

Supplements materials

Table S1. Characteristics of steel slag and biochar used in this study.

Treatments	Physical property	Fe ₂ O ₃ (%)	Fe (%)	S (%)	SiO ₂ (%)	C (%)	N (%)	P (%)	K (%)	Mg (%)	Ca (%)
Steel slag	Granular form (2 mm)	4.8	-	-	40.7	0.7	0.01	0.01	0.5	0.36	24.9
Biochar	Granular form (2 mm)	-	0.2	0.6	-	56.6	1.4	1.0	1.8	1.0	0.5

Table S2. Pearson correlation coefficients between soil organic carbon fractions.

Stage	C form	TOC	LOC	MBC	DOC
Early paddy field	TOC	1.000	-0.101	0.147	0.052
	LOC	-0.101	1.000	-0.133	-0.391
	MBC	0.147	-0.133	1.000	-0.170
	DOC	0.052	-0.391	-0.170	1.000
Late paddy field	TOC	1.000	-0.049	0.368	0.354
	LOC	-0.049	1.000	-0.666**	-0.145
	MBC	0.368	-0.666**	1.000	0.335
	DOC	0.354	-0.145	0.335	1.000
Combined paddy field	TOC	1.000	-0.031	0.151	0.105
	LOC	-0.031	1.000	-0.543**	-0.366*
	MBC	0.151	-0.543**	1.000	0.194
	DOC	0.105	-0.366*	0.194	1.000

* significant at $p < 0.05$, ** significant at $p < 0.01$. TOC: Total organic carbon; LOC: Labile organic carbon; MBC: Microbial biomass carbon; DOC: Dissolved organic carbon

Table S3. Pearson correlation coefficients between the total stocks of different carbon forms and various soil properties.

Stage	C types	Bacteria	Fungi	Fungi:bacteria ratio	Salinity	pH	Total N	C:N ratio	Bulk density	Water content	C release	Related C concentration
Early paddy field	TOC	-0.318	0.348	0.781**	0.090	0.278	0.788**	0.940**	0.340	0.293	-0.119	0.979**
	LOC	0.673**	0.281	-0.350	-0.438	-0.390	0.033	-0.099	0.132	-0.465	0.586*	0.988**
	MBC	-0.499*	-0.412	0.149	-0.284	-0.081	-0.031	0.157	0.750**	-0.228	-0.242	0.973**
	DOC	-0.409	-0.070	0.160	0.780**	0.827**	-0.389	0.267	0.129	-0.315	-0.648	0.976**
	C release	0.606*	0.406	-0.108	-0.564*	-0.674**	0.132	-0.190	-0.149	-0.159	1.000	—
Late paddy field	TOC	-0.641*	-0.404	0.352	0.889**	0.624*	0.308	0.931**	-0.053	0.001	0.421	0.956**
	LOC	0.226	0.288	-0.135	-0.079	0.058	-0.694**	0.171	0.521*	-0.394	-0.049	0.983**
	MBC	-0.471	-0.614*	0.218	0.513*	0.362	0.294	0.221	0.018	-0.083	0.310	0.951**
	DOC	-0.398	-0.448	0.314	0.261	0.147	0.062	0.171	0.299	-0.070	-0.128	0.902**
	C release	0.038	-0.168	0.369	0.190	0.499*	0.050	0.515*	-0.145	-0.144	1.000	—
Combined paddy field	TOC	-0.500**	-0.171	0.110	0.431*	0.352*	0.419*	0.875**	0.272	-0.112	-0.007	0.908**
	LOC	0.458**	0.300	-0.035	-0.245	-0.181	-0.329	0.070	0.099	-0.170	0.196	0.952**
	MBC	-0.626**	-0.717**	-0.336	0.006	-0.047	-0.146	0.089	-0.621**	0.760**	-0.449*	0.959**
	DOC	-0.543**	-0.462*	-0.213	0.464*	0.486**	-0.330	0.141	-0.514**	0.540**	-0.571**	0.934**
	C release	0.459*	0.406*	0.565**	-0.033	0.047	0.202	0.266	0.422*	-0.598**	1.000	—

*significant at $p < 0.05$, **significant at $p < 0.01$. TOC: Total organic carbon; LOC: Labile organic carbon; MBC: Microbial biomass carbon; DOC: Dissolved organic carbon

