Revised Table S2. Results of the two-way analysis of variance (ANOVA) on the effects of sites, fencing, and their interaction (sites: fencing) on vegetation aboveground biomass, initial MBC, SOC, and soil mineral.

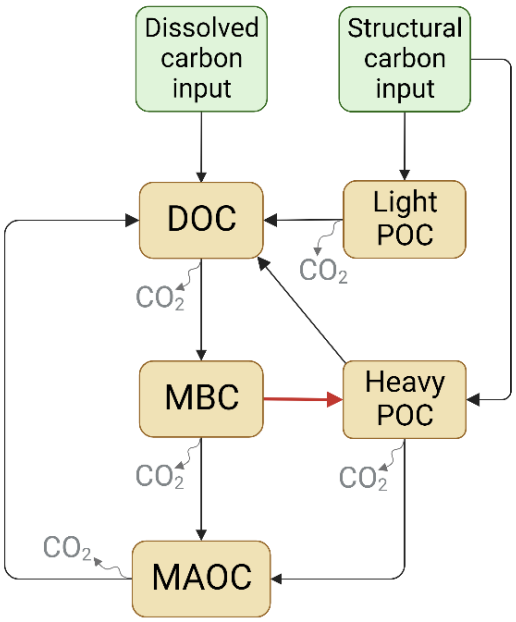
	Df	Sum Sq	*F*-value	*P*-value
Aboveground biomass				
Sites	4	1.52×10^{5}	2.14×10^{1}	<0.001
Fencing	1	2.66×10^{5}	1.50×10^{2}	<0.001
Sites: Fencing	4	1.20×10^{5}	1.69×10^{1}	<0.001
Residuals	50	8.87×10^{4}		
Initial MBC				
Sites	4	1.40	7.17×10^{1}	<0.001
Fencing	1	2.92×10^{-2}	5.98	<0.05
Sites: Fencing	4	3.04×10^{-2}	1.56	0.211
Residuals	30	1.46×10^{-1}		
Initial SOC				
Sites	4	1.04×10^{4}	5.36×10^{2}	<0.001
Fencing	1	9.40×10^{1}	1.94×10^{1}	<0.001
Sites: Fencing	4	1.31×10^{2}	6.74	<0.01
Residuals	20	9.70×10^{1}		
Soil mineral (Silt and clay)				
Sites	4	3.67×10^{3}	3.70×10^{2}	<0.001
Fencing	1	1.60×10^{1}	6.32	<0.05
Sites: Fencing	4	4.80×10^{1}	4.87	<0.05
Residuals	10	2.50×10^{1}		

Revised Table S3. Results of the two-way ANOVA on the effects of sites, fencing, and their interaction (sites: fencing) on glucose-derived SOC, MAOC, POC, MBC, DOC, and cumulative respiration. Cumulative respiration is the total respiration after 102d incubation calculated from the respiration rate. The SOC content is the sum of the sizes of the other four C pools combined.

