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FACTSHEETS

RICE IRRIGATION MANAGEMENT UNDER DRY SEEDING, EARLY IRRIGATION CUT-OFF AND NO RUNOFF (DENR) IN BAIX TER (SPAIN)

This factsheet is based on field experiences carried out in the Baix Ter rice-growing district during the 2024 and 2025 cropping seasons within the PROMEDRICE project. The recommendations and data provided here may not be valid or directly applicable to other rice-producing regions.

Background and Context

Agricultural Traditional rice cultivation in the Mediterranean has relied on Wet Seeding and Flooding (WFL), which maintains a variable water layer throughout the cycle but requires high water consumption.
Persistent hydrological droughts in 2023 and 2024 led to significant water restrictions, pushing farmers in Baix Ter to adopt alternative strategies.
The DENR system was implemented across nearly the entire rice-growing area during the 2023– 2025 campaigns to optimize limited water resources.

The DENR Technique

The DENR system is defined by three main pillars designed to minimize non-productive water flows:

- **Dry Seeding: Unlike** WFL, flooding is delayed until approximately June, when rice has 3–4 leaves, significantly reducing early-season water use.
- **No Runoff:** Drainage is eliminated to conserve water within the field, except in specific cases where salts leaching is required.
- **Early Irrigation Cut-off:** Irrigation is stopped during the early stages of grain ripening, about one month before harvesting. This allows the remaining water to infiltrate, ensuring the soil is firm enough for heavy machinery to pass during harvest.

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Figure 1. Monitored DENR field in the Baix Ter.

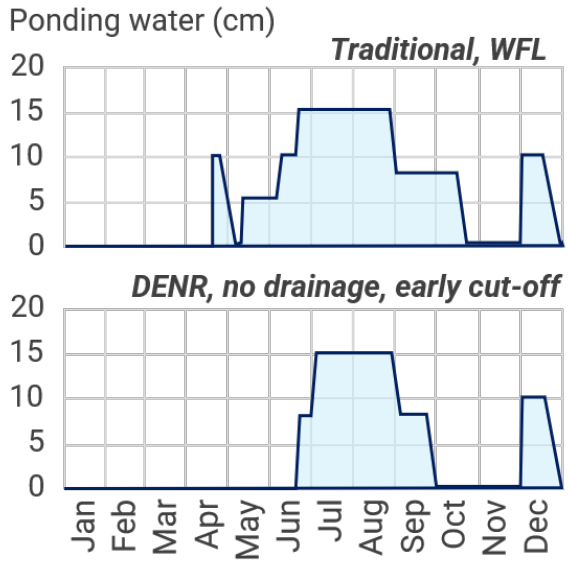


Figure 2. Ponded water level during the year in WFL and DENR irrigation techniques.

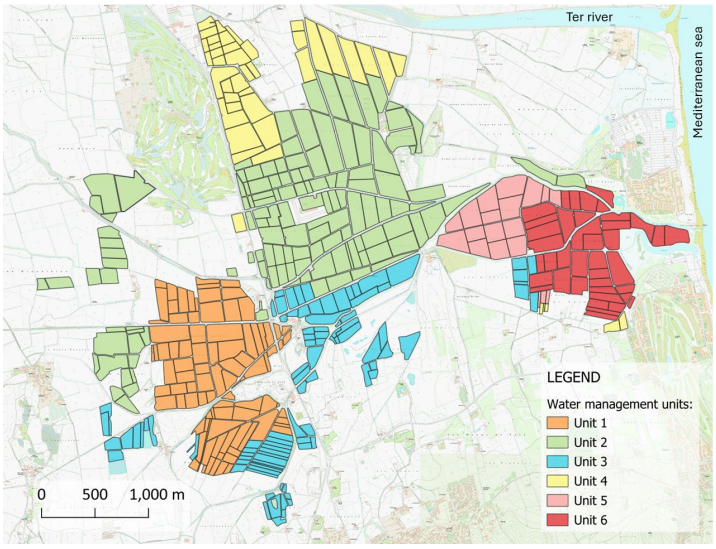


Figure 3. Water Management Units (WMU) in the Baix Ter rice irrigation district.

Figure 2 shows the water-layer depth in the WFL and DENR systems. In the WFL system, the field is flooded before sowing—typically in late April—and the water layer is maintained until harvest. In the DENR system, the field is flooded roughly one month after sowing, and irrigation terminates when the grain reaches physiological maturity. In both systems, an additional flooding event is carried out outside the growing season, around December, to allow soil puddling.

The depth of ponded water varies according to the crop's phenological stage, maintaining a maximum layer of 15 cm during the most sensitive phases, particularly flowering and grain filling.

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Water Management Units (WMU)

Water requirements depend strongly on soil texture, position within the irrigation district, and existing soil salinity. The the study area was divided into six Water Management Units (WMUs), each with distinct water needs:

- **Deep silty-clay-loam soils** with shallow water tables (WMU-1 and parts of WMU-3): **7,000-14000 m³/ha.**
- **Loamy sand to clay loam soils** (WMU-2 and WMU-4): **12,000-14,000 m³/ha.**
- **Saline loamy and sandy soils** influenced by seawater (WMU-5 and WMU-6): **12,000-20,000 m³/ha.**

Salinity Risks and Impact

Rice plants are sensitive to salinity. Under DENR, and especially during drought, the main salinity risks are:

- **Concentration of Salts:** Long irrigation intervals (up to 14 days) can cause the soil surface to dry, concentrating salts in the root zone
- **Critical Stages:** The vegetative and reproductive stages (particularly panicle initiation) are the most sensitive. In varieties like Bahia, salinity can cause yield drops of up to 30%
- **Observed Impact**: In July 2024, 35% of the district's surface exhibited ponded-water electrical conductivity (ECw) above the 2 dS/m threshold, a level associated with potential yield reductions. Combined with pyricularia outbreaks, this resulted in a 43% decrease in average district production in 2024 compared to a normal year.

Management Recommendations

To effectively manage salinity within a DENR system, the following practices are advised:

- **Monitoring:** Regularly measure the electrical conductivity of the ponded water layer (ECw).

- **Leaching Protocols:** If ECw approaches 2 dS/m, drain the surface water and apply a significant irrigation layer (~15 cm) using low-salinity water from the irrigation network (typically 0.6–0.8 dS/m).

- **Effectiveness:** Draining the field and applying these heavy irrigation layers with water of good quality can reduce root-zone salinity by up to 70%.

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