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## Abstract

Expansion of commercial agriculture in equatorial regions has significant implications for regional nitrogen (N) budgets. Here we investigate changes in N availability and turnover in Southeast Asia following the replacement of tropical forest with oil palm plantations along a chronosequence of oil palm maturity (3-months to 15-year-old stands) and secondary to primary forest succession in Sabah, Malaysian Borneo. Ten sites were sampled during March and April 2012 and rates of gross ammonium ( $\text{NH}_4^+$ ) and nitrate ( $\text{NO}_3^-$ ) production (mineralisation and nitrification) and consumption ( $n = 8$ ), potential denitrification and “anaerobic ammonium oxidation” (“anammox”) ( $n = 12$ ) were determined using  $^{15}\text{N}$  isotope additions to soil cores and slurries respectively. Gross mineralisation rates ( $0.05\text{--}3.08 \text{ g N m}^{-2} \text{ d}^{-1}$ ) remained unchanged in oil palm relative to forests. However, a significant reduction in gross nitrification ( $0.04\text{--}2.31 \text{ g N m}^{-2} \text{ d}^{-1}$ ) and an increase in  $\text{NH}_4^+$  immobilisation disrupt the pathway to nitrogen gas ( $\text{N}_2$ ) production substantially reducing (by  $> 90\%$ ) rates of denitrification and “anammox” in recently planted oil palm relative to primary forest. Potential nitrous oxide ( $\text{N}_2\text{O}$ ) emissions were greater than potential  $\text{N}_2$  production and remained unchanged across the chronosequence indicating a potentially increased ratio of  $\text{N}_2\text{O}:\text{N}_2$  emission when soils were first disturbed. These results are an important precursor to studies that could yield improved estimates of regional N turnover and loss in Southeast Asia which will have global implications for N biogeochemical cycling.