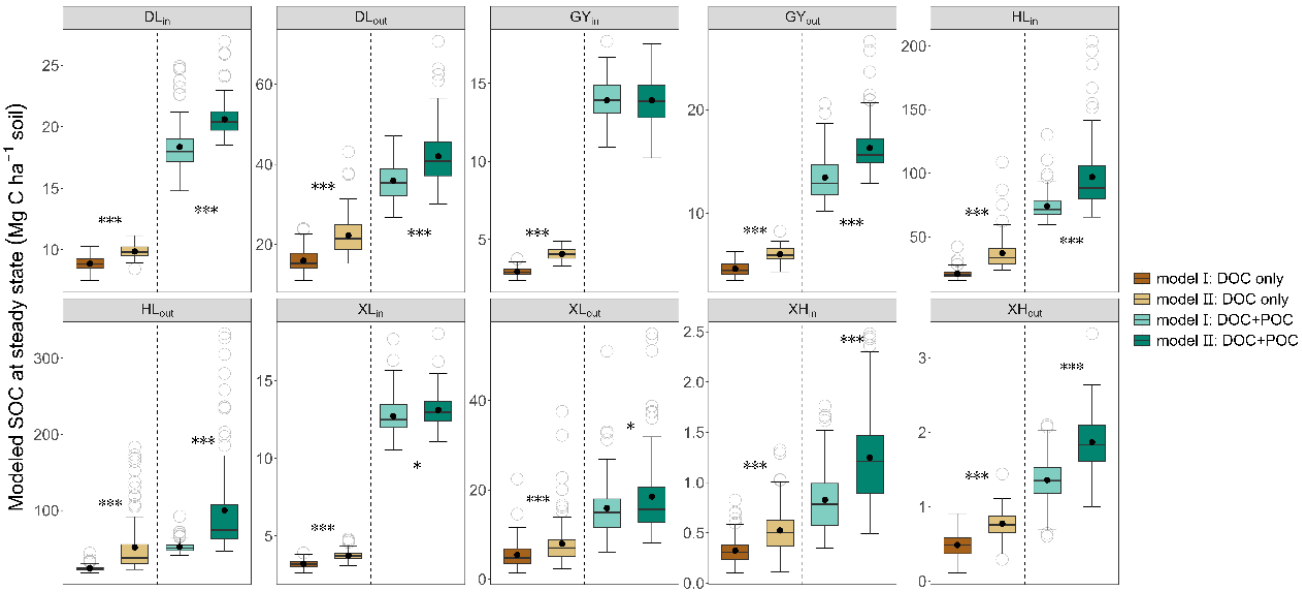
	Df	Sum Sq	*F*-value	*P*-value
Glucose-derived SOC				
Sites	4	3.85×10^{-2}	1.10×10^{2}	**<0.001**
Fencing	1	9.00×10^{-5}	9.75×10^{-1}	0.331
Sites: Fencing	4	9.00×10^{-4}	2.58	0.058
Residuals	30	2.62×10^{-3}		
Glucose-derived MAOC				
Sites	4	3.94×10^{-3}	3.95×10^{1}	**<0.001**
Fencing	1	3.18×10^{-4}	1.27×10^{1}	**<0.01**
Sites: Fencing	4	4.78×10^{-4}	4.79	**<0.01**
Residuals	30	7.48×10^{-4}		
Glucose-derived POC				
Sites	4	7.15×10^{-3}	1.74×10^{2}	**<0.001**
Fencing	1	4.00×10^{-5}	3.85	0.059
Sites: Fencing	4	7.78×10^{-4}	1.90×10^{1}	**<0.001**
Residuals	30	3.08×10^{-4}		
Glucose-derived MBC				
Sites	4	4.43×10^{-3}	1.83×10^{1}	**<0.001**
Fencing	1	6.00×10^{-6}	1.02×10^{-1}	0.752
Sites: Fencing	4	2.28×10^{-4}	9.37×10^{-1}	0.456
Residuals	30	1.82×10^{-3}		
Glucose-derived DOC				
Sites	4	1.62×10^{-7}	8.89	**<0.001**
Fencing	1	3.42×10^{-8}	7.50	**<0.05**
Sites: Fencing	4	5.08×10^{-8}	2.78	**<0.05**
Residuals	30	1.37×10^{-7}		
Cumulative respiration				
Sites	4	1.21×10^{3}	2.05×10^{2}	**<0.001**
Fencing	1	8.40	5.67	**<0.05**
Sites: Fencing	4	1.38×10^{1}	2.33	0.079
Residuals	30	4.44×10^{1}		

Revised Table S4. Multiple linear regression of cumulative respiration and glucose-derived SOC. Cumulative respiration is the total respiration after 102d incubation calculated from the respiration rate. Soil mineral was represented by the sum of clay and silt content.

