

# Sugarcane plantations decreased soil nitrogen availability and the abundance of nitrogen cycling functional genes

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The appropriate supply of nitrogen (N) is essential for sustainable sugarcane production with minimised environment risks. On the other hand, sugarcane plantations can alter soil N cycling processes via the management regimes (e.g. fertilisation, litter retention, irrigation etc.). The objective of this study was to examine how sugarcane plantations altered soil N availability and associated microbial processes. Two adjacent paired-sites (native forest vs 78 yr old sugarcane field; pasture vs 78 yr old sugarcane field) were selected for this study. The five paired composite surface soils (0-10 cm, 10-15 cores for each composite sample) were collected from each of the paired land uses. Results indicated that sugarcane plantations decreased soil total organic C and N by ca. 50% and total P by 25-35% compared with native forest and pasture soils. Concentrations of NH<sub>4</sub><sup>+</sup>-N were significantly lower in sugarcane soils (8 mg kg<sup>-1</sup>) than in pasture soils (18 mg kg<sup>-1</sup>), while there was no significant difference in the concentration of NO<sub>3</sub><sup>-</sup>-N. But concentrations of NO<sub>3</sub><sup>-</sup>-N was significantly lower in sugarcane soils (7 mg kg<sup>-1</sup>) than in native forest soils (16 mg kg<sup>-1</sup>), while there was no significant difference in the concentration of NH<sub>4</sub><sup>+</sup>-N. Soil soluble organic C and N were lower in sugarcane soils compared with native forest and pasture soils. Soil microbial biomass C (MBC) and N (MBN), MBC/total C% and MBN/ total N%, and soil respiration were also lower in sugarcane soils compared with native forest and pasture soils, while the metabolic quotient (qCO<sub>2</sub>) in sugarcane soil increased. Sugarcane plantation decreased the abundance of nitrification genes (bacterial amoA, archaeal amoA) and denitrification genes (e.g. narG, nosZ, nirK, nirS). But there were no significant differences in the N-cycling genes between sugarcane and pasture soils. Overall, sugarcane plantation decrease soil N availability, N-cycling processes and N fertility.