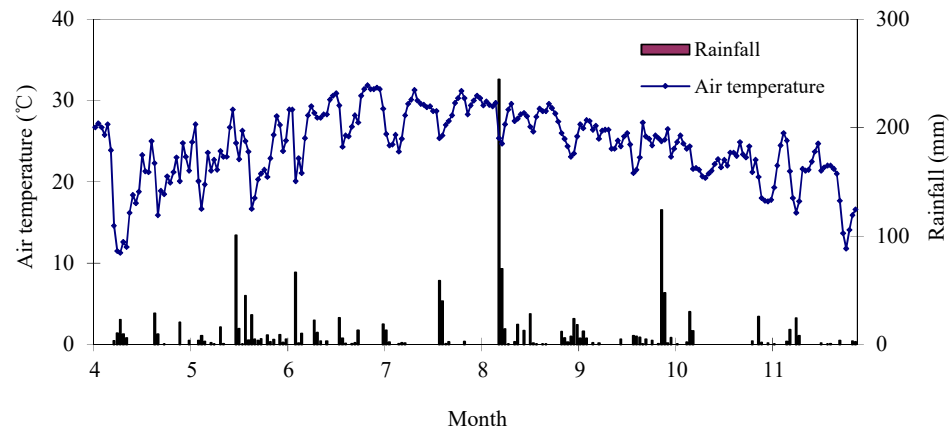


Figure S1. Temporal variations of air temperature (A) and rainfall (B) in the study area.

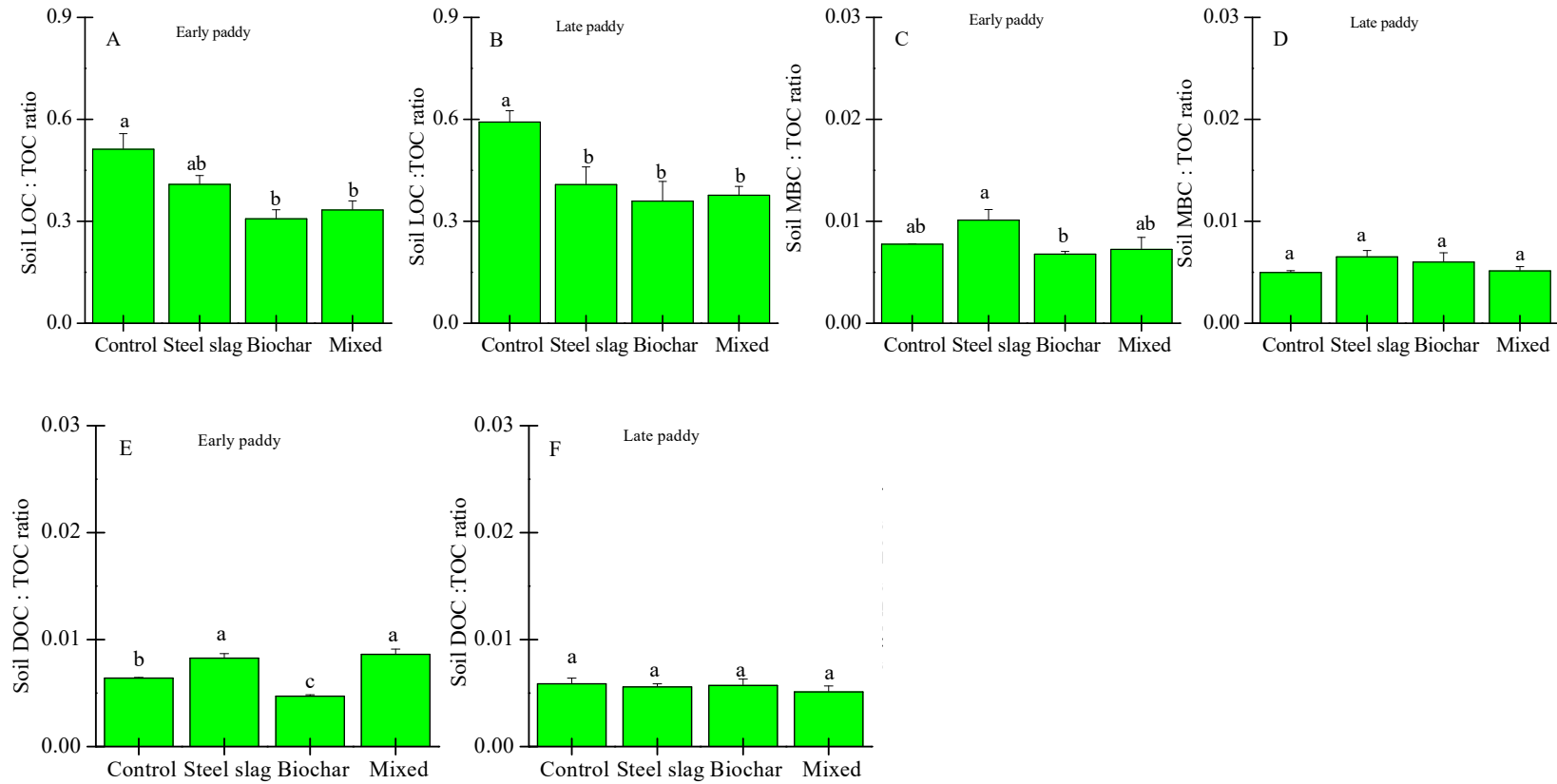


Figure S2. Mean ratios of LOC:TOC (A,B), MBC:TOC (C,D), and DOC:TOC (E,F) in the treatment and control plots in the early and late paddy fields. Different letters represent significant difference in mean values among treatments ($p < 0.05$, $n = 6$).

