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Environmental, economic and social sustainability of Alternate Wetting and Drying rice irrigation in Northern Italy

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Italy is the Europe's leading rice producer, with over half of total European production. The main rice area is in the north-western part of the country (Lombardy and Piedmont regions). In this area, irrigation of rice has been traditionally carried out by flooding; the introduction of alternative water-saving irrigation strategies could reduce water consumption, but their overall environmental and economic sustainability, as well as their social acceptability, should be investigated.

An experimental platform was set up in the core of the Italian rice district (Lomellina, PV) to compare different rice irrigation management options: wet seeding and traditional flooding (WFL), dry seeding and delayed flooding (DFL), wet seeding and alternated wetting and drying (AWD). Six plots of about 20 m x 80 m each were set-up, with two replicates for each irrigation option. One out of two replicates for each option was instrumented with: water inflow and outflow meters, set of piezometers, set of tensiometers and water tubes for the irrigation management in the AWD plots. Proper agronomic practices were adopted for the three management options. Periodic measurements of crop biometric parameters (LAI, crop height, crop rooting depth) were performed and rice grain yields and quality (As and Cd in the grain) were determined. Data measured in the field, together with those provided by the farmer, concerning the agronomic inputs and the economic costs incurred for the three irrigation options, were used to assess their economic and environmental sustainability through a set of quantitative indicators. Finally, through interviews with rice growers of the area, barriers to the adoption of the AWD technique were assessed and ways of overcoming them identified. In order to support water management decisions and policies, data collected at the farm level are extrapolated to the irrigation district level through a semi-distributed agro-hydrological model, used to compare the overall irrigation efficiency achieved implementing AWD when compared to WFL.