

Supporting Information

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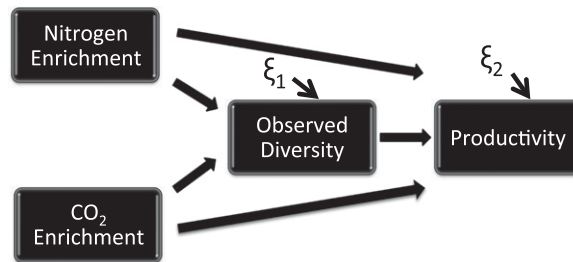


Fig. S1. Structural equation model. The top and bottom arrows respectively show the direct effects of N and CO₂ enrichment on productivity. The indirect effect of N (or CO₂) enrichment is the product of the effect of N (or CO₂) enrichment on observed diversity, and the effect of observed diversity on productivity. N and CO₂ enrichment treatments were coded as a binary variable that indicated the ambient (0) or enriched (1) treatment level; observed diversity was quantified the mean number of species observed in peak biomass samples and percent cover estimates; and productivity was the peak aboveground community biomass in the mixture. Productivity and observed diversity were ln-transformed to meet linear model assumptions. The model was fit to species mixture data separately within each year of the experiment. Direct and indirect effects are reported in Fig. 2 C and D. Further details in *Methods*.

Table S1. BioCON experiment treatment effects on productivity and observed number of species

Source	Productivity	Observed no. of species
CO ₂ (C)	$F_{1,4} = 7.70^*$	$F_{1,4} = 0.59$
Nitrogen (N)	$F_{1,156} = 16.29^{***}$	$F_{1,156} = 30.32^{***}$
Planted diversity (D)	$F_{1,156} = 40.18^{***}$	$F_{1,156} = 1863.57^{***}$
Log _e (Year) (Y)	$F_{1,2056} = 9.23^{**}$	$F_{1,2056} = 1205.19^{***}$
C × N	$F_{1,156} = 0.01$	$F_{1,156} = 3.21$
C × D	$F_{1,156} = 1.87$	$F_{1,156} = 0.13$
N × D	$F_{1,156} = 10.98^{**}$	$F_{1,156} = 8.92^{**}$
C × Y	$F_{1,2056} = 0.08$	$F_{1,2056} = 1.06$
N × Y	$F_{1,2056} = 5.53^*$	$F_{1,2056} = 2.36$
D × Y	$F_{1,2056} = 31.91^{***}$	$F_{1,2056} = 623.21^{***}$
C × N × D	$F_{1,156} = 0.02$	$F_{1,156} = 0.40$
C × N × Y	$F_{1,2056} = 0.26$	$F_{1,2056} = 1.00$
C × D × Y	$F_{1,2056} = 0.16$	$F_{1,2056} = 0.60$
N × D × Y	$F_{1,2056} = 7.79^{**}$	$F_{1,2056} = 20.52^{***}$
C × N × D × Y	$F_{1,2056} = 0.02$	$F_{1,2056} = 0.58$

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.