Rice: a sustainable future for agriculture on peatland in NW Europe?

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Most peatlands in NW-Europe are used as intensively managed grasslands to feed dairy cows. Currently, drained peatlands are a major source of greenhouse gas emissions due to peat oxidation, a process causing land subsidence. Rewetting peatlands is generally seen as the way to make these systems part of the solution rather than part of the problem, for which paludiculture (wet agriculture) has been proposed as a key strategy.

In this project, we explore the potential of rice cultivation as a paludiculture crop in NW Europe, to strongly limit or even stop land subsidence, reduce net greenhouse gas emissions, and increase biodiversity. Moreover, since wetland rice cultivation benefits from higher temperatures, it is potentially also a climate adaptation option. Yet many questions remain unanswered in terms of the suitability of rice cultivation in NW Europe: can rice be cultivated successfully? what are the synergies and trade-offs with environmental objectives? which are the transition pathways that can introduce this novel crop?

In this contribution we will present results from two years of pilot experiments (2023 and 2024) with rice on peatland in the Netherlands that will provide some preliminary answers, and discuss future research plans. Screening early-flowering rice cultivars (n = 33) from Japan, Russia, China, and several other countries in both climate chambers and open field conditions has shown that rice cultivars suited to current climatic conditions of the Netherlands, and possibly beyond, exist.

In a four-year project that started this spring, we plan to further screen rice cultivars and optimize agronomy in field experiments on peatlands with contrasting soil characteristics, balancing yield and environmental objectives. We will closely monitor the effects of cultivation in two multiyear field experiments on emissions of CO_2, CH_4 and N_2O; measure N and P fluxes in water flows; quantify N, P and K balances at the field scale, and assess impacts of biodiversity at the landscape level. Measured plant growth parameters will then be used to calibrate the ORYZA model and map the suitability of rice cultivation across NW Europe under current and future climate conditions. Finally, we plan to evaluate the potential for transitioning and transforming the current (dairy-based) farming systems. We will host workshops with stakeholders and farmers and conduct semi-structured interviews with potential rice farmers to determine best entry points for a transformative systems change, identifying motivations and limitations for farmers to adopt rice or rice with fish as a component of their future farming system. Collectively, the project will further scientific understanding of the functioning of rewetted peatlands used for crop production, and provide an evidence base for informed decision making related to rice production in restored peatlands in NW Europe.