

Abstract No: A-210

**THE EFFECT OF NITROGEN FERTILIZATION ON SOIL N<sub>2</sub>O EMISSIONS FROM OIL PALM CULTIVATION ON DEEP PEAT**

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The addition of nitrogen (N) fertilizer in Histosols is suspected to increase soil organic matter oxidation and nitrous oxide (N<sub>2</sub>O) emissions. The objectives of this study were to investigate the impact of N fertilization rate on soil N<sub>2</sub>O emissions and to evaluate how key environmental variables such as the soil water-filled pore space (WFPS) and N availability, may affect the emissions. The study was conducted in an oil palm plantation fertilizer trial on peat in Sumatra which included 3 N application rates: 0 kg N ha<sup>-1</sup> y<sup>-1</sup> (N0), 153 kg N ha<sup>-1</sup> y<sup>-1</sup> (N1) and 306 kg N ha<sup>-1</sup> y<sup>-1</sup> (N2). Soil N<sub>2</sub>O fluxes were measured using the static chamber method from October 2012 until September 2013. Intensive sampling was carried out for 30 days following two fertilization events in October 2012 and April 2013. The site presented a high spatial variation in emissions with persistent hotspots emitting at rates > 100 g N ha<sup>-1</sup> even outside of fertilization periods. The magnitude of the fluxes was high with annual emission rates in the N0, N1 and N2 treatments of 22.0 ± 2.8, 12.5 ± 1.3 and 26.6 ± 5.7 kg N-N<sub>2</sub>O ha<sup>-1</sup> yr<sup>-1</sup>, respectively. Fertilizer application exacerbated the emissions especially in the N2 treatment and following the April fertilization. Cumulated emissions over the thirty days following fertilizer application amounted to 0.3% of the N applied. The N<sub>2</sub>O fluxes displayed significant positive relationships with soil NH<sub>4</sub><sup>+</sup> content, NO<sub>3</sub><sup>-</sup> content and net nitrification rate (R<sup>2</sup>=0.9; R<sup>2</sup>=0.3; R<sup>2</sup>=0.5 respectively) but did not appear to depend much upon soil moisture. Indeed no significant effect in water table variation was detected and the relationship between the N<sub>2</sub>O fluxes and the WFPS was very weak (R<sup>2</sup> = 0.05).

**Keywords:** -