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Insights into the nitrogen cycling shifts with the conversion from pasture to sugarcane fields in Brazil

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Sugarcane fields in Brazil are increasing every year as consequence of biofuel raising demand. Low-intensity pastures are the main sites giving place to the sugarcane crop. As consequence, the pressure to improve the grazing fields' productivity will lead to the pastures intensification, which usually includes practices that were not applied before, such as fertilizer use and soil tillage. Despite their similarities, sugarcane and brachiaria have their peculiarities and their management differs as well. For instances, nitrogen (N) yield might be higher than its input for both crops due to N fixation. Spontaneous brachiaria might inhibits nitrification driven by Bacteria (AOB). This phenomenon would result in the predominance of ammonia oxidizing Archaea (AOA). In sugarcane fields fertilizer is concentrated in bands and liming is performed, what could favor AOB over AOA. Nitrification driven by either one of these two groups of nitrifiers would yield different ratios of N-N2O. In this research we are examining how land use change between pasture to sugarcane affects greenhouse gases (GHGs) emissions; and its relation with shifts in the N cycling functional genes and nitrification and immobilization potentials. The experimental design includes three scenarios: low-intensity pasture (LIP), with no soil management practices; LIP to high-intensity pasture (HIP), in which soil tillage, planting and fertilizer are used; and LIP to sugarcane field. In a thematic project, the land use change was simulated in three experimental sites (n=5; plots 2,500 m2) in regions that represent the expansion of sugarcane in São Paulo State, which produces around 50% of the sugarcane in Brazil. GHG fluxes measurements began with soil tillage, in spring. Sugarcane and pasture were planted in the first week of December 2018. Fields growing sugarcane in the same catena than the one from the experiments were used as reference for long term effects of land use change. Soils in these three sites present a textural gradient, from sandy to clay soil. Despite contrasting soil characteristics, soil use (pasture or sugarcane) significantly affected ammonia oxidizers, being AOA more abundant in pastures and AOB in sugarcane fields ($p<0.05$). The other quantified functional genes related to N cycling (nifH, nirS, nirK) shifted among sites ($p<0.05$) but not among soil uses. We are now analyzing the GHG data along with the functional genes upon soil tillage as well the effects of land use change on N immobilization and mineralization potentials. For this purpose we are using an N isotope tracing method.