

Supplementary Materials

Figure S1. Experimental design

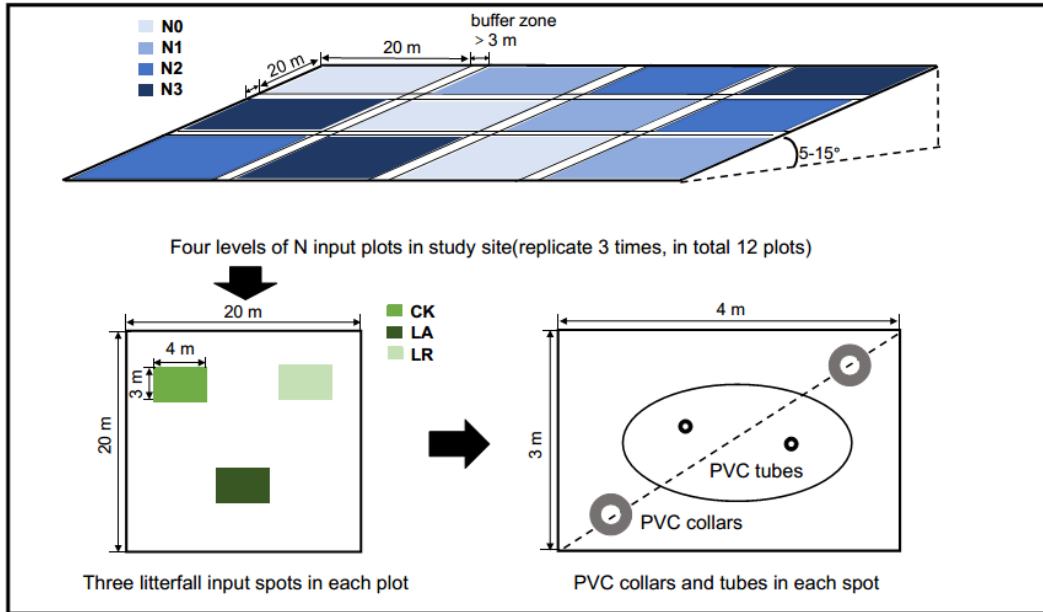


Figure S2. All plausible interaction pathways in the structural equation model.

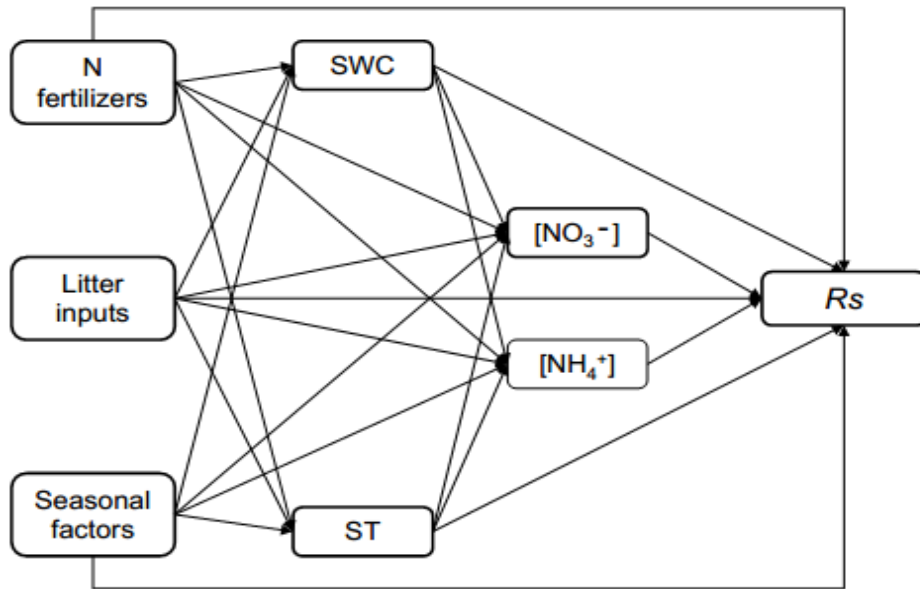


Figure S3: The linear relationships between R_s and ST (a) or SWC (b) under different N fertilizer and litter input treatments ($n=288$).

