Supporting Information Figures S1-S3 and Table S1.
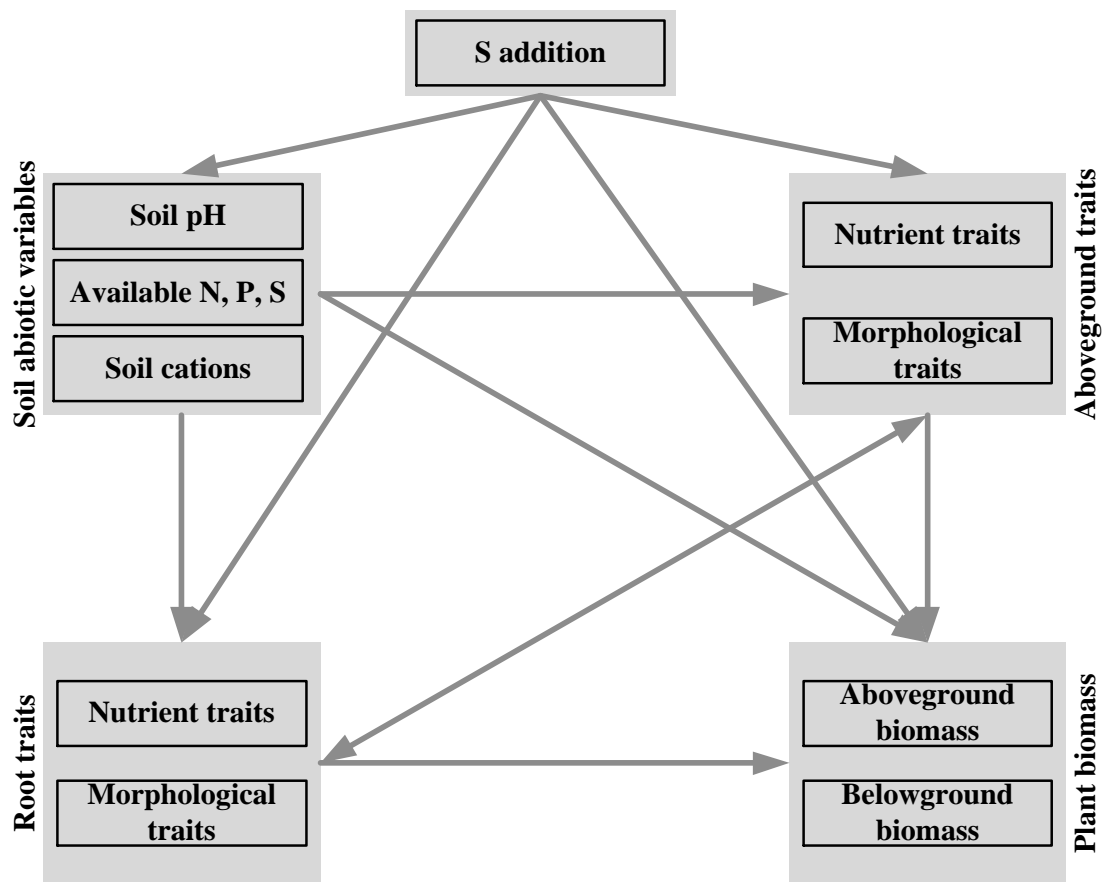
Supplementary Figures:

Fig. S1 An a priori conceptual model explored the direct and indirect effects of S addition on plant traits and biomass in the meadow steppe. The model contained the possible pathways that caused changes in the soil abiotic variables, aboveground traits, root traits and plant biomass: 1) the direct pathways of S addition on soil abiotic variables; 2) the direct and indirect pathways of S addition on aboveground and root traits via changes in soil abiotic variables; 3) the direct and indirect pathways of S addition on plant biomass via changes in soil abiotic and aboveground and root trait variables.