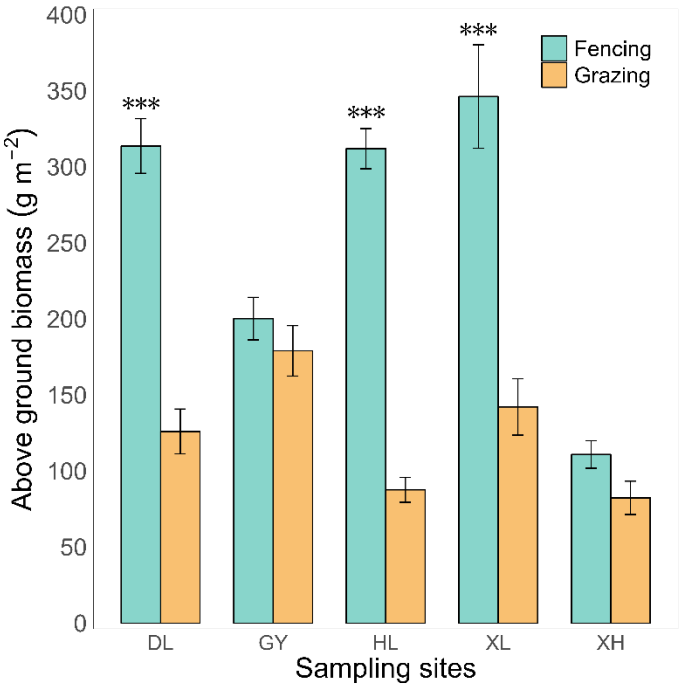
	Estimate	Std.Error	t value	P
Cumulative respiration~soil mineral + SOC, Multiple R^2=0.8743, Adjusted R^2=0.8384				
Intercept	6.229	1.842	3.382	<0.05
soil mineral	-0.381	0.088	-4.349	<0.01
SOC	0.357	0.051	6.978	<0.001
Glucose-derived SOC~soil mineral, Multiple R^2=0.9185, Adjusted R^2=0.9083				
Intercept	0.056	0.008	7.203	<0.001
soil mineral	0.003	0.000	9.497	<0.001



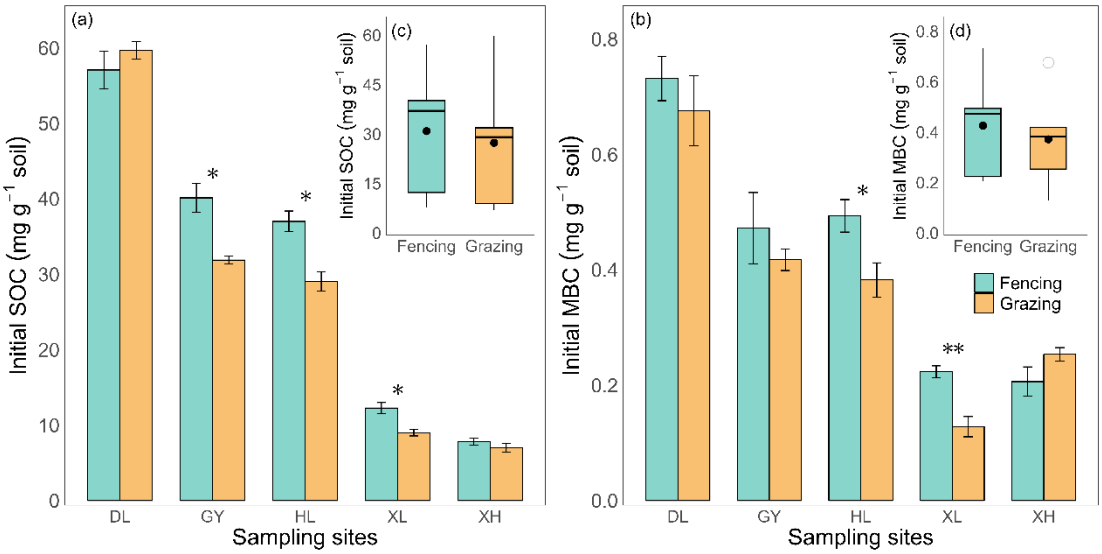
Revised Figure 1. The model scheme of soil carbon (C) dynamics. Model I and Model II share similar structure except that Model II includes a C flow from MBC to heavy-POC (red arrow) but Model I does not.