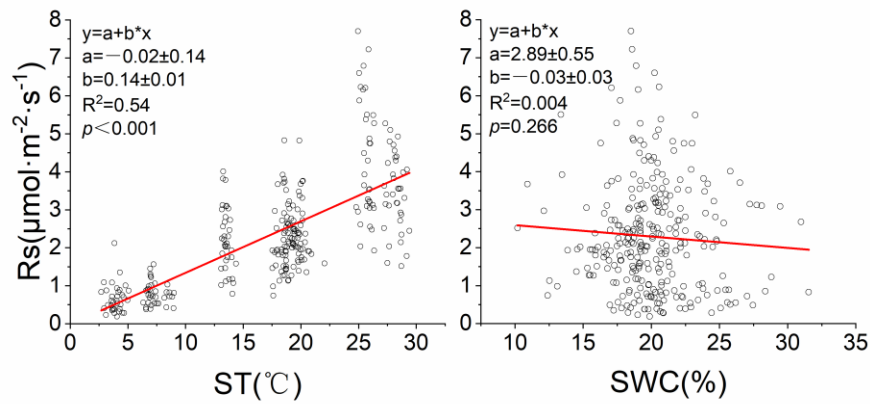


Table S1

The exponential relationship between soil respiration (R_s) rates and soil temperature (ST), and temperature sensitivity (Q10) under different N fertilizer (n=24) and litter input treatments (n=96).

Treatments	Functions	R ²	Q10	Functions	R ²	Q10
CK	N0	$R_s = 0.708 \times \exp^{0.076 \times ST}$	0.58	$R_s = 0.513 \times \exp^{0.073 \times ST}$	0.63	2.08 b
	N1	$R_s = 0.439 \times \exp^{0.074 \times ST}$	0.78			
	N2	$R_s = 0.503 \times \exp^{0.069 \times ST}$	0.74			
	N3	$R_s = 0.421 \times \exp^{0.080 \times ST}$	0.71			
LA	N0	$R_s = 0.556 \times \exp^{0.081 \times ST}$	0.68	$R_s = 0.606 \times \exp^{0.077 \times ST}$	0.73	2.16 ab
	N1	$R_s = 0.593 \times \exp^{0.071 \times ST}$	0.75			
	N2	$R_s = 0.688 \times \exp^{0.075 \times ST}$	0.82			
	N3	$R_s = 0.594 \times \exp^{0.081 \times ST}$	0.75			
LR	N0	$R_s = 0.241 \times \exp^{0.094 \times ST}$	0.77	$R_s = 0.367 \times \exp^{0.082 \times ST}$	0.75	2.28 a
	N1	$R_s = 0.421 \times \exp^{0.070 \times ST}$	0.68			
	N2	$R_s = 0.375 \times \exp^{0.085 \times ST}$	0.86			
	N3	$R_s = 0.486 \times \exp^{0.080 \times ST}$	0.88			

Different letters beside the values indicate significant differences (ANOVA followed by Duncan tests, $p < 0.05$).

Table S2

Path coefficients for the best-fit model (Figure 6a). The trait values are community-weighted means and standardized to have a mean of 0 and variance of 1

Response		Predictor	Estimate	SE	Standardized estimate	p-value	
ST	←	Season	-2.001	0.164	-0.58	<0.001	***
SWC	←	Litter	1.178	0.210	0.31	<0.001	***
SWC	←	Season	0.360	0.075	0.26	<0.001	***
SWC	← →	ST	-0.089	NA	-0.089	0.066	ns
[NH4+]	←	Litter	4.274	0.807	0.29	<0.001	***
[NH4+]	←	Season	-0.964	0.284	-0.19	<0.001	***
[NH4+]	←	SWC	-1.381	0.216	-0.37	<0.001	***
[NO3-]	←	Nitrogen	0.306	0.047	0.34	<0.001	***
[NO3-]	←	Litter	1.330	0.665	0.11	0.046	*
[NO3-]	←	ST	0.385	0.069	0.29	<0.001	***
[NO3-]	← →	[NH4+]	0.071	NA	0.071	0.115	ns
R_s	←	Litter	0.431	0.067	0.24	<0.001	***
R_s	←	Season	-0.071	0.029	-0.11	0.016	*
R_s	←	ST	0.123	0.009	0.67	<0.001	***
R_s	←	[NH4+]	0.005	0.004	0.04	0.259	ns
R_s	←	[NO3-]	0.005	0.005	0.04	0.353	ns

Note. ns: non-significant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table S3

Path coefficients for the best-fit model (Figure 6b). The trait values are community-weighted means and standardized to have a mean of 0 and variance of 1

Response		Predictor	Estimate	SE	Standardized estimate	p-value	
[NH ₄ ⁺]	←	Litter	2.646	0.851	0.18	0.002	**
[NO ₃ ⁻]	←	Nitrogen	0.309	0.050	0.34	<0.001	***
[NO ₃ ⁻]	←	Litter	1.363	0.699	0.11	0.052	ns
[NO ₃ ⁻]	← →	[NH ₄ ⁺]	0.105	NA	0.11	0.037	*
Rs	←	Nitrogen	-0.008	0.007	-0.06	0.298	ns
Rs	←	Litter	0.343	0.099	0.19	<0.001	***
Rs	←	[NH ₄ ⁺]	0.016	0.007	0.14	0.017	*
Rs	←	[NO ₃ ⁻]	0.035	0.008	0.25	<0.001	***

Note. ns: non-significant. *p < 0.05, **p < 0.01, ***p < 0.001.