Fig. S2 Correlations between species traits, biomass and soil properties of *L. chinensis* for S addition. Asterisks indicate significant correlation (significance levels: $^*P < 0.05$; $^{**}P < 0.01$).
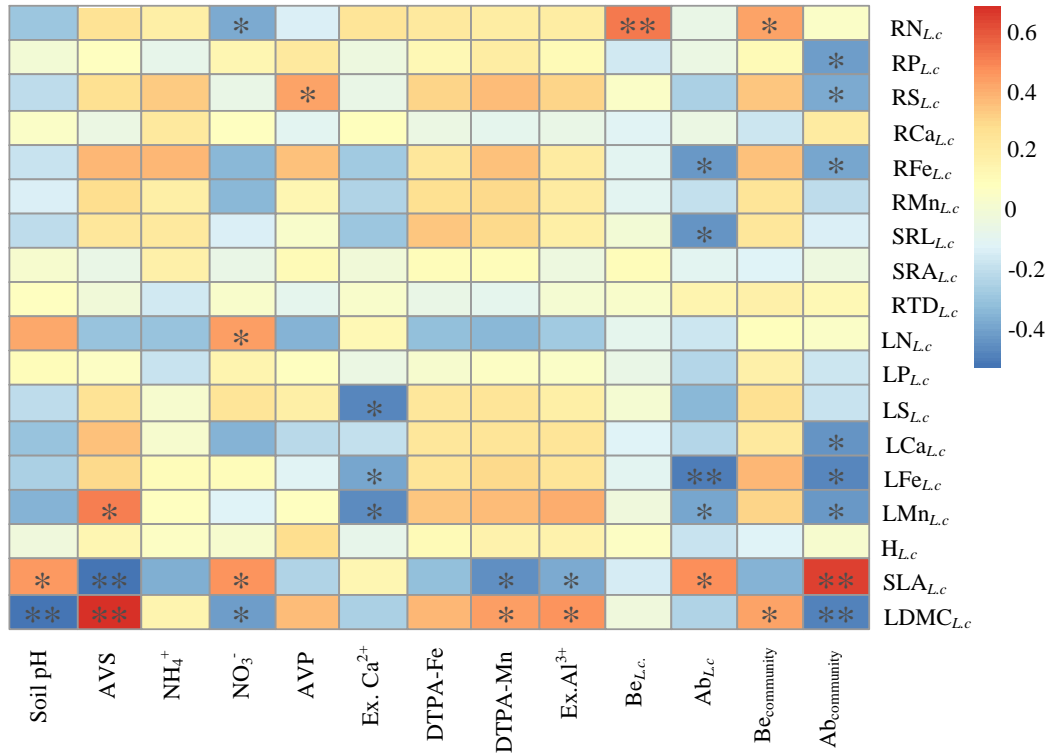
Fig. S3 Correlations between species traits, biomass and soil properties of *C. duriuscula* for S addition. Asterisks indicate significant correlation (significance levels: $^*P < 0.05$; $^{**}P < 0.01$).
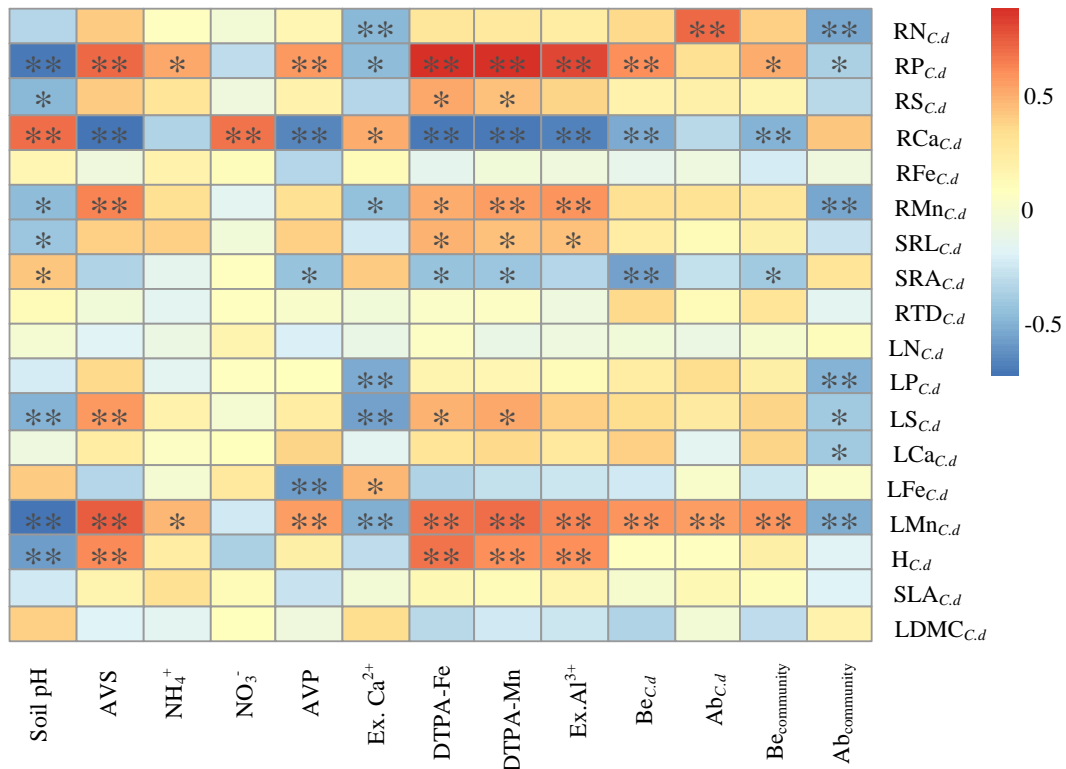
Supplementary Table:

