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Background

Nitrogen (N) is critical in rice production, being the most limiting factor for yields. This is frequently associated with high N inputs, which could often lead to losses and negative environmental impacts. Achieving optimal Nitrogen Use Efficiency (NUE) would mitigate these adverse effects. Recently, INIA Uruguay has developed a tool (**Fertiliz-Arr**) allowing for objective N fertilization at tillering, prior to water flooding in rice-pasture rotations. N fertilization based on Potentially Mineralized Nitrogen (PMN) is obtained from soil sampling at planting (0-20 cm).

Aim

Compare the hypothetical objective N dose to be added at tillering (plus 25 kg N ha⁻¹ on average at panicle initiation = PI across all treatments), against the adjusted response to total N addition (0, 50, 100, and 150 kg ha⁻¹), in different rice rotations (continuous rice = RI-CONT, rice-soybean = RI-SOY, and first and second rice in a rotation with pastures = RI1 and RI2-PAST) in two contrasting years in terms of yield and N uptake, assessing different NUE metrics: partial N factor productivity (**PNFP**), agronomic efficiency (**AE**), apparent recovery efficiency (**ARE**) and internal use efficiency (**IUE**) based on the 4 chart panel approach.

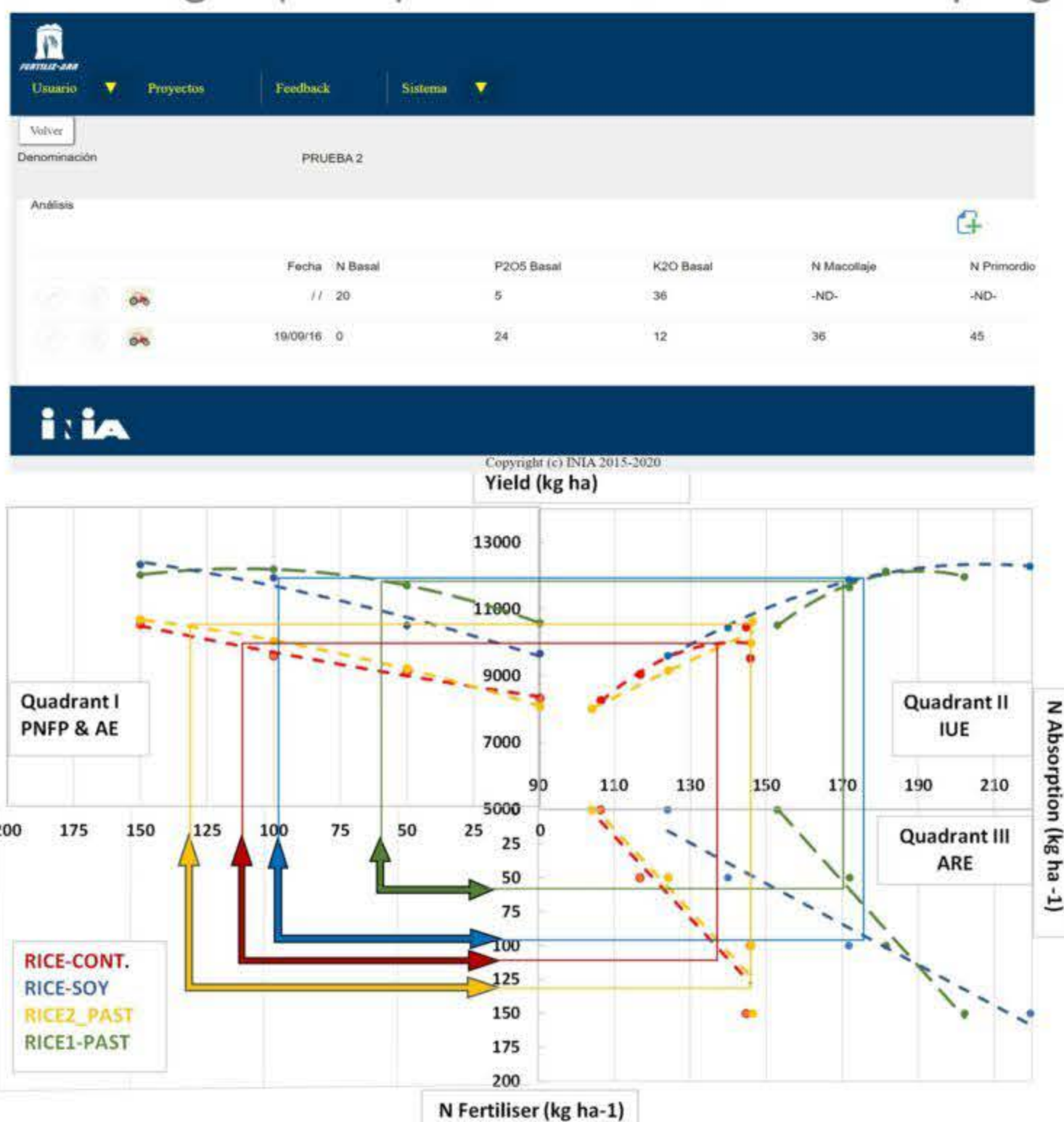


Figure 1. NUE metrics achieved by objective N fertilization criteria in different rice rotations in season 1.