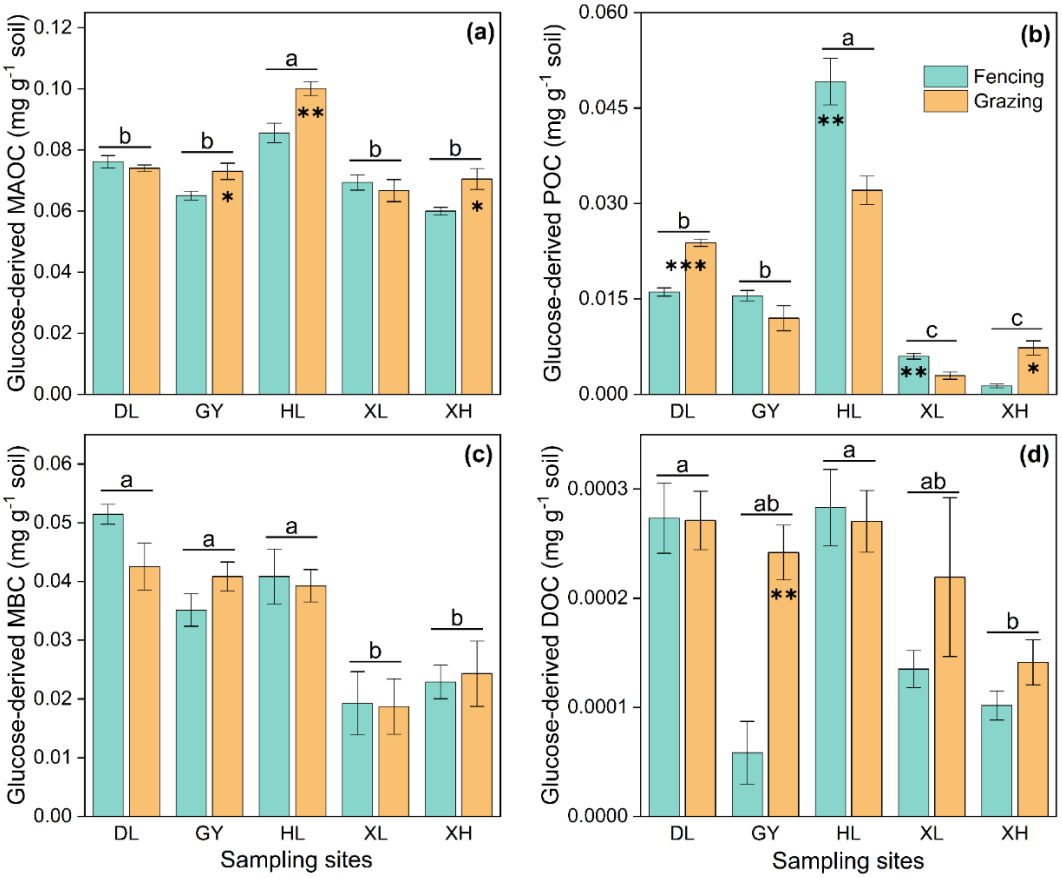
Revised Figure 4: Modeled SOC content at steady state under two types of C input conditions. The upper and lower ends of boxes denote the 0.25 and 0.75 percentiles, respectively. The solid line and solid dots in the box mark the median and mean of each dataset. Hollow dot denotes outliers. Asterisks represent significant differences between Model I and Model II (*P < 0.05, **P < 0.01, ***P < 0.001).



