Table S1. Overall effects of lime and biochar on soil responses.

Response	df1	df2	Lime F	Lime P	Biochar F	Biochar P	Lime × biochar F	Lime × biochar P
Mean CO_2-C release rate	1	6	30.205	0.001521	1.350	0.289369	16.413	0.006717
Soil pH	1	6	727.886	1.713e-07	16.865	0.006309	1.395	0.282225
Exchangeable H^+	1	6	181.559	1.036e-05	6.097	0.048515	0.045	0.839394
Exchangeable acidity	1	6	876.945	9.831e-08	20.167	0.004145	19.449	0.004519
Exchangeable Al^{3+}	1	6	638.557	2.530e-07	11.833	0.013802	38.555	0.000805
Soil moisture	1	6	106.542	4.833e-05	19.554	0.004461	14.586	0.008769
Bulk density	1	6	0.224	0.652877	10.281	0.018450	0.008	0.933040
SOC	1	6	1.150	0.324832	233.453	4.963e-06	0.474	0.516955
DOC	1	6	64.721	0.000197	15.221	0.007971	5.455	0.058201
TN	1	6	0.085	0.780015	6.552	0.042924	2.134	0.194394
DN	1	6	287.973	2.678e-06	8.228	0.028487	21.081	0.003725
AP	1	6	0.550	0.486217	1.854	0.222221	0.927	0.372765
AK	1	6	30.741	0.001454	1.476	0.270109	35.724	0.000984
MBC	1	6	75.185	0.000130	3.340	0.117394	2.473	0.166892
MBN	1	6	20.929	0.003791	2.082	0.199138	7.564	0.033277
LPI-C	1	6	24.107	0.002684	1.198	0.315643	2.909	0.138949
LPII-C	1	6	40.550	0.000704	25.717	0.002285	0.467	0.519782
RP-C	1	6	3.083	0.129652	83.466	9.673e-05	1.431	0.276702
LPI-N	1	6	0.965	0.363977	74.316	0.000134	0.503	0.504756
LPII-N	1	6	30.761	0.001451	35.454	0.001004	14.743	0.008562
RP-N	1	6	7.180	0.036560	62.475	0.000218	5.904	0.051176
BG	1	6	164.286	1.385e-05	7.906	0.030687	61.067	0.000232
CB	1	6	51.496	0.000370	2.718	0.150288	66.684	0.000182
NAG	1	6	72.813	0.000142	3.087	0.129418	30.889	0.001436
LAP	1	6	63.988	0.000204	0.101	0.761039	0.000	0.985876
PHOS	1	6	242.892	4.418e-06	31.812	0.001331	10.396	0.018041
PERO	1	6	64.514	0.000199	0.109	0.752032	3.213	0.123236
PHOX	1	6	39.539	0.000753	0.700	0.434886	1.364	0.287158
GMEA	1	6	94.546	6.795e-05	0.377	0.561680	52.988	0.000342
Vector length	1	6	5.559	0.056453	3.178	0.124887	12.134	0.013088
Vector angle	1	6	370.466	1.273e-06	27.900	0.001862	63.780	0.000205

Response	df1	df2	Lime F	Lime P	Biochar F	Biochar P	Lime × biochar F	Lime × biochar P
Bacterial gene abundance	1	6	195.936	8.290e-06	4.384	0.081161	40.864	0.000690
Fungal gene abundance	1	6	38.763	0.000794	14.529	0.008845	0.929	0.372376
Archaeal gene abundance	1	6	167.332	1.313e-05	24.789	0.002505	46.430	0.000490
Actinobacteria gene abundance	1	6	259.961	3.619e-06	1.329	0.292786	54.463	0.000317
α-Proteobacteria gene abundance	1	6	546.839	4.011e-07	4.607	0.075472	60.085	0.000242
β-Proteobacteria gene abundance	1	6	904.539	8.964e-08	0.417	0.542443	16.448	0.006684
Firmicutes gene abundance	1	6	48.464	0.000436	6.165	0.047620	6.339	0.045431
Bacteroidetes gene abundance	1	6	46.694	0.000483	26.128	0.002196	31.310	0.001387
Acidobacteria gene abundance	1	6	5.439	0.058469	21.140	0.003700	6.270	0.046275
Basidiomycota gene abundance	1	6	4.880	0.069232	0.991	0.357891	20.207	0.004125

Notes: Overall treatment effects were estimated using a blocked factorial repeated-measures ANOVA, with lime and biochar as between-plot factors and sampling occasion as the within-plot factor. The same 12 plots (three complete blocks; three plots per treatment) were sampled on three occasions. Tests average the occasions equally and use the between-plot residual error. df1 and df2 denote numerator and denominator degrees of freedom, respectively, and apply to each of the three effects. Only lime, biochar and lime × biochar effects are displayed. *P*-values are nominal and are not adjusted across response variables. SOC, soil organic carbon; DOC, dissolved organic carbon; TN, total nitrogen; DN, dissolved nitrogen; AP, available phosphorus; AK, available potassium; MBC and MBN, microbial biomass carbon and nitrogen; LPI and LPII, labile pools I and II; RP, non-hydrolysable (recalcitrant) pool. Enzyme and microbial-group abbreviations follow the main text.

