

Supporting Information for

Nitrogen cycle patterns during forest regrowth in an African Miombo Woodland landscape

Marc Mayes^{1,2,*}, Jerry Melillo², Christopher Neill³, Cheryl Palm⁴, John F. Mustard¹ and Gerson Nyadzi⁵.

¹Department of Earth, Environmental and Planetary Sciences, Brown University, Providence, Rhode Island USA.

²The Ecosystems Center, Marine Biological Laboratory, Woods Hole, Massachusetts USA.

³The Woods Hole Research Center, Falmouth, Massachusetts USA.

⁴Institute for Sustainable Food Systems, University of Florida, Gainesville, Florida USA 32611

⁵Millennium Promise Tabora, Tabora, Tanzania.

*Present address: Earth Research Institute, University of California-Santa Barbara, Santa Barbara, California USA. Email: mmayes@ucsb.edu

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Introduction

This document contains additional data on aboveground tree biomass carbon accumulation rates collected alongside the main nitrogen (N) cycling project (Figure S1), and supporting tables and statistics on ecosystem N cycle indicators reported in the main text and figures.

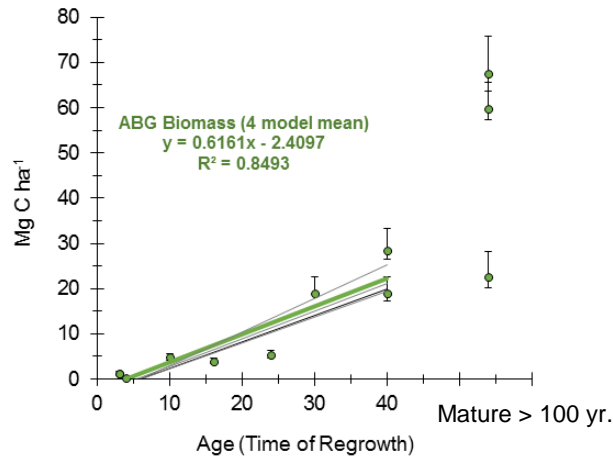


Figure S1. Tabora Miombo Woodland carbon stock accumulation with regrowth site age. Carbon stocks were assessed via methods similar to Williams et al. (2008) (Williams et al., 2008), by sampling all stems >5 cm diameter-at-breast-height in four 10 m-radius subplots distributed in a stratified random manner within 50 x 50 m field sites (see Methods). Four sets of allometric equations from three Miombo sites (Zambia (E.N Chidumayo, 2014), Mozambique (Ryan et al., 2011), Tanzania (Malimbwi et al., 1994) and the pan-Dry Tropics (Brown et al., 1989) were used to calculate stem biomass and C stocks and single-model C stock accumulations (grey lines below). Model results were averaged to produce C stocks with uncertainties for each site (green dots, error bars s.e.m. of four model-calculations) and an average linear C stock accumulation curve to regrowth sites aged 40 yr. N accumulation in woody biomass with regrowth was calculated using an average of published Miombo wood biomass %N values (Emmanuel N. Chidumayo, 1993).

Age class <i>n=3 sites</i>	Depth cm	Soil N concentration (NH ₄ +NO ₃) mg kg ⁻¹ soil (dry season)	NH ₄ ⁺ : NO ₃ ⁻ (dry season)	Soil N mineralization potential (14d lab) NH ₄ +NO ₃ kg ha ⁻¹ 14d ⁻¹ (wet season)	Soil N mineralization potential (14d lab) NH ₄ +NO ₃ kg ha ⁻¹ 14d ⁻¹ (dry season)
3-4 yr.	0-5	2.36 (1.1)	55.1 (19.5)	0.59 (0.12)	0.36 (0.20)
	5-15	1.27 (0.4)	22.1 (11.1)	2.12 (0.81)	1.14 (0.46)
	0-15			2.71 (0.90)	1.51 (0.60)
10-24 yr.	0-5	1.73 (0.30)	65.6 (21.0)	0.72 (0.25)	0.37 (0.14)
	5-15	0.92 (0.19)	27.8 (6.55)	2.92 (0.30)	0.82 (0.49)
	0-15			3.64 (0.55)	1.19 (0.61)
30-40 yr.	0-5	1.71 (0.24)	61.9 (26.0)	1.03 (0.33)	0.56 (0.07)
	5-15	0.94 (0.16)	30.7 (8.29)	1.67 (0.64)	1.36 (1.01)
	0-15			2.70 (0.95)	1.92 (1.08)
Mature >100 yr.	0-5	4.00 (0.67)	54.5	1.89 (0.42)	0.76 (0.46)
	5-15	1.54 (0.04)	25.2 (5.14)	3.65 (0.13)	1.22 (0.57)
	0-15			5.54 (0.51)	1.98 (1.03)

