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Assessment of paddy rice management practices aiming water resources protection in the Lower Mondego Valley, Portugal

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Abstract. Rice crop sustainability requires better control of negative impacts on water resources. A study is underway in rice-producing companies of the Lower Mondego Valley (LMV), Portugal, within the scope of the PROMEDRICE project, focused on assessing Best Management Practices (BMP) – modern wet-sowing and continuous flooding, dry-seeding and delaying flooding, alternate wetting and drying, drainage water recirculation, and optimized fertilization plans – to safeguard water resources.

The field monitoring methodology utilized various forms and sensors of data collection, including agronomic practices, measuring paddies field water levels, water fluxes, and soil, applying water balance method. Comprehensive soil and water sampling protocols were implemented to assess the effect of crop practices, through electrical conductivity, nitrates and other parameters.

Land productivity results range from 4.4 to 7.0 tons/ha, the water productivity varied between 0.60 to 1.05 kg/m^3, the irrigation water use between 1200 and 1400 m^3/ha, with relative deep percolation and surface drainage around 33% and 30%. Regarding the effect of rice paddies on drainage water quality, there is generally a reduction in nitrates and salinity, indicating a positive impact of the crop on surface water quality. Regarding groundwater, the process is more complex, and the effects depend heavily on the local context of each farm and its interaction with upstream conditions.

This study provided a rational understanding of BMPs effects of rice cultivation on water resource quality, with a significant adaptation of cultivation practices to field conditions in each farm location. In general, it is concluded that the good practices applied minimize negative effects and ensure good soil and water conservation to guarantee long-term cultivation conditions.

Keywords: Rice irrigation, environmental sustainability, best management practices, control of water pollution, PROMEDRICE