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FACTSHEET

PADDY RICE MANAGEMENT PRACTICES TO PROTECT WATER RESOURCES IN THE LOWER MONDEGO VALLEY: DRAINAGE WATER REUSE FOR IRRIGATION

WHAT IS WRD?

WRD – Water reuse from drainage ditches - allowing the nutrients recovery and conventional water saving through the recirculation of drainage water; this practice is feasible when de salinity of drainage water is low, requiring special care to avoid worsening soil salinity conditions and paddies water eutrophication; according to the nature of the water distribution network, usually it requires pumping from the drainage ditches; this practice can be applied to any of the practices mentioned previously, WFL - Improved wet seeding and continuous flooding, AWD - alternate wetting and drying flooding, or DFL - Dry seeding with delayed flooding. This Factsheet reports on the experimental study of the WRD carried on in Lower Mondego Valley.

EXPERIMENTAL SCHEME

Two Rice Pilot Farms were monitored during the period 2023-2025 (one applying WFL and another DFL), observing the field water level (FWL), irrigation depth, crop evapotranspiration, precipitation during crop season, and paddies surface drainage. The paddy water balance method was applied to calculate deep percolation. Crop monitoring and production measurements were conducted. Several physicochemical parameters were observed, such as electrical conductivity, ammoniacal nitrogen, and nitrates, being the layout of water monitoring at farm level presented in Figure 1. An example of irrigation pumping from a ditch, reusing drainage water, is presented in Figure 2.

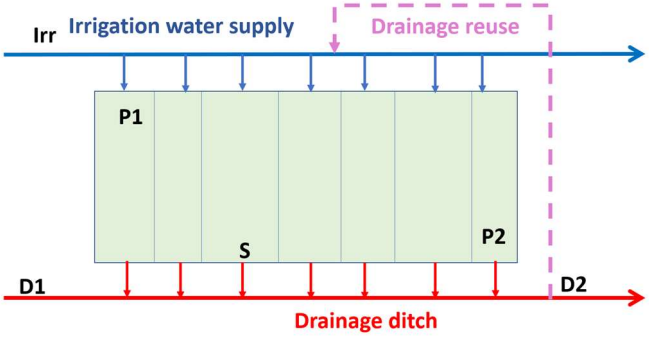


Figure 1 – Layout of water monitoring at farm level. Legend: Irr - irrigation depth, D1, D2 – upstream/ downstream, surface drainage ditch, P1, P2 – upstream/downstream subsurface water collected through piezometers 2.5 m depth, S = paddy surface drainage.

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Figure 2 – Example of irrigation pumping from a ditch, reusing drainage water

EFFECTS ON IRRIGATION WATER USE AND ON LAND PRODUCTIVITY

Results of water irrigation use are presented in Figure 3, and the values of yield or land productivity are presented in Figure 4, showing in both figures the average value per farm, and the average values of WRD.

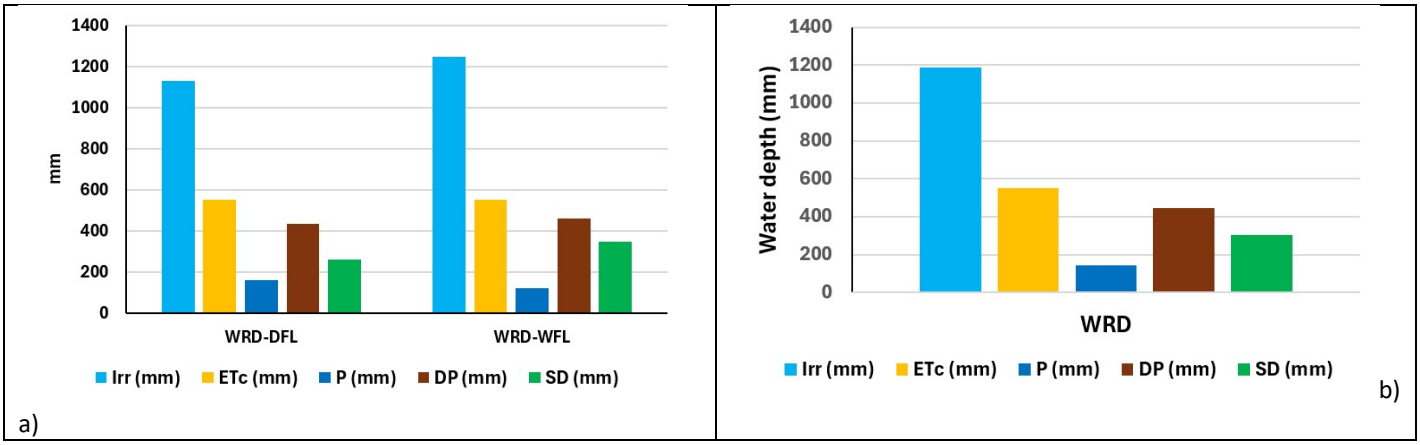


Figure 3. Water irrigation use: a) average values per farm; b) WRD average values. Legend: Irr – irrigation depth, ETc – crop evapotranspiration, P – precipitation during crop season, DP – paddies deep percolation, SD – paddies surface drainage

