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## The implications of the intensification of a temperate rice-livestock rotation, in terms of nitrogen.

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The Uruguayan rice-livestock system is one of the most productive worldwide, adding meagre amounts of N as fertiliser and reaching a very tight nitrogen (N) balance (N-BAL), low N surplus (N-SUR) and a high system N use efficiency (NUE), being a good example of a circular economy system. Nevertheless, in the search for additional economic incomes, the system is now exploring more intensive rotations which could lead to altering the current status, regarding the environment in the current climate change scenario. Here, we assess three rice rotations: continuous rice (Ri-Ri), rice-soybean (Ri-Soy) and the business-as-usual rice-pasture-livestock rotation (Ri-Liv), in terms of N-BAL (N inputs minus N in food products), N-SUR (N inputs minus all N outputs) and NUE in percentage (N in food considering all the N inputs). We use productive, management and modelled records of the last nine years from a rice long-term experiment. While no differences in the N balance among rotations (8.5, 0.5 and -5.3 kg ha<sup>-1</sup> yr<sup>-1</sup>, for the Ri-Ri, Ri-Liv and Ri-Soy respectively) were found, the N surplus of Ri-Ri was higher (47.4 kg N ha<sup>-1</sup> yr<sup>-1</sup>) than the Ri-Soy and Ri-Liv rotations (14.7 and 11.6 kg N ha<sup>-1</sup> yr<sup>-1</sup> respectively). The N use efficiency was higher in the Ri-Soy rotation (98%) compared with Ri-Soy and Ri-Liv (64.4 and 67.5% respectively). The results show that the Ri-Soy rotation could be an alternative to the current Ri-Liv rotation, combining tight N balances and high NUE, minimizing negative environmental issues based on the N surplus value.

Castillo, J., Kirk, G.J.D., Rivero, M.J., Dobermann, A., Haefele, S.M., 2021. The nitrogen economy of rice-livestock systems in Uruguay. *Glob. Food Sec.* 30, 100566. <https://doi.org/10.1016/j.gfs.2021.100566>

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