Table S1. Soil mineral N (ammonium - NH₄⁺ plus nitrate - NO₃⁻) concentrations and N mineralization potentials from 14-day lab incubations across a Miombo forest regrowth chronosequence. Accompanies Figure 2b-c and Figure 3. Values are means with standard errors.

Soil N resources 0-15 cm			
Site age class (n sites)	Total soil organic N ^o kg ha ⁻¹	Est. annualized soil mineral N potentials ^o (NH ₄ ⁺ + NO ₃ ⁻) kg N ha ⁻¹ yr ⁻¹	Est. percent total soil N mineralized per year (%)
3-4 yr. (3)	970 (216)	54.9 (8.17)	5.7
10-24 yr. (3)	594 (52)	62.8 (13.5)	11
30-40 yr. (3)	981 (188)	60.1 (11.4)	6.1
Mature (3) > 100 yr.	857 (103)	97.9 (15.9)	11

Table S2. Estimated annualized soil N mineralization rates and their comparison to total soil N stocks. N mineralization rates obtained from 2-week lab incubations in wet and dry seasons were scaled to a hypothetical year with 50% weighting between wet and dry season weeks. Values are means with standard errors.

Species	Age class yr	N trees	Foliar %C	Foliar N g kg ⁻¹	C:N mol	d ¹⁵ N (‰)	SLA g m ⁻²
Mninga	3-4	3	46.7 (0.3)	30.8 (2.6)	17.9 (1.6)	-0.16 (0.54)	102 (11.0)
<i>Pterocarpus angolensis</i> , fam. Fabaceae	10-24	6	47.2 (0.2)	28.7 (0.6)	19.3 (0.4)	-1.16 (0.24)	93.9 (7.7)
	30-40	4	46.4 (0.3)	29.6 (0.6)	18.3 (0.4)	-1.31 (0.21)	81.2 (1.8)
	Mature	4	48.5(0.32)	32.9 (2.0)	17.4 (0.8)	-0.94 (0.54)	82.8 (5.2)
Mtundu	3-4	4	48.4 (0.4)	26.3 (1.5)	21.7 (1.3)	3.01 (1.02)	112 (7.7)
<i>(Brachystegia spiciformis</i> , fam. Caesal.	10-24	6	49.6 (0.4)	22.5 (0.7)	25.9 (0.8)	1.83 (0.56)	104 (10.8)
	30-40	4	47.9 (0.7)	24.4 (1.1)	23.1(0.9)	1.71 (0.40)	114(3.8)
	Mature	4	50.1 (0.9)	25.1 (2.2)	23.7 (1.6)	1.62 (0.70)	99.1 (12.3)
Mzima	3-4	4	47.2 (0.3)	18.9 (1.3)	29.4 (2.0)	4.15 (2.45)	142 (6.8)
<i>Terminalia sericea</i> , fam. Combretaceae	10-24	6	46.8 (0.3)	14.5 (0.5)	37.9 (1.2)	0.81 (0.11)	153(9.2)
	30-40	4	46.2 (0.3)	13.1 (0.6)	41.5 (1.9)	0.54 (0.63)	144 (13.1)
	Mature	4	48.6 (1.2)	19.4 (3.9)	31.8 (4.2)	1.42 (0.54)	125 (12.7)

Table S3. Foliar data grouped by tree species and forest regrowth age class.
Accompanies Figure 3. Values are means with standard errors.

Table S4. AN(C)OVA Model summaries of forest site age and other co-variate effects on N cycle indicators. Accompanies Figures 2-4, Tables 1-3, Table S1).

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Table S5. Comparisons of foliar chemistry results among tree species and forest regrowth age classes. Accompanies Figure 3.

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