Table S1 Basic chemical and physical properties in soils (0-10 cm) under different N enrichment levels and warming treatment (mean ± SD, n = 6)

Treatment	Bulk density (g cm^{-3})		pH		AGB (g m^{-2})		SOC stock (Mg ha^{-1})		C/N		MBC (mg g^{-1})		EnC (nmol activity g^{-1} dry soil h^{-1})	
	C	W	C	W	C	W	C	W	C	W	C	W	C	W
N0	0.9±0.1	0.9±0.1	6.1±0.1	6.2±0.3	442.3±53.1	446.7±141.7	78.5±10.7	65.6±7.1	12.8±0.2	13.1±0.4	2.1±0.2	1.2±0.2	334.5±13.3	275.8±27.1
N1	1.1±0.1	1.0±0.2	6.1±0.1	6±0.1	505±43.7	367.2±78.5	95.7±4.3	69.3±18.8	12.7±0.4	11.5±1	1.7±0.4	1.6±0.2	676.2±63.4	392.2±42.7
N2	1.2±0.1	1.0±0.1	5.7±0.2	5.3±0.2	457.3±55	329.4±74.9	93.2±6.6	69.0±7.3	12.4±0.1	12.2±0.2	1.9±0.2	1.3±0.4	575.9±64.2	453.9±50
N3	1.1±0.1	0.9±0.2	5.6±0.2	5.3±0.2	440.6±118.6	420.5±119.1	78.8±5.9	68.0±13.1	11.9±0.3	11.9±0.4	1.3±0.3	1.2±0.2	472.7±37.5	316.3±29.8
ANOVA *P*-values														
N input	0.039		0.000		0.000		0.000		0.000		0.000		0.000	
Warming	0.001		0.001		0.000		0.000		0.026		0.005		0.000	
N input × Warming	0.180		0.003		0.000		0.000		0.003		0.385		0.000	

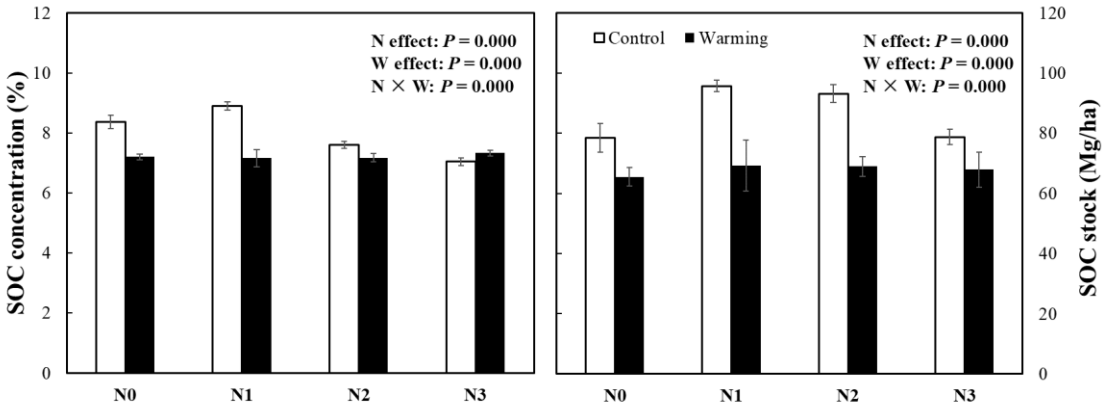

Figure S1 SOC concentration and SOC stock (0-10 cm) under different N enrichment levels and warming treatment (mean ± SD, n = 6)