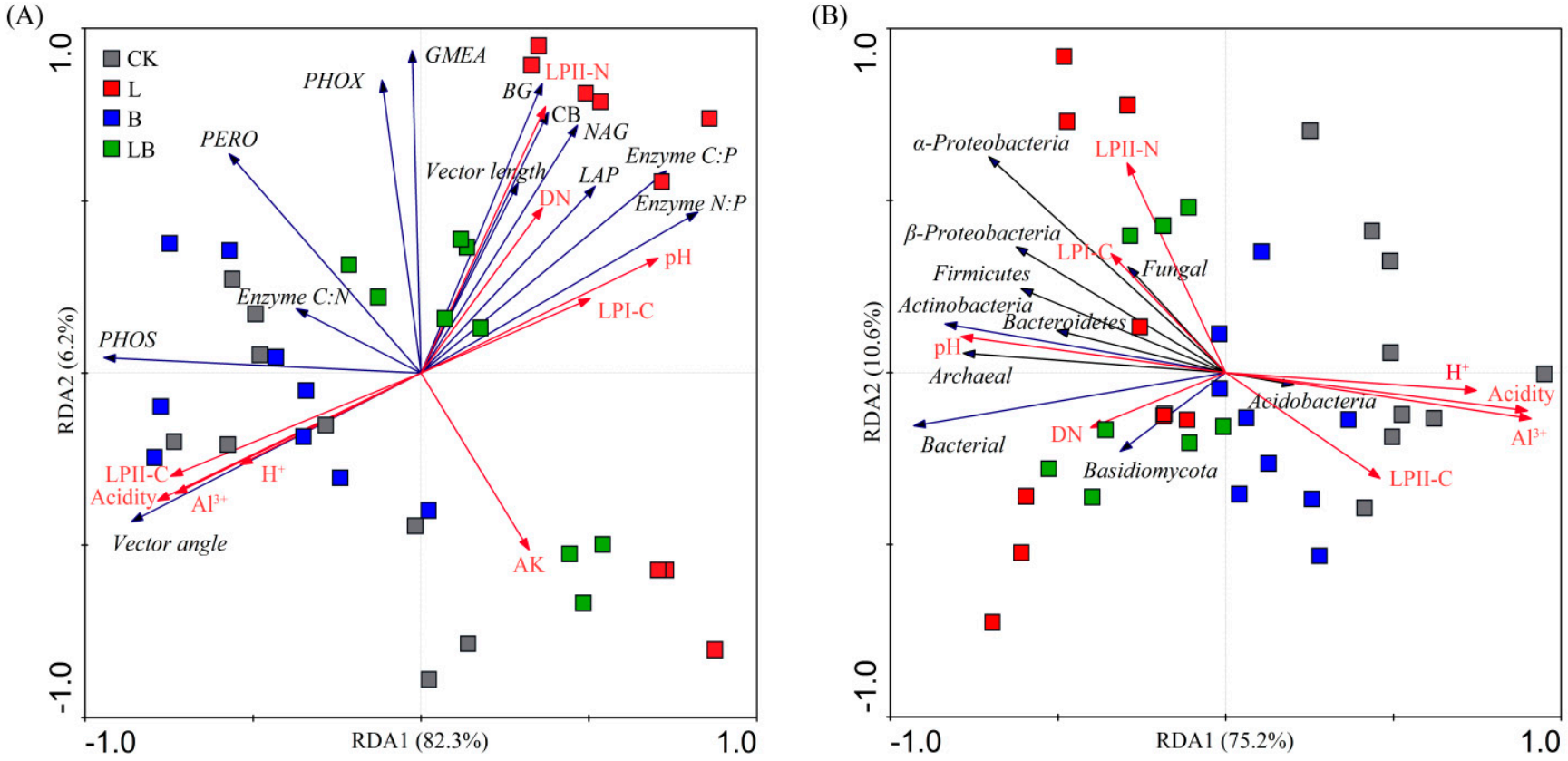


Figure S1. Redundancy analysis (RDA) of the relationships between soil properties and extracellular enzyme activities (A) and microbial abundances (B). Arrows represent soil physicochemical properties and C and N fractions included as explanatory variables. Squares represent individual samples from the four treatments. LPI-C and LPII-C, labile pool I and II C; RP-C, recalcitrant C; LPI-N and LPII-N, labile pool I and II N; RP-N, recalcitrant N; DOC, dissolved organic carbon; DN, dissolved nitrogen; AP, available phosphorus; AK, available potassium. Enzyme and microbial abbreviations are defined as in Figs. 4 and 5.

