Interrelationships among soil nitrogen transformation rates, functional gene abundance and soil properties in a tropical forest with exogenous N inputs

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Table S1 Primer information of selected soil functional genes.

Gene	Primers	Primer sequence (5'--3')	Location	Length	References
AOB-*amoA*	amoA 1F	5' GGGGTTTCTACTGGTGGT 3'	322-249	500bp	(Rich et al., 2003; Levy-Booth et al., 2014)
	amoA 2R	5' CCCCTCKGSAAAGCCTTCTTC 3'	802-822		
AOA-*amoA*	CrenamoA 23F	5' ATGGTCTGGCTWAGACG 3'	7-24	620bp	(Levy-Booth et al., 2014)
	CrenamoA 616R	5' GCCATCCATCTGTATGTCCA 3'	611-631		
nirK	nirK F560-589	5'- GGGCATGAACGGCGCGCTCATGGTGCTGCC -3'	560-589	376bp	(Levy-Booth et al., 2014)
	nirK R906-935	5'-CGGGTTGGCGAACTTGCCGGTGGTCCAGAC -3'	906-935		
nosZ	nosZ-F	5'- CGCTGTTCITCGACAGYCAG -3'	1181-1201	700bp	(Rich et al., 2003)
	nosZ-R	5'- ATGTGCAKIGCRTGGCAGAA -3'	1880-1900		

(Han et al., 2018)

Table S2 Reaction programs of quantitative PCR for selected functional genes.

Gene	Primers	Thermal cycling conditions	References
AOB-*amoA*	amoA 1F amoA 2R	95 °30"-40(95 °15"-53 °15"-72 °40")	(Rich et al., 2003; Levy-Booth et al., 2014)
AOA-*amoA*	CrenamoA23F CrenamoA616R	95 °30"-40(95 °5"-53 °34"-72 °60")	(Levy-Booth et al., 2014)
nirK	nirK F560-589 nirK R906-935	95 °30"-40(95 °5"-65 °34"-72 °60")	(Levy-Booth et al., 2014)
nosZ	nosZ-F nosZ-R	95 °30"-40(95 °5"-56 °34"-72 °40")	(Rich et al., 2003)

(Han et al., 2018)

Table S3

Responses of soil properties and microbial biomass to nitrogen addition. Shown is the mean value ± standard error (n = 3). Different letters represent significant difference (one-way ANOVA, *P* < 0.05, LSD post hoc analysis) among different levels of N addition. Note: All the results were collected from surface soil samples (0-10 cm) except for special instructions.

	Dry season								**Wet season**							
	Jan, 2015				Jan, 2016				Jul, 2015				Jul, 2016			
	Control	LN	MN	HN	Control	LN	MN	HN	Control	LN	MN	HN	Control	LN	MN	HN
pH	3.73a (0.04)	3.77a (0.02)	3.72a (0.04)	3.73a (0.02)	3.78a (0.07)	3.81a (0.05)	3.68a (0.07)	3.76a (0.03)	3.9a (0.03)	3.9a (0.01)	3.84b (0.02)	3.8b (0.02)	3.78a (0.05)	3.76a (0.06)	3.71a (0.09)	3.68a (0.03)
TN ($mg\ g^{-1}$)	2.9a (0.41)	2.43a (0.17)	2.73a (0.36)	2.63a (0.17)	2.31a (0.44)	1.88a (0.22)	2.22a (0.15)	2.08a (0.38)	1.86a (0.13)	1.7a (0.38)	1.99a (0.52)	1.89a (0.32)	2.38a (0.28)	2.41a (0.18)	2.32a (0.03)	2.38a (0.25)
SOC ($mg\ g^{-1}$)	52.3a (7.5)	43.8a (2.4)	50.5a (7.02)	42.4a (3.5)	38.0a (3.7)	24.8a (5.7)	25.2a (3.5)	32.1a (9.8)	25.5a (3.3)	25.8a (4.7)	25.7a (1.7)	27.6a (2.9)	42.3a (1.4)	35.0a (9.2)	31.0a (9.0)	33.7a (9.5)
C/N	18.0a (0.5)	18.0a (0.3)	18.5a (0.2)	16.1a (1.1)	16.7a (2.3)	13.2a (2.5)	11.3a (0.9)	15.2a (2.4)	13.6a (0.8)	15.3a (1.0)	13.3a (2.4)	14.7a (1.0)	17.9a (2.5)	14.5a (3.3)	13.4a (3.9)	14.1a (3.2)
TP ($mg\ g^{-1}$)	0.26a (0.01)	0.24a (0.03)	0.24a (0.00)	0.24a (0.02)	0.28a (0.21)	0.15a (0.03)	0.15a (0.03)	0.14a (0.02)	0.23a (0.02)	0.24a (0.04)	0.24a (0.01)	0.23a (0.04)	0.24a (0.05)	0.3a (0.16)	0.24a (0.11)	0.25a (0.04)

SWC (%)	38.7a (1.2)	34.4a (1.6)	36.9a (5.6)	35.5a (1.5)	43.19a (1.4)	39.19a (3.8)	43.48a (5.9)	39.06a (1.1)	35.9a (1.9)	33.8a (1.8)	34.7a (3.4)	33.7a (1.0)	47.6a (1.0)	45.5a (0.6)	45.8a (6.0)	45.8a (2.6)
NH_4^+-N (mg kg^{-1})	2.81b (1.03)	3.83ab (1.10)	2.75b (0.58)	5.44a (0.95)	0.97b (0.25)	3.21a (1.15)	3.81a (0.74)	4.64a (1.18)	4.43a (2.23)	6.73a (3.46)	5.98a (1.24)	3.04a (1.21)	0.97a (0.66)	0.64a (0.19)	0.37a (0.06)	0.28a (0.05)
NO_3^--N (mg kg^{-1})	6.42a (0.63)	5.15a (2.02)	7.85a (4.05)	9.8a (2.23)	4.95c (0.75)	5.57c (0.63)	9.7a (1.35)	7.81b (1.00)	7.08a (1.67)	7.54a (0.73)	6.96a (1.91)	9.62a (0.8)	11.45a (2.62)	13.63a (1.89)	13.9a (1.96)	13.06a (0.57)
MBC (mg kg^{-1})	508.8a (161.9)	447.5a (88.4)	466.6a (162.8)	382.1a (39.3)	435.3b (60.6)	421.2b (24.3)	525.5a (33.1)	419.2b (5.4)	504.5a (25.1)	521.2a (57.4)	464.8a (56.0)	498.2a (33.6)	671.0a (52.8)	540.0a (187.7)	690.3a (326.7)	800.7a (216.1)
MBN (mg kg^{-1})	72.7a (20.4)	70.4a (15.7)	58.0a (13.3)	60.6a (11.1)	74.0a (6.3)	67.3a (18.2)	88.2a (8.2)	64.9a (1.3)	49.4a (0.9)	51a (6.1)	47.2a (4.4)	49.7a (3.5)	130.8a (45.3)	122.7a (24.8)	123.2a (21.2)	119.1a (8.5)

(Nie et al., 2018)

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