PRACTICAL ACTION
Technology challenging poverty

technical brief

RICE CULTIVATION USING ALTERNATE WET & DRY IRRIGATION (AWDI)

This brief describes the 'Alternate Wet and Dry Irrigation (AWDI)' technique that can be used to cultivate rice using less water

Introduction

Rice is one of the leading food crops in the world and is reported to feed nearly half of the world's population. Rice grows best in the abundant water environment and this differentiates rice from other important crops. There are four generally recognized cultivation practices: irrigated, flood-prone, rainfall lowland and upland. Paddy (or irrigated) rice growing is the most common approach and uses continuously flooded field. However, water resources are becoming increasingly scarce. Industrial and urban demands are increasing in addition to the agriculture demands. Therefore, it is essential to develop and adopt practices and strategies that will use water efficiently in irrigation schemes, especially in countries with the higher rice demand, low rice yields and competition for limited water resources. There is a growing interest in finding better ways to grow rice with less water.

One such strategy referred to as 'alternate wet-dry irrigation' (AWDI) is increasingly being used in the parts of Asia. The AWDI of rice cultivation uses water efficiently (or increases water use efficiency in irrigation schemes).

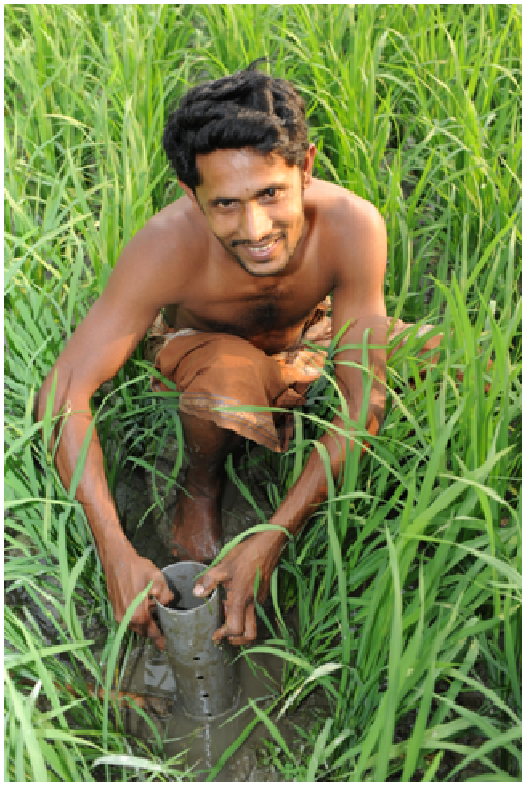

Figure 1: Setting alternative wetting and drying (AWD) pipe in a rice field.
Photo credit: Zul Mukhida / Practical Action.

Rice cultivation using alternate wet and dry irrigation (AWDI)

In the recent years, this practice has shown that it is possible to reduce consumption of water without yield loss. In addition to the water saving potential, there are other benefits of AWDI such as improved irrigation efficiency, great effects on the soil nutrients, aeration and microclimatic condition and potential human health benefits (E.g. producing more rice with less water could reduce vector-borne disease outbreaks, traditionally associated with rice cultivation), cost savings (as a result of reduced irrigation cost) and reducing energy crisis.

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The AWDI implies that rice fields are allowed to dry intermittently during the rice growing stage rather than keeping the fields continuously submerged. Farmers can adapt their AWDI practices to fit the soil type and availability of water and labor.

In AWD systems, flush irrigation is used to supplement rainfall as required. The field is alternately flooded and non-flooded. This may be for the whole growing season or strategically for the part of the season. The AWDI involves flooding the field (after a certain number of days have passed) using irrigation water after the disappearance of ponded water. The number of days of non-flooded soil can vary from 1 to more than 10 days.

It is believed that continuous submergence is often practiced to control weeds, thus minimizing the use of herbicide and reducing the labor for weeding. However, the amount of labor spent for these activities could be smaller in magnitude than those spent for other rice production activities.

There are a few issues that can affect the implementing of AWDI such as little water control and lack of a reliable water source. However, farmers can increase yields while reducing water demand by combining AWDI with SRI (system of rice intensification) cultivation practices, described in the Intensive Rice Cultivation technical brief.

How to implement AWDI?

- Using the field water tube, monitor the water depth in the field
- After an irrigation application, the depth of ponded water will gradually decrease over time. When the water level drops to 15 cm below the soil surface, apply irrigation and flood the soil with a depth of around 5 cm
- Around the time of flowering, ponded water should always be kept at 5 cm depth (to avoid any water stress that could result in yield loss) from 1 week before to 1 week after the peak of flowering.
- After flowering, during grain filling and ripening, the water level can drop again to 15 cm below the surface before re-irrigation
- AWDI could be started a few days after transplanting (or with a 10 cm tall crop in direct seeding)
- If many weeds are present, AWDI can be postponed for 2-3- weeks until weeds have been suppressed by ponded water

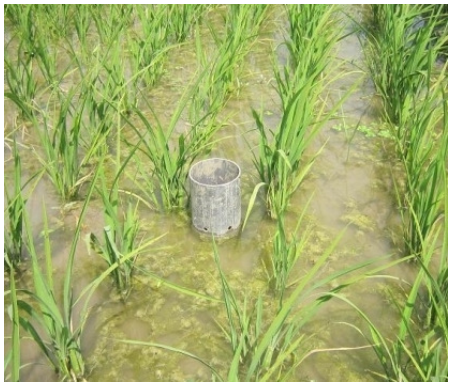

Figure 2: A field tube under flooded conditions. Photo credit: Practical Action.