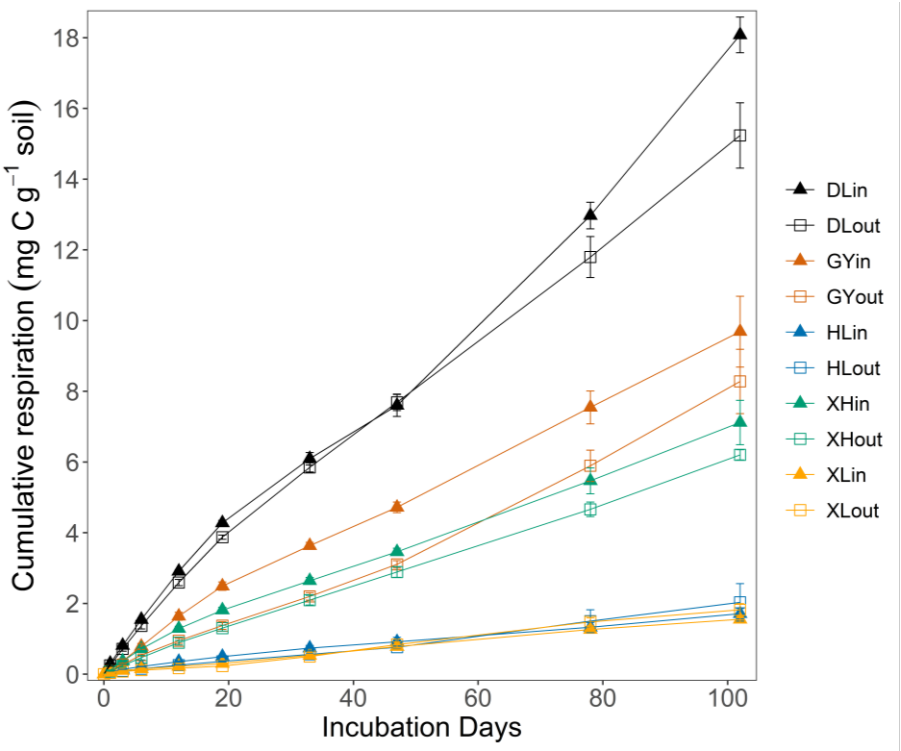
Revised Figure S1. Response of above ground biomass to sites and fencing. Error bars represent the standard errors.



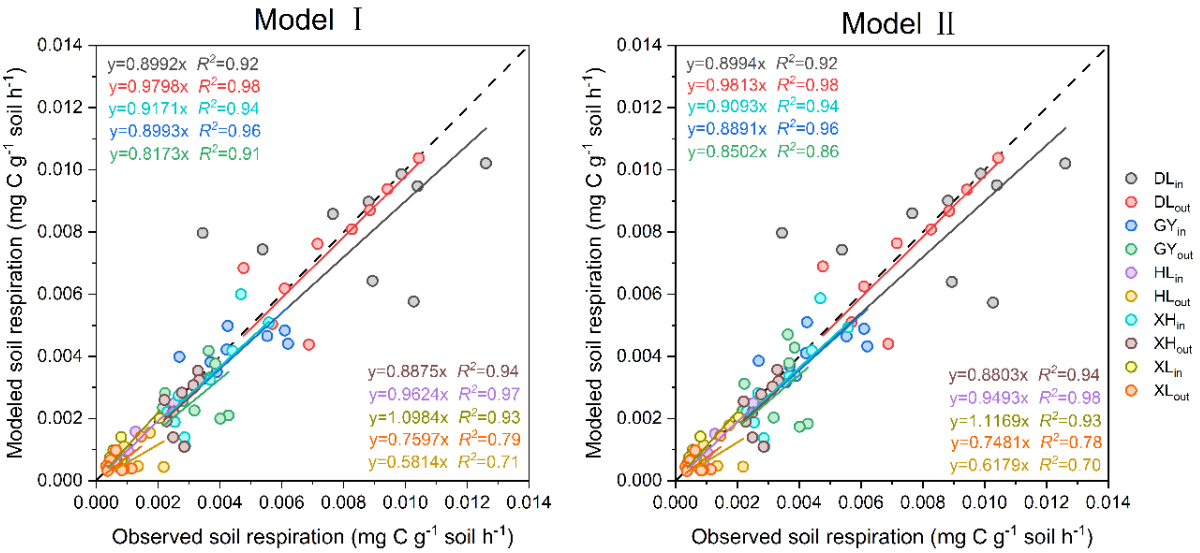
Revised Figure S2. Response of initial SOC and MBC to sites and fencing. Error bars represent the standard errors in bar graph. In the boxplot, the upper and lower ends of boxes denote the 0.25 and 0.75 percentiles, respectively. The solid line and solid dots in the box mark the median and mean of each dataset. Hollow dot denotes outliers. Asterisks represent significant differences between grazing and fencing (*P < 0.05, **P < 0.01).



