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## Linking soil microbiome to sustainability

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Sustainable agriculture depends on healthy soil and soil microbial diversity and thus must focus on managing soil microbes to deliver more efficient ecosystem services to crops. Moreover, intensified crop production demands integrated nutrient management systems to maintain agricultural productivity and protect the environment. Using beneficial native microbes that promote plant health and quality, and recycling crop residues with low environmental impact are ultimate practices for sustainable food and energy production. In this study we use biological native resources (beneficial bacteria and fungi) and recycling organic residues for sustainable crop production. Our studies have shown that sugarcane endophyte bacteria and fungi, when inoculated in plantlets, promote sugarcane plants growth, quality, and health (microorganisms antagonistic to sugarcane pathogens). Subsequently, following the crop cycling production, our studies on recycling of crop residue as a sustainable practice, showed that the combination of sugarcane residue (vinasse), rich in carbon, nitrogen, and potassium when applied together with inorganic fertilizer, emits more nitrous oxide than inorganic fertilizers through nitrification process carried out by bacteria. In order to mitigate  $N_2O$  emissions, we showed that the use of inhibitors of nitrification is a practical solution and, more importantly, these compounds do not affect soil-borne microbial community diversity.

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