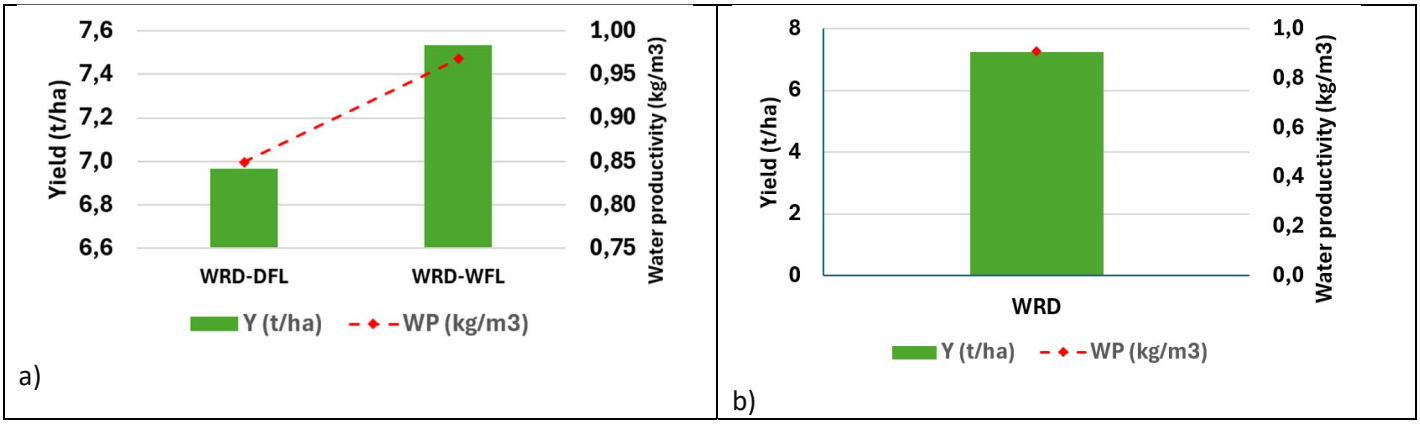


Figure 4. Yield and water productivity (ton/ha, whole grain 14% humidity): a) average value per farm; b) average values of WRD.

The seasonal irrigation depth of WRD – 1190 mm, was lower than the average WFL – 1370 mm. Being the reuse based on water pumping, farmers have a better control of water use to reduce energy costs. The average yield of 7.25 t/ha was higher than the WFL average, explained this difference by the relationship with farms location area, due to soil texture and quality, and microclimatic conditions.

EFFECTS ON NITROGEN WATER POLLUTION

Results effects on nitrogen water pollution are presented in Figure 5, showing the average value of nitrates and ammoniacal of WRD.

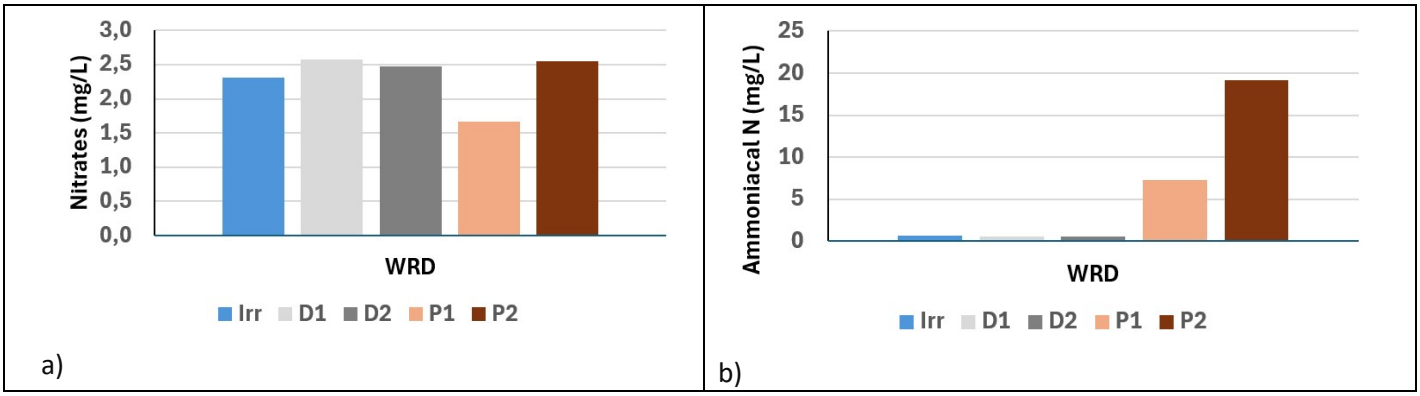


Figure 5. Average values of nitrates and ammoniacal of WRD.

It was observed that nitrates reduced slightly on surface drainage from upstream D1 to downstream D2, showing a beneficial effect of the rice paddy on SD. On the contrary, on subsurface water, the nitrate values increase from upstream P1 to downstream P2. It highlights the importance of better rationalizing nitrogen fertilization. Furthermore, reducing nitrates in surface drainage water mitigates the problem of contamination of downstream water resources. The ammoniacal nitrogen in irrigation water and surface drainage has very low values, and on the contrary, higher values were found in the subsurface water, increasing from upstream P1 to downstream P2, reflecting the effect of significant fertilization with ammoniacal nitrogen.

MANAGEMENT RECOMMENDATIONS

1. Carefully maintain soil preparation and precision land levelling practices, allowing for rigorous control of field water levels and water saving.
2. Monitor the electrical conductivity of irrigation and drainage water, especially in high-risk areas, to mitigate the negative effects of salinity.
3. The income of some nutrients (nitrogen and phosphorus) in irrigation water should be considered in fertilization calculation, since WRD allows its recovery.

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