Negative feedback on plant available nitrogen may restrict the advance of trees in C$_4$ savannas

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Kgope et al. 2010

Root dry weight

Increase in CO2
RuBP carboxylase/oxygenase
Rubisco

Carbon Dioxide

C₃ Photosynthesis
Calvin cycle

Regeneration

Reduction
Increase in tree biomass with a decrease in grass.

Tree cover in absence of disturbance
Limited by
- water availability

Factors that can modify tree cover e.g., fire, grazing, browsing,

Sankaran et al 2004
Grass roots contribute a disproportional amount of nitrogen to the system relative to above ground biomass. Grass roots contribute a disproportional amount of nitrogen to the system relative to above ground biomass. 

February et al. 2013
Will the increase in trees and decrease in grasses result in a change in plant available nitrogen?
We manipulate the amount of water available to plants and do this with and without trees present.
We determined nitrogen mineralization rates at the end of each month for one growing season.

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Regardless of available water, N mineralization is highest at the beginning of the growing season.
Regardless of treatment, where grass is present N mineralization is highest.
So;

↑ Increase in tree biomass

↓ Decrease in grass biomass

= Reduction in available N

We suggest that this reduction in available N must result in an asymptote in CO$_2$ effect on tree biomass?
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