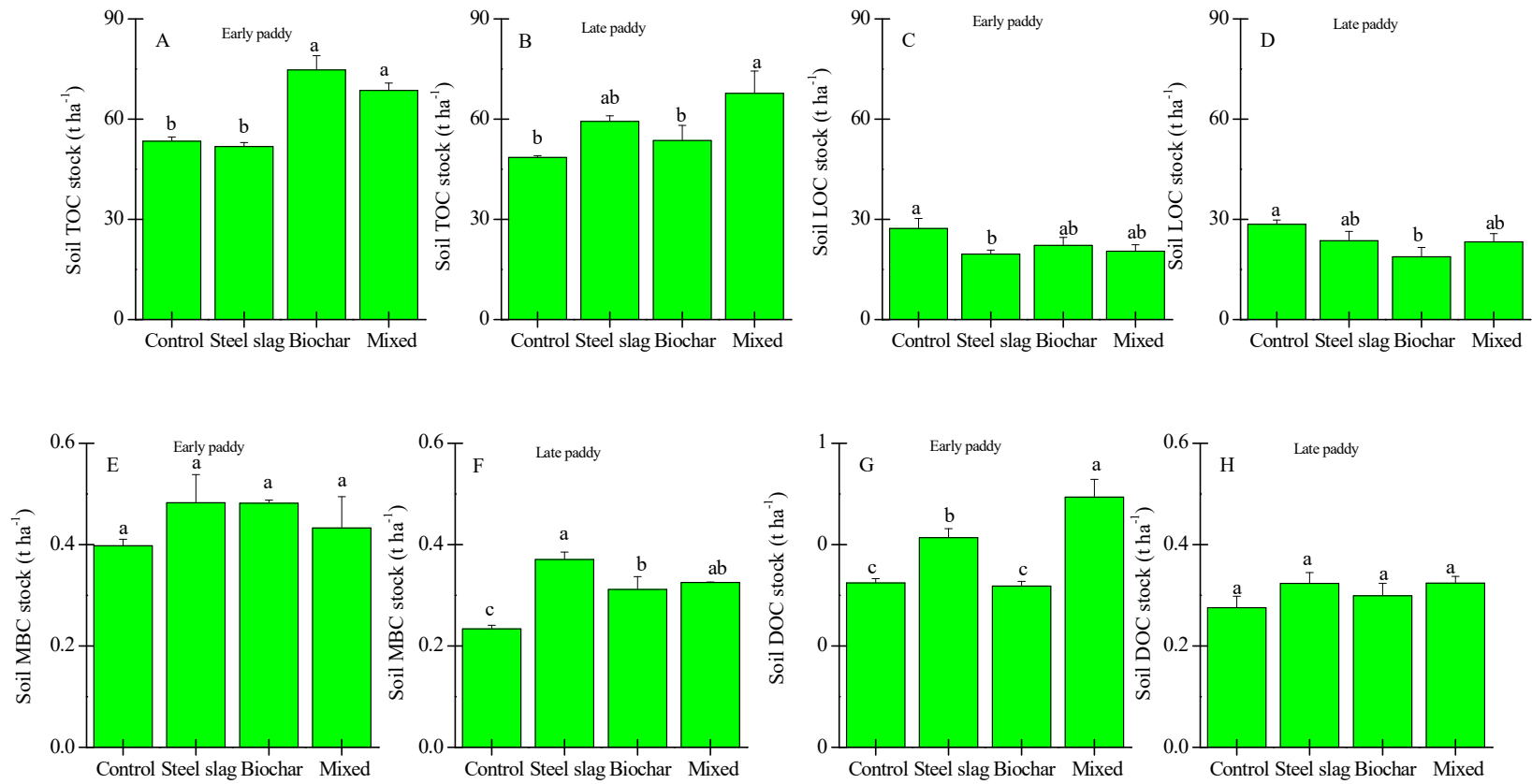


Figure S3. Mean total stocks of SOC (A,B), LOC (C,D), MBC (E,F), and DOC (G,H) in the treatment and control plots in the early and late paddy fields. Different letters represent significant difference in mean values among treatments ($p < 0.05$, $n = 6$).