The threshold of 15 cm water depth (below the surface) before irrigation is called 'Safe AWD" as this will not cause any yield decline (since the roots of the rice plants will still be able to take up water from the saturated soil and the perched water in the root zone).

In AWD, water savings are in the order of 15%, without any yield penalty. After creating confidence, farmers may experiment by lowering the irrigation threshold level to to 20, 25, 30 cm depth, or even deeper. Lowering the irrigation threshold level will increase the water savings; some yield penalty may be acceptable when the water is scarce or when the price of water is high. The groundwater in many irrigated areas is very shallow and may reach into the field water tube.

technical brief

The field tube installation

The filed tube can be made of plastic pipe or bamboo (40 cm long and a diameter of 15 cm or more so that the water table is easily visible). Perforate the field tube with holes on all the sides. The field tube can be placed on a flat part of the field close to a bund. This makes it easy to monitor the depth of ponded water.

Installation

- Push the field tube (so that 20 cm protrudes above the surface of the soil) vertically by hand
- Do not penetrate through the bottom of the plow pan
- Drive cylinder using a mallet
- Check clearance from the soil surface
- Ensure that the water table inside the field tube is the same as outside the tube
- Remove the soil inside the tube so that the bottom of the field tube is visible
- Check and level the top of the tube

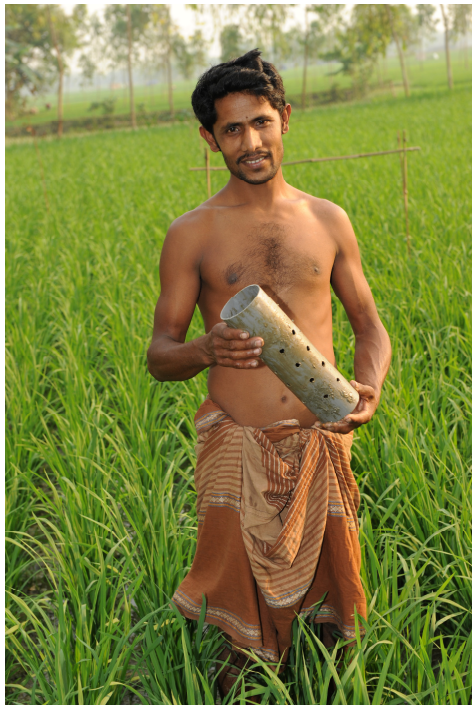

Figure 3: A field tube before installation. Photo: Zul Mukhida / Practical Action.

References

- Bouman B.A.M., Lampayan R.M., and Tuong T.P. 2007. *Water Management in Irrigated Rice: Coping with Water Scarcity*. International Rice Research Institute. Los Baños, Philippines, Los Baños
- McHugh O. V, Steenhuis T.S, Barison J., Fernandes E.C.M. and Uphoff N. T. 2002. *Farmer implementation of alternate wet-dry and nonflooded irrigation practices in the System of Rice Intensification (SRI). In: Water-Wise Rice Production: Proceedings of the International Workshop on Water-Wise Rice Production,* 8-11, 2002, Los Baños, Philippines
- Van der Hoek, W., Sakthivadivel, R., Renshaw, M., Silver, J.B., Birley, M.H. and Konradsen, F. 2001. *Alternate Wet/Dry Irrigation in Rice Cultivation: A Practical Way to Save Water and Control Malaria and Japanses Encephalitis?* Research report no. 47, International Water Management Institute, Sri Lanka.
- Vial L. K., (2007), *Aerobic and Alternate-Wet-and-Dry (AWD) Rice Systems*. A report for Nuffield Australia farming scholars

Further information

- http://practicalaction.org/intensive-rice-cultivation
- http://practicalaction.org/adapting-rice-to-saltier-conditions-1
- http://www.knowledgebank.irri.org/factsheetsPDFs/watermanagement_FSAWD3.pdf
- http://www.knowledgebank.irri.org
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- http://www.lk.iwmi.org/Test/CD/pub/pubs/Proceedings/Water-SavingIrrigation/pdf/Chapter5.pdf
- http://www.cabi.org/GARA/FullTextPDF/2009/20093019324.pdf

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Rice Cultivation Using Alternate Wet & Dry Irrigation was written by Amruta Khatavkar for Practical Action, July 2012.

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