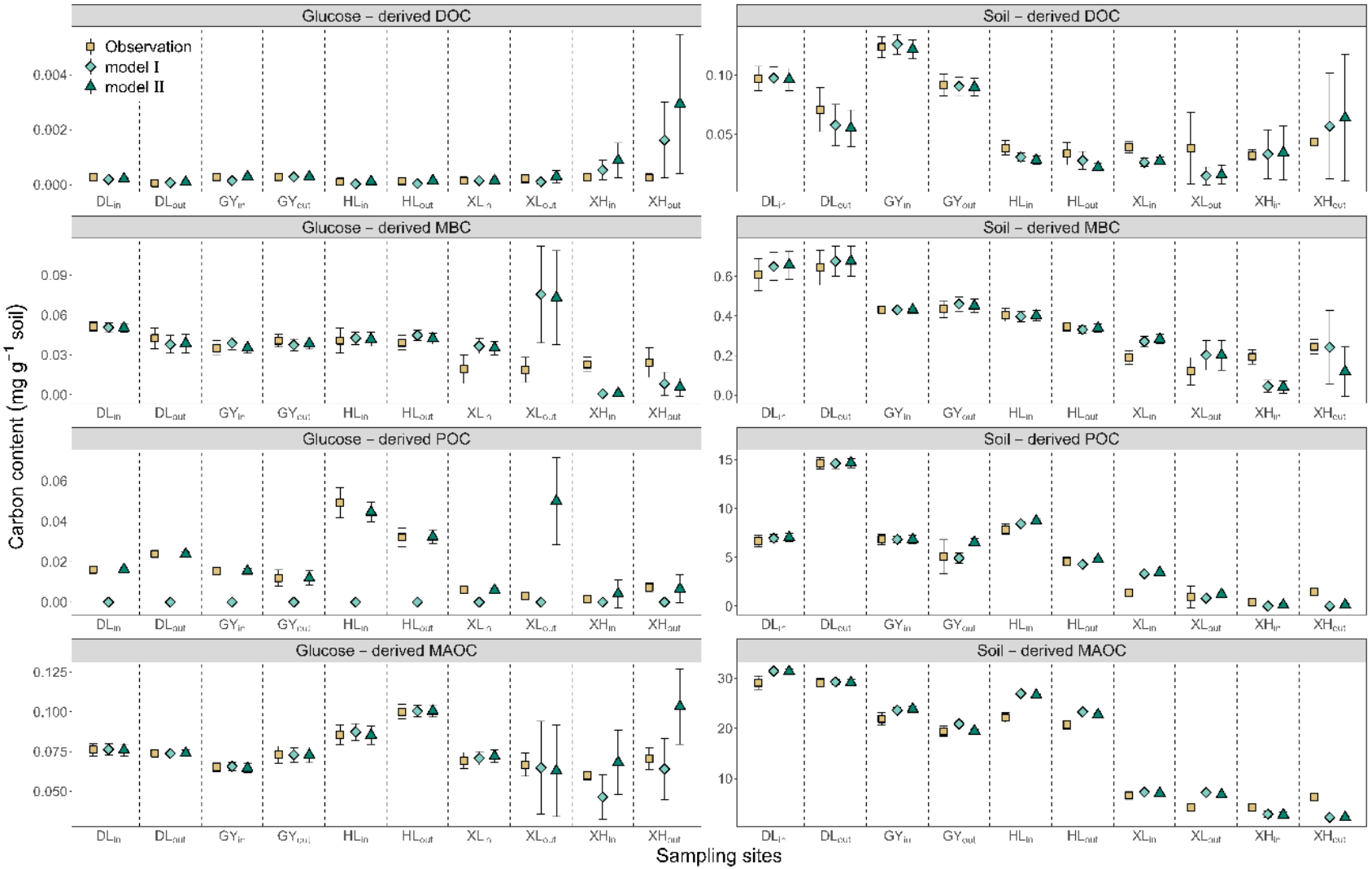
Revised Figure S3. **Response of C sequestration to sites and fencing. a**. Glucose-derived MAOC; **b**. Glucose-derived POC; **c**. Glucose-derived MBC; **d**. Glucose-derived DOC. The data are the means of four replicates and the error bars represent the standard errors of four replicates. Different letters above bars represent significant differences among sites ($P < 0.05$). Asterisks represent significant differences between grazing and fencing treatment (*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$).