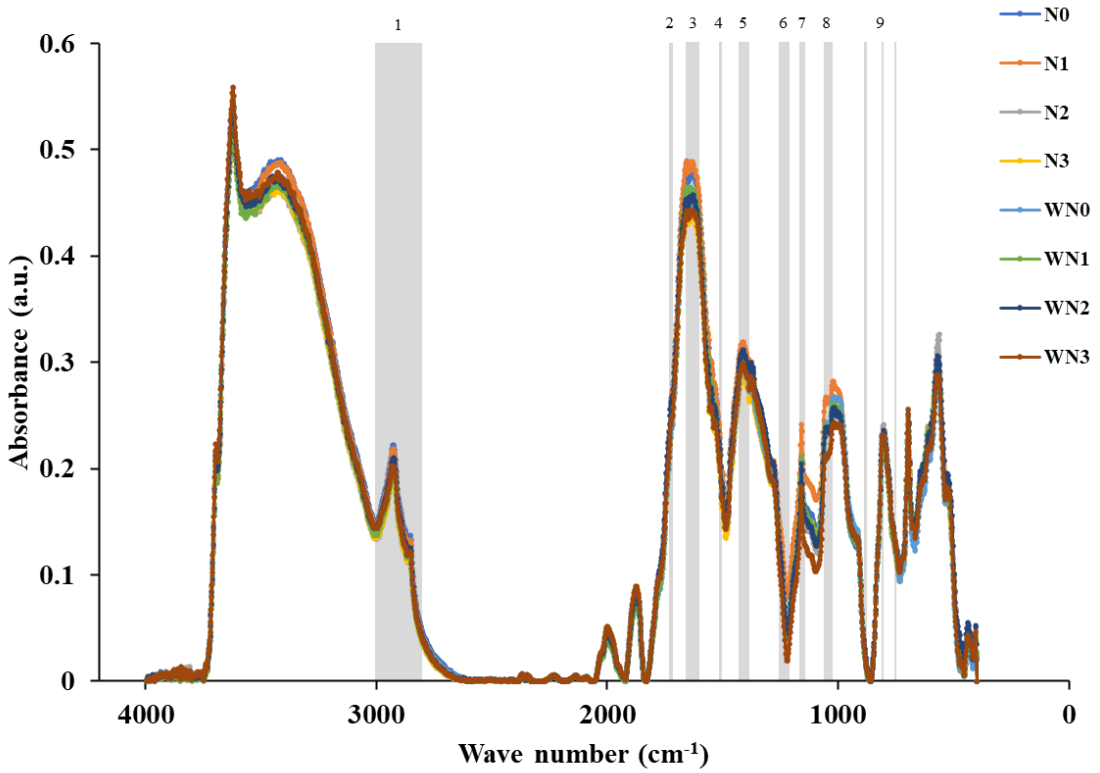

Figure S2 The absorption bands identifiable by diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy (0-10 cm, mean, n = 6)

Note: 1: 3000–2800 cm^{-1} aliphatic C–H, 2: 1735–1720 cm^{-1} aromatic esters, carbonyl/carboxyl C=O, 3: 1660–1600 cm^{-1} aromatic C=C, 4: 1515–1500 cm^{-1} lignin like residues, 5: 1430–1380 cm^{-1} aromatic C=C, 6: 1260–1210 cm^{-1} phenolic/cellulose, 7: 1170–1148 cm^{-1}, C–O bonds of poly-alcoholic and ether groups, 8:1060–1020 cm^{-1} aliphatic C–O – and alcohol C–O, 9: 880, 805, 745 cm^{-1} C–H aromatic.

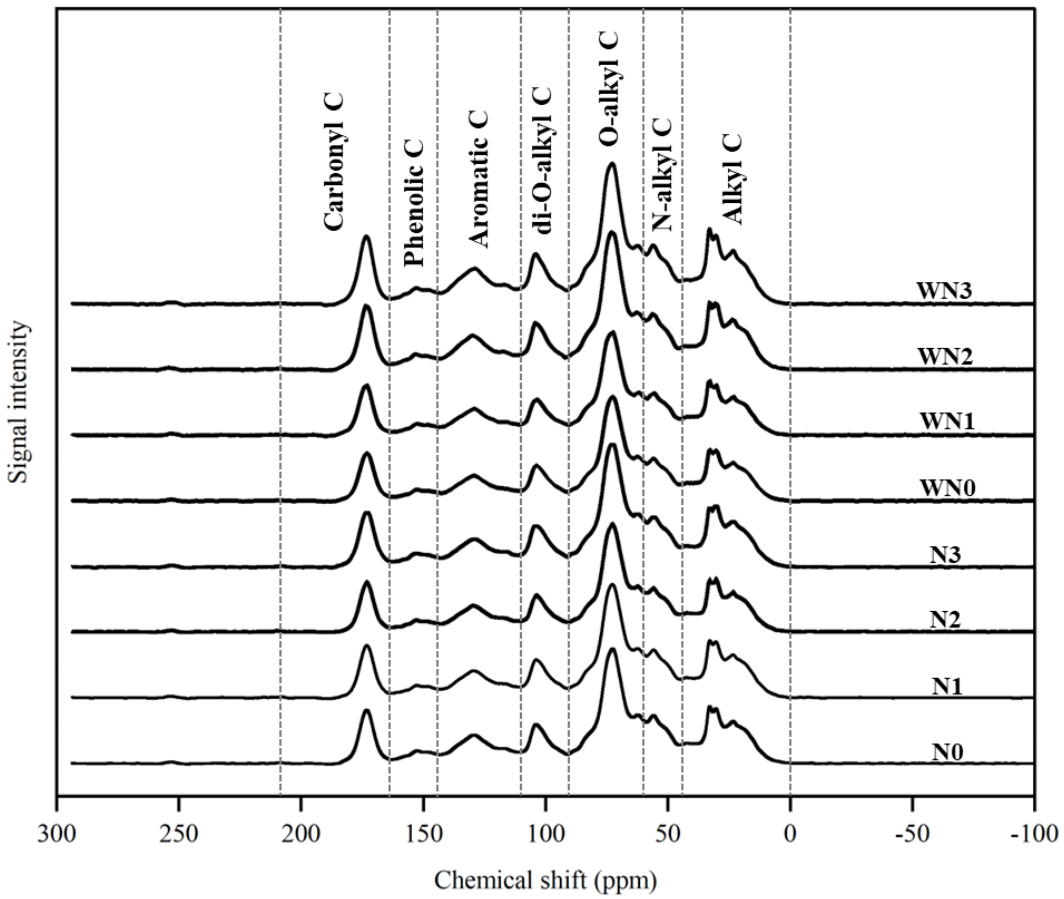

Figure S3 Carbon-13 CPMAS NMR spectra of HF-treated soils (0–10 cm) under N enrichment and warming in the Tibetan grassland (mean, n = 6)

Note: alkyl C (0–45 ppm); N-alkyl C (45-60 ppm); O-alkyl C (60–90 ppm); di-O-alkyl C (90–110 ppm); aromatic C (110-145 ppm); phenolic C (145-165 ppm); carbonyl C (165–210 ppm).