

Assessing the relationship between N application and N₂O emissions in Sub-Saharan Africa: Towards a meta-analysis.

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Research indicates that the average nitrogen application rates in Sub-Saharan Africa (SSA) are 8 kilograms of nitrogen per hectare (kg N ha⁻¹), compared to 100kg N ha⁻¹ in the United States and 220kg N ha⁻¹ in China. Increasing nitrogen inputs – both in form of mineral fertilizer and organic additions – remains an integral piece of propelling SSA towards food security. However, mineral fertilizers yield the largest percentage of anthropogenic Nitrous Oxide (N₂O), a powerful greenhouse gas (GHG) whose Global Warming Potential (GWP) is approximately 296 times larger than that of Carbon Dioxide (CO₂) over 100 years. There exists a substantial amount of literature on N₂O emissions from temperate agroecosystems in North America, Asia, Europe and Oceania, but such research has been done on a far smaller scale in SSA. The current protocol for calculating N₂O inventories from SSA, based on IPCC guidelines, assumes that 1% of applied fertilizer is directly lost as N₂O. To establish the appropriateness of this assumption, we conducted i) a field experiment and ii) a literature review. The central research question we sought to answer was: “Is the relationship between N input and N₂O emissions in SSA linear or non-linear?” Our findings did not point at a definitive answer, but they did provide the basis for a more complex meta-analysis.