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“Development on the margin”

Aboveground Net Primary Production Response to Chronic Nitrogen Addition in a Tropical Montane Forest

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Abstract

Nitrogen (N) deposition in tropical areas is projected to increase rapidly in the next decades and little is known on how tropical forest productivity will respond to increase in N availability. We used an N-addition experiment to achieve an N-enriched condition in an old-growth forest growing in an Aluandic Andosol soil at 1200–1300-m elevation in Fortuna Forest Reserve, Panama. Control and N-addition treatments (starting in 2006 at a rate of 125 kg urea-N ha⁻¹ yr⁻¹, split in four applications) were laid out in paired-plots design with four replicate plots (40mx40 m each, separated by ≥ 40 -m distance). Here, we report the changes in various components of above-ground net primary production (ANPP) during the 3–4-yr N addition: stem diameter growth (separated by diameter at breast height (DBH) classes of 10–30 cm, 30–50 cm, and >50 cm), woody biomass production (WBP) and fine litterfall. No significant differences were observed between 3–4-yr N addition and the control in stem diameter growth of any DBH classes or all classes combined (control: 1.6±0.2 mm yr⁻¹; N-addition plots: 1.9±0.2 mm yr⁻¹), in WBP (control: 4.3±0.6 Mg ha⁻¹ yr⁻¹; N-addition plots: 4.2±0.5 Mg ha⁻¹ yr⁻¹), in total fine litterfall (control: 7.3±0.4 Mg ha⁻¹ yr⁻¹; N-fertilised: 8.0±0.4 Mg ha⁻¹ yr⁻¹), and in ANPP (control: 11.6±0.8 Mg ha⁻¹ yr⁻¹; N-fertilised: 12.3±0.8 Mg ha⁻¹ yr⁻¹). The first 2 years of N addition showed significant increase in ANPP compared to the control, and this was mainly due to increased leaf-litter production (Adamek et al. 2009). Our results showed interannual variation of ANPP response to N addition.

Keywords: Aboveground net primary production, chronic nitrogen addition, tropical forest