Table S1 Results of a principal components analysis (PCA) of three groups (soil properties, root nutrient traits in *C. duriuscula*, aboveground morphological traits in *L. chinensis*).

Fig. S1 An a priori conceptual model explored the direct and indirect effects of S addition on plant traits and biomass in the meadow steppe. The model contained the possible pathways that caused changes in the soil abiotic variables, aboveground traits, root traits and plant biomass: 1) the direct pathways of S addition on soil abiotic variables; 2) the direct and indirect pathways of S addition on aboveground and root traits via changes in soil abiotic variables; 3) the direct and indirect pathways of S addition on plant biomass via changes in soil abiotic and aboveground and root trait variables.

Fig. S2 Correlations between species traits, biomass and soil properties of *L. chinensis* for S addition. Asterisks indicate significant correlation (significance levels: *$P < 0.05$; **$P < 0.01$).

Fig. S3 Correlations between species traits, biomass and soil properties of *C. duriuscula* for S addition. Asterisks indicate significant correlation (significance levels: *$P < 0.05$;

$^{**}P < 0.01$).

Table S1 Results of a principal components analysis (PCA) of three groups (soil properties, root nutrient traits in *C. duriuscula*, aboveground morphological traits in *L. chinensis*).

Variables	PC1
Soil acidification	
Soil pH	0.97^{**}
Ex. Al^{3+} (mg kg^{-1})	-0.94^{**}
Cumulative (%)	94.8
Soil nutrients	
Ammonium (mg kg^{-1})	0.64^{**}
Nitrate (mg kg^{-1})	-0.71^{**}
AVP (mg kg^{-1})	0.60^{**}
AVS (mg kg^{-1})	0.93^{**}
Ex. Ca^{2+} ($cmol_+$ kg^{-1})	-0.63^{**}
DTPA-Fe (mg kg^{-1})	0.96^{**}
DTPA-Mn (mg kg^{-1})	0.95^{**}
Cumulative (%)	62.3
Root nutrient traits in *C. duriuscula*	
Root [N] (g kg^{-1})	0.66^{**}
Root [P] (g kg^{-1})	0.85^{**}
Root [S] (g kg^{-1})	0.67^{**}
Root [Ca] (g kg^{-1})	-0.74^{**}
Root [Fe] (g kg^{-1})	-0.33
Root [Mn] (mg kg^{-1})	0.70^{**}
Cumulative (%)	45.7
Shoot morphological trait in *L. chinensis*	
Height (cm)	-0.12
SLA (cm^2 g^{-1})	0.90^{**}
LDMC (g g^{-1})	-0.91^{**}
Cumulative (%)	54.7

Note: Asterisks indicate the correlation coefficient (R values) relating variable and PC1 (*, ** Significance level at $P < 0.05$ and 0.01, respectively).