How to manage water

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Rice is typically grown in bunded fields that are continuously flooded up to 7−10 days before harvest.

Continuous flooding helps ensure sufficient water and control weeds.

Lowland rice requires a lot of water.

On average, it takes 1,432 liters of water to produce 1 kg of rice in an irrigated lowland production system. Total seasonal water input to rice fields varies from as little as 400 mm in heavy clay soils with shallow groundwater tables to more than 2000 mm in coarse-textured (sandy or loamy) soils with deep groundwater tables.

> Around 1300−1500 mm is a typical amount of water needed for irrigated rice in Asia. Irrigated rice receives an estimated 34−43% of the total world's irrigation water, or about 24−30% of the entire world's developed fresh water resources.

Worldwide, water for agriculture is becoming increasingly scarce. Due to its semi-aquatic ancestry, rice is extremely sensitive to water shortages.

To effectively and efficiently use water and maximize rice yields, the following good water management practices can be done:

STEP 1 Construct field channels to control the flow of water to and from your field

The construction of separate channels to move water to and from each field greatly improves the control of water by individual farmers.

Field channels allow water to be delivered to the individual seed beds separately and the main field does not need to be irrigated until it's time to plant in the main field.

In addition, the ability to control water to your field is important when you need to retain water (especially after applying fertilizer so nutrients are not lost) or when you need to drain the field for harvest.

Construction of individual field channels is the recommended practice in any type of irrigation system.

STEP 2 Prepare the land to minimize water loss and create a hard pan

Large amounts of water can be lost during land soaking prior to puddling when large and deep cracks are present due to drainage of water down the cracks, beyond the root zone.

Till the soil to fill cracks

Perform shallow tillage operations before land soaking. This fills in the cracks and can greatly reduce the amount of water used in land preparation.

Puddle the field to reduce water loss

- For clayey soils that form cracks during the fallow period, puddling results in a good compacted hard pan
- For coarse sandy soils, puddling may not be effective
- For heavy clay soils, puddling may not be necessary to reduce water losses because of the low infiltration rate of such soils; however, puddling may still be necessary if the soil was cracked prior to primary tillage, if weeds are present prior to transplanting, or if the soil is too hard or cloddy for transplanting after soaking

Despite reducing water loss, the action of puddling itself consumes water. There is a trade-off between the amount of water used for puddling and the amount of water "saved" during the crop growth period because of a compact hard pan.

> Wet land preparation can consume up to a third of the total water required for growing rice in an irrigated production system.
>
> If water cost or availability at the time of crop establishment is a concern, consider dry land preparation which uses considerably less water than wet land preparation.

Minimize time between operations to reduce water use

In some canal irrigation systems, the period of time between land soaking for land preparation and planting can be up to 40 days. To minimize time between operations:

- install field channels
- use common/community seed beds

- plant nearby fields at the same time, or
- practice direct wet seeding

STEP 3 Level the field

A well-leveled field is crucial to good water management. An unleveled field requires an extra 80−100 mm of water to give complete water coverage. This is nearly an extra 10% of the total water requirement to grow the crop.

Most fields need to be plowed twice before you can level. In wet land preparation, the second plowing should be done with standing water in the field to define high and low areas.

Read: Leveling implements | Laser leveling

STEP 4 Construct bunds and repair any cracks or holes

Good bunds are a prerequisite to limit water losses. Bunds should be well compacted and cracks or rat holes should be plastered with mud at the beginning of the crop season to limit water loss.

Bunds should be high enough (at least 20 cm) to avoid overflowing during heavy rainfall.

Lower levees of 5−10 cm height in the bunds can be used to keep the ponded water depth at that height. These levees can be heightened with soil when more stored water is needed.

Read: How to construct bunds

Different crop establishment methods require different water management practices:

For continuous flooding

Continuous flooding of water generally provides the best growth environment for rice.

After transplanting, water levels should be around 3 cm initially, and gradually increase to 5−10 cm (with increasing plant height) and remain there until the field is drained 7−10 days before harvest.

For direct wet seeded rice, field should be flooded only once the plants are large enough to withstand shallow flooding (3-4 leaf stage).

For safe Alternate Wetting and Drying

Transplanting

Alternate Wetting and Drying (AWD) can be started a few weeks (1-2) after transplanting. Irrigate and then allow the water depth to drop to 15 cm below the surface using a field water tube (pictured to the right) to monitor the water level depth. Once the water level has dropped to 15 cm below the surface, re-flood the field to a depth of 5 cm above the surface and repeat. From one week before to one week after flowering, the field should remain flooded. After flowering, during grain filling and ripening, the water level can drop to 15 cm below the surface before re-flooding.

When many weeds are present, AWD should be post-poned for 2-3 weeks to assist suppression of weeds by ponded water and to improve the efficacy of herbicide.

Policy brief: AWD reduces green house gas emissions and saves water

Direct seeded rice

Keep the soil moist but not saturated from sowing till emergence, to avoid seeds from rotting in the soil.

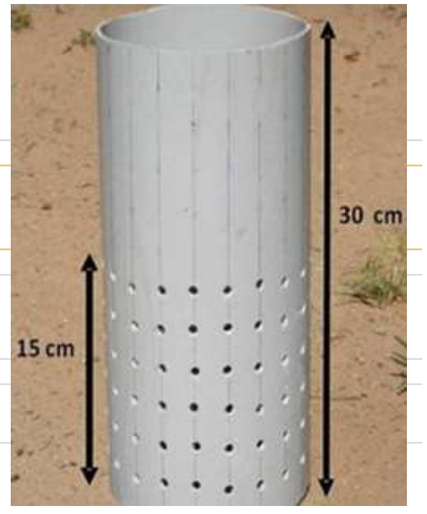
After sowing, apply a flush irrigation to wet the soil, if there is no rainfall.

Saturate the soil when plants have developed three leaves, and then follow the safe Alternate Wetting and Drying practices as described above.

Read: Direct seeding

Lowland rice is extremely sensitive to water shortage (below saturation) at the flowering stage. Drought at flowering results in yield loss from increased spikelet sterility, thus fewer grains.

Keep the water level in the fields at 5 cm at all times from heading to the end of flowering.



In case of water scarcity, apply water-saving technologies such as Alternate Wetting and Drying (AWD) and consider changing planting method from puddled transplanting to non-puddled transplanting or dry-direct seeding.

Fact sheets: Aerobic Rice | Alternate Wetting and Drying (AWD)
FAQ: What's the difference between dry seeded rice (DSR) and aerobic rice?

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