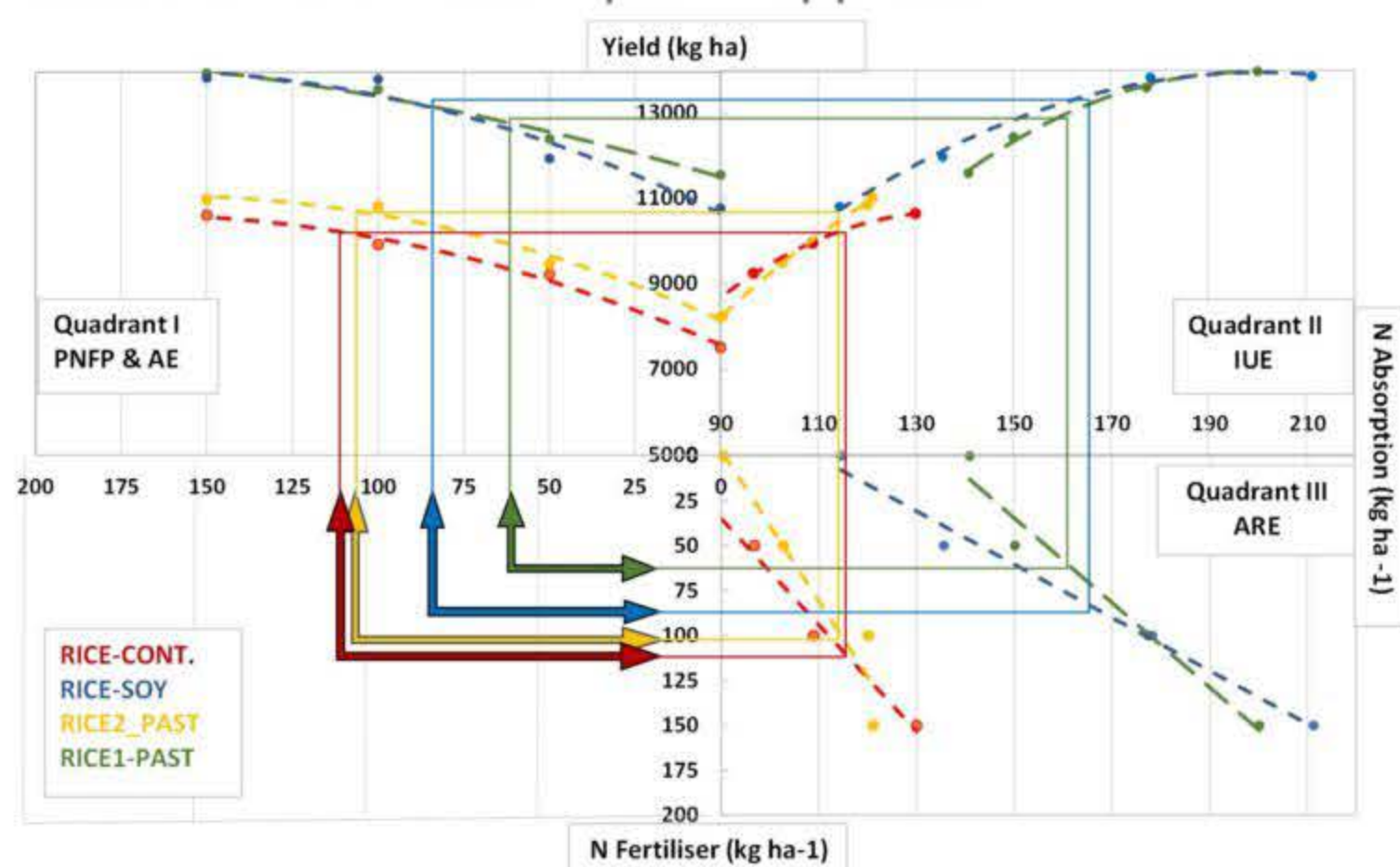


Figure 2. NUE metrics achieved by objective N fertilization criteria in different rice rotations in season 2.



Summary

Fertilization based on objective parameters appeared to be a useful tool, allowing for the combination of high yields with good NUE parameters in contrasting rice rotations and years.

Results

Based on objective N fertilization, 105, 95, 127, and 55 kg N ha⁻¹ would have been required in year 1 (**figure 1**), and 110, 84, 105, and 60 kg N ha⁻¹ in year 2, for RI-CONT, RI-SOY, RI2-PAST, and RI1-PAST, respectively (**figure 2**). For all situations and years, objective N fertilization achieved between **90 and 95%** of maximum yield and **PNFP (quadrant I)** and Internal Use Efficiency (**quadrant 2**) for the evaluated N dose range. Except for RI-CONT in year 2, **AE** was **maximized** with objective doses (**+40%**) (**quadrant I**), while Apparent Recovery Efficiency ranged between **85 to 95%** of the best recovery (**quadrant III**).

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