Safe alternate wetting and drying

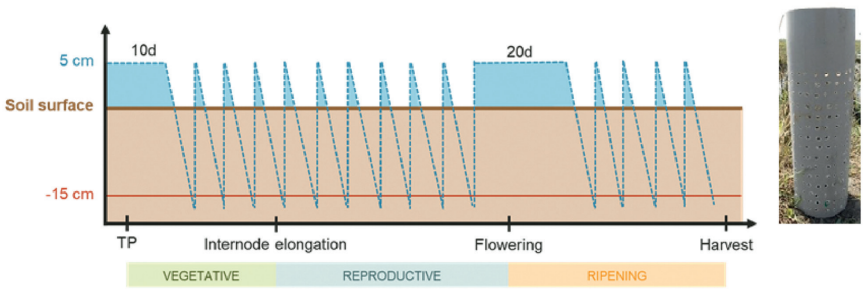
A water-saving irrigation technology that maintains rice yield and grain quality in irrigated systems

Introduction

Safe alternate wetting and drying (AWD) is a water-saving technology that enables irrigated rice cultivation with less water than the conventional practice of maintaining the field continuously flooded. Under Safe AWD, fields are subjected to intermittent flooding, where irrigation is interrupted and water is allowed to naturally drain until the water level drops to a certain depth (e.g. 15 cm) below the surface of the soil, after which the field is re-flooded. Safe AWD is suitable for irrigated rice systems where water scarcity is a major challenge. Safe AWD is not recommended for schemes with sandy soils and deep groundwater. It can be adopted by individuals or farmers' organizations and by national governments that aim to increase rice production in irrigated systems with reduced water use. Safe AWD has been validated in several West African countries, including Burkina Faso, Côte d'Ivoire and Senegal, and reduced water use by 15–43% and increased water productivity by 8–87% without significantly affecting rice yield compared to continuous flooding. Safe AWD also reduced methane emissions by 41% and the global warming potential of rice cultivation by 39%, compared to continuous flooding in Côte d'Ivoire. In irrigated systems, where lowland weeds are the most dominant, Safe AWD reduced weed biomass by 36%, and thus reduced the labor requirement for weeding. Important pre-conditions to achieve high yield and grain quality under Safe AWD include proper land leveling, and appropriate weed and fertilizer management practices. Under Safe AWD, water is allowed to percolate naturally until the water level drops to a certain depth below the soil surface, while under forced drainage, surface water is removed from the field to the canals.

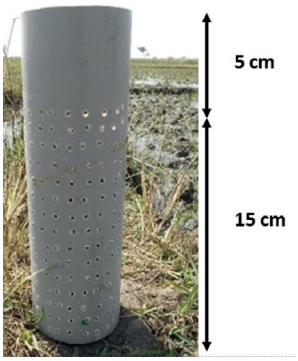
How to use Safe AWD

Perforated field water tubes are installed to a depth of 15 cm in the plot to monitor water depth. During the first 10 days after transplanting, field water depth is kept at 2–5 cm to suppress weeds and reduce transplanting shock. After this, the timing of irrigation is based on the water depth in the field water tube. When the water disappears from the tube, the plot is irrigated to a depth of 5 cm above the soil surface. At the flowering stage, the field is re-flooded, and thereafter the AWD cycles are repeated until 7 days before harvest.



Step 1: Installation of field water tube

- A field water tube should be made from plastic pipe and perforated with many holes on all sides, so that water can flow readily in and out of the tube. It should have a diameter of 10–15 cm so that the water table is easily visible, and it is easy to remove soil inside. Install the tube to a depth of 15 cm below the surface of the soil in the plot before transplanting or direct seeding. Use one perforated field tube in the center of each plot.



Step 2: Water management during the first 10 days after transplanting

- Maintain the field flooded during the first 10 days after transplanting.

Step 3: Irrigate intermittently based on water level in the field tube

- Monitor the water level in the field tube every 2 days, and irrigate to 5 cm whenever water disappears from the field tube.

Step 4: Flooding the field during flowering stage

- Maintain the field flooded during the flowering stage for 20 days.

Step 5: Irrigate intermittently based on water level in the field tube after flowering stage

- After the flowering stage until 7 days before maturity, monitor the water level in the field tube, and irrigate to 5 cm whenever water disappears from the field tube.

A farmer measuring the water level in the field tube

Additional information

Dossou-Yovo ER, Devkota KP, Akpoti K, Danvi A, Duku C and Zwart SJ 2022. Thirty years of water management research for rice in sub-Saharan Africa: Achievement and perspective. *Field Crops Research*, 283: art. 108548

Dossou-Yovo ER and Saito K 2021. Can management practices reduce weed infestation and increase water productivity, rice yield and grain quality in irrigated systems in central Côte d'Ivoire? *Field Crops Research*, 270: art. 108209.

Contact information

For further information, email Elliott Dossou-Yovo: e.dossou-yovo@cgiar.org