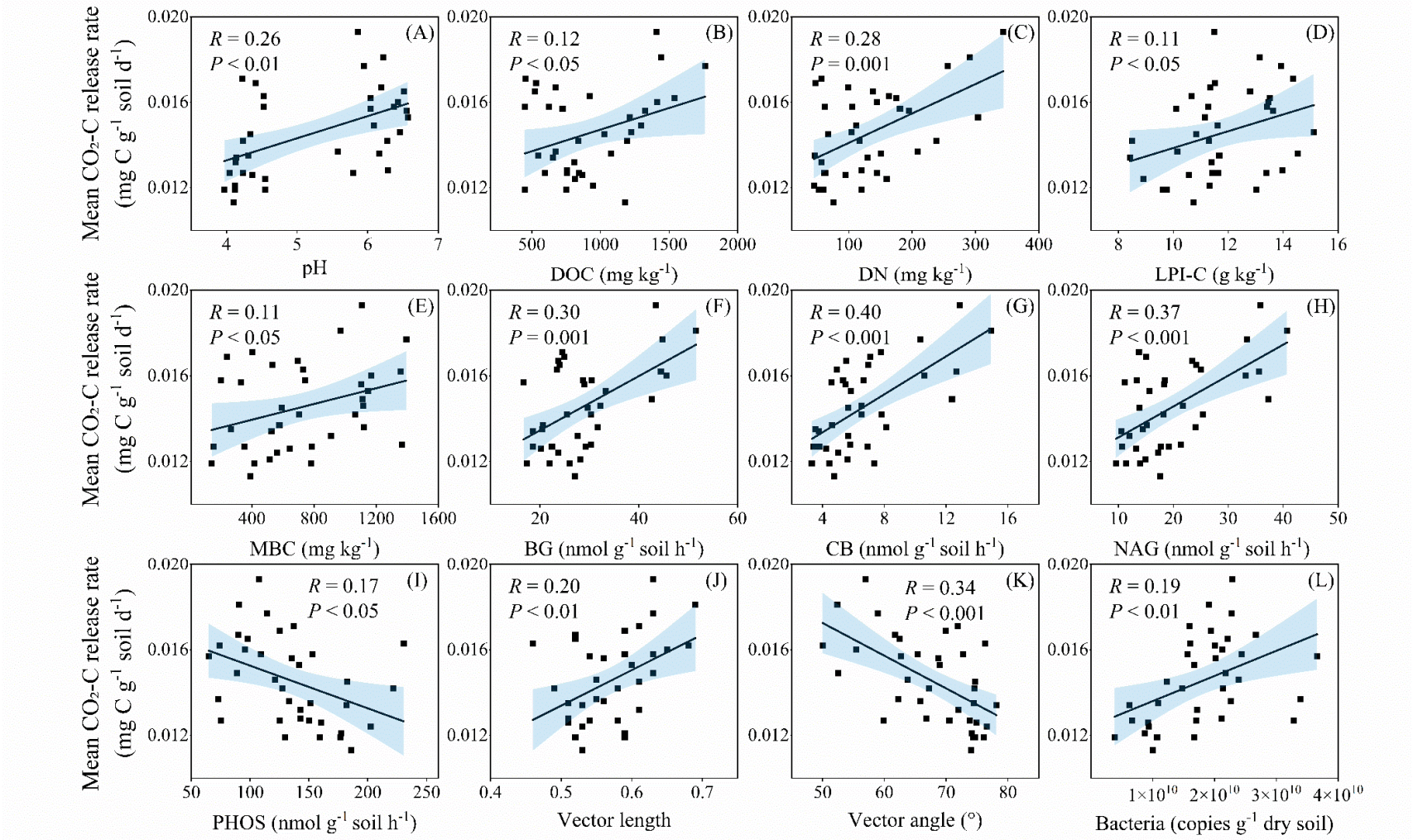


Figure S2. Relationships between soil mean CO_2-C release rate and soil physicochemical and microbial properties. Linear relationships of mean CO_2-C release rate with soil pH (A), dissolved organic carbon (DOC; B), dissolved nitrogen (DN; C), labile pool I C (LPI-C; D), microbial biomass carbon (MBC; E), β-glucosidase (BG; F), cellobiosidase (CB; G), N-acetyl-β-glucosaminidase (NAG; H), acid phosphatase (PHOS; I), vector length (J), vector angle (K), and bacterial abundance (L). Solid lines represent linear regressions, and shaded areas represent 95% confidence intervals.