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# DENITRIFICATION: A CHALLENGE FOR PURE AND APPLIED SCIENCE



BOOK OF ABSTRACTS

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## Impact of fertilization and direct seeding on activity and abundance of key denitrifier communities in a tropical soil

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Direct seeding mulch-based cropping systems (DMC) are increasingly adopted worldwide to minimize soil erosion and improve soil quality. In Madagascar, where the study was performed, DMC including mulches of soybean and rice residues is combined with mineral/organic fertilization on a clay ferrallitic soil. Previous studies showed that this land use induces significant changes on chemical, physical and biological soil properties such as soil carbon content, soil structure and microbial diversity indexes. Therefore, the aim of this work was to investigate to which extent different practices (land use + three levels of organic/mineral fertilization) impacted on the bacterial communities involved in N<sub>2</sub>O emission (denitrifiers). In order to characterize the respective influence of crop rotation and mulch quality, plots were sampled twice ; in February 2005 corresponding to soybean crop under rice mulch and in February 2006 corresponding to rice crop under soybean mulch. Soil samples were analyzed in terms of denitrifiers density (qPCR of *nirK/nirS/nosZ* genes) and potential activity (Denitrification Enzyme Assay  $\pm$  C<sub>2</sub>H<sub>2</sub>, DEA).

Potential emissions of N<sub>2</sub>O (DEA  $\pm$  C<sub>2</sub>H<sub>2</sub>) were significantly increased by direct seeding for both years, whereas fertilization modalities and crop rotation had no impact at all. No significant reduction of N<sub>2</sub>O into N<sub>2</sub> (DEA without C<sub>2</sub>H<sub>2</sub>) was noticed. For both years and for all treatments, *nosZ* gene copy numbers were significantly lower than those of *nirK* gene with average *nosZ* densities around 5% of *nirK* gene numbers. Values registered for *nirS* gene were often too close to the threshold detection to be reliably integrated. A general trend in 2005 and 2006 indicated that all gene densities were significantly increased in plots under direct seeding except for plots with high fertilization levels. In addition, fertilization modalities and crop rotation had no impact on denitrifiers density.

Overall, crop and mulch types as well as fertilization intensity appear to have far less impacted densities and activities of denitrifiers than direct seeding. Further investigations are needed to elucidate the in situ impact of this practice on nitrogen fluxes and losses through nitrogenous gases.