pH
	NH ₄ ⁺ -N	0.93**	DOC	0.94**	NO ₃ ⁻ -N	0.80**	AP	0.99**	NH ₄ ⁺ -N	0.71**

Note: C3 treatments PC3 and PC4 both have only one high factor loading indicator and therefore were placed directly into the MDS. Abbreviations refer to Figure 1.

The PC1 high-weight metric correlations (Table S1) showed that SOM under the F3 treatment had the largest sum of correlation coefficients and was therefore selected into MDS. The high weight indicator MBC/MBN in PC2 had the largest correlation coefficient sum and was therefore selected into the MDS. In PC3, the correlation coefficients of NH₄⁺-N and NO₃⁻-N were $r > 0.60$ (Table S2), and NO₃⁻-N was selected into the MDS because it had a high factor loading. PC4 had only one high weight indicator C/N, so C/N was selected into the MDS. As a result, the MDS indicators for soil quality evaluation under F3 treatment were SOM, MBC/MBN, NO₃⁻-N and C/N

Table S3. Weights of TDS evaluation indicators of paddy soil under different treatments.

Soil indicators	F3		C3		C7		F7	
	Common factor variance	Weight value	Common factor variance	Weight value	Common factor variance	Weight value	Common factor variance	Weight value
pH	0.86	0.07	0.94	0.07	0.98	0.07	0.98	0.07
NH ₄ ⁺ -N	0.96	0.07	0.85	0.06	0.90	0.07	0.99	0.07
NO ₃ ⁻ -N	0.94	0.07	0.98	0.07	0.97	0.07	0.96	0.07
AK	0.81	0.06	0.94	0.07	0.92	0.07	0.95	0.07
AP	0.94	0.07	0.96	0.07	0.95	0.07	0.97	0.07
DOC	0.97	0.07	1.00	0.07	0.98	0.07	0.98	0.07
SOC	0.96	0.07	1.00	0.07	0.96	0.07	0.98	0.07
SOM	0.97	0.07	0.99	0.07	0.99	0.07	0.98	0.07
MBC	0.98	0.07	1.00	0.07	1.00	0.07	1.00	0.07
TN	0.96	0.07	0.99	0.07	0.99	0.07	0.99	0.07

C/N	0.95	0.07	0.99	0.07	0.96	0.07	0.97	0.07
MBN	0.97	0.07	1.00	0.07	0.99	0.07	1.00	0.07
MBC/MBN	0.98	0.08	1.00	0.07	1.00	0.07	0.99	0.07
DON	0.84	0.06	1.00	0.07	1.00	0.07	1.00	0.07

Abbreviations refer to Figure 1.

Table S4. Weights of MDS evaluation indicators of paddy soil under different treatments.

Treatments	Index	MDS	
		Common factor variance	Weight value
F3	MBC/MBN	0.98	0.26
	DOC	0.97	0.25
	NO ₃ ⁻ -N	0.94	0.24
	C/N	0.95	0.25
C3	MBC/MBN	1.00	0.25
	SOC	1.00	0.25
	AP	0.96	0.24
	NO ₃ ⁻ -N	0.98	0.25
C7	DON	1.00	0.25
	SOM	0.99	0.25
	DOC	0.98	0.25
	NO ₃ ⁻ -N	0.97	0.25
F7	MBN	1.00	0.25
	AP	0.97	0.25
	DOC	0.98	0.25
	pH	0.98	0.25

Abbreviations refer to Figure 1.