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"Development on the margin"

Examining Nitrogen Dynamics in an Upland Rice-*Stylosanthes guianensis* Based Conservation Agriculture System Using ^{15}N Stable Isotope Techniques

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Abstract

The ferralitic soils of the Malagasy highlands have low fertility and become more and more degraded as continued conventional cropping based on soil tillage results in nutrient depletion through nutrient mining and soil erosion. Conservation agriculture, which comprises minimal soil disturbance, permanent soil cover and crop rotation, often includes legumes as cover or inter-crop to enhance soil fertility through a possible biological nitrogen (N) fixation-benefit. Since more than a decade, conservation agriculture has been introduced on Madagascar as an alternative for small scale farmers. One of the legumes propagated in local up-land rice production systems is *Stylosanthes guianensis*. Yet, little research has been done looking at the nutrient N flows in such a system of low input conservation agriculture. How do soil and residue management (tillage vs. direct seeding) influence N flows and dynamics, in a situation where soils are highly P deficient. How do these conditions affect the N use efficiency in this system, when applying different fertilisers (mineral, legume residues and manure) and how can the input of atmospheric N fixed by the legume be maximised to spare mineral fertiliser N inputs? Our aim is thus to characterise the nutrient N flows, dynamics and the N use efficiency by rice in order to optimise the N input by the legume *Stylosanthes guianensis* to the system. Hereby we will compare and examine conservation vs. conventional agricultural practices applied in an upland rice-*Stylosanthes guianensis* based agricultural system, using ^{15}N direct and indirect labeling stable isotope techniques. Expected outputs are the quantification of symbiotic N_2 fixation of stylo, quantification of uptake and recovery of N by rice from different N-sources (legume residues, manure, mineral fertiliser N) and to monitor and quantify soil N dynamics. In the poster we present the concept, design and methodological approaches of the study.

Keywords: Biological nitrogen fixation, conservation agriculture, ferralitic soils, Madagascar, stable isotope, *Stylosanthes guianensis*, upland rice

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