Revised Figure S4. Response of soil cumulative respiration to sites and fencing. The data are the means of four replicates and the error bars represent the standard errors of four replicates. The first two capital letters in the legend are the initials of the site, followed by "in" for grazing excluded grassland and "out" for grazing grassland.



Revised Figure S5. Comparison of observed and modeled CO_2 flux in the incubation experiment. Diagonal black dotted line is 1:1 line.



Revised Figure S6. Observed and modeled soil C pools by Model I and II. The error bars represent the standard deviation of each dataset.

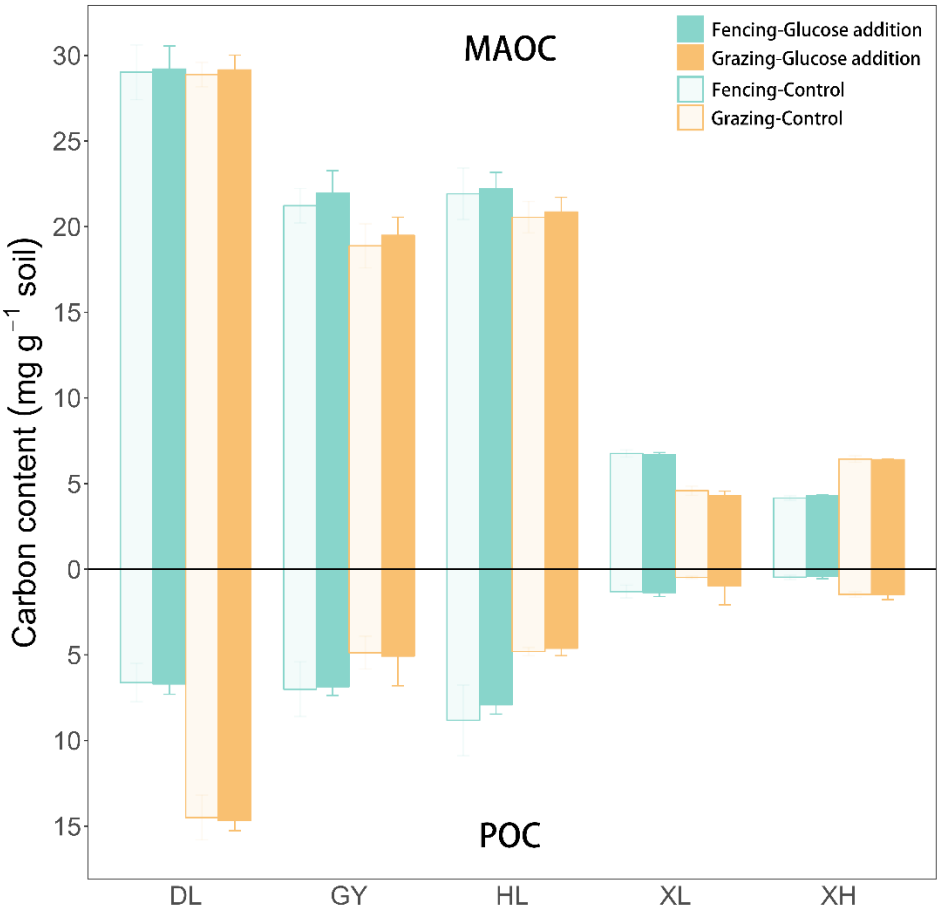


Figure R1. MAOC and POC contents of glucose-added and control treatments at the end of incubation. The top half of the figure represents MAOC, and the bottom half represents POC. filled bars represent the glucose-added treatment and open bars represent the control. Mean ± SD.