The majority of rice production involves growing the crop in flooded fields, but this method is not necessary for cultivation. While flooding fields is an effective way to reduce weeds and other pests, using fresh water for rice cultivation diverts this limited resource away from other uses. Given the estimate that rice cultivation under flooded conditions uses 30 to 45% of the world’s fresh water, finding ways to reduce water use to grow rice could have a big impact on access to this resource.

Some researchers are evaluating the costs and benefits to growing rice under aerobic conditions where rice is grown in unsaturated soil. Aerobic cultivation relies upon precipitation, and irrigation where needed, and uses less water to grow the crop. Water loss can be reduced even more with the use of drip irrigation systems. Drip irrigation enables the precision application of water and fertilizer and limits evaporation. Using drip irrigation in rice is a relatively new management approach, and the best management practices for these systems are not well understood. In a recent article in Agronomy Journal (https://doi.org/10.2134/agronj2018.01.0002), researchers interested in reducing water use for rice production evaluated conventional aerobic cultivation and drip irrigation systems.

The field trials were conducted in 2012 and 2013 at Tamil Nadu Agricultural University, Coimbatore, India. Theivasigamani Parthasarathi, a member of ASA, conducted this research as part of his doctoral degree. The experiment compared conventional aerobic cultivation to a series of drip irrigation treatments. The drip treatments included combinations of three lateral distances (0.6, 0.8, and 1.0 m), two dripper discharge rates (0.6, 1.0 liter per hour), and two irrigation methods (surface and 15-cm subsurface). Rice yield, plant growth, root length, and physiological and leaf gas exchange factors were measured.

In general, the use of drip irrigation resulted in 50% water savings and a 29% increase in rice yield compared with aerobic cultivation. Of the 12 drip irrigation treatments, the subsurface drip laid out at a 0.8-m lateral distance with a 1.0 L h⁻¹ dripper discharge irrigation system had the best performance in terms of growth, physiology, and rice yield. Drip irrigation appears to increase the length and density of roots, which subsequently increase aboveground growth.

Parthasarathi notes there is a two-fold increase in water productivity of aerobic rice under drip irrigation. “This concept could be widely propagated wherever rice is being cultivated under well irrigation sources or where groundwater categories are classified as overexploited and exploited,” he says. “Drip-responsive rice genotypes could be developed, and this is one of the future lines of research in rice variety development.” This could lead to even greater gains in rice yields and further incentivize farmers to change their cultivation system.

Demonstrating the potential for high performance using drip irrigation is encouraging for growers considering in investing in new technology and methods to reduce water use. While there are upfront costs to install drip irrigation systems, the technology is compatible with other crops. “The best lateral distance of 0.8 m is suitable to most vegetables and rice crops as well as more economical in system design and cost perspective,” Parthasarathi says. Therefore, growers can not only improve their rice cultivation system, but can utilize the fields for other crops, keeping them in production rotation.

Drip Irrigation in Rice

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1 Humphreys et al., 2010. See https://bit.ly/2L9LH9p
• Rice is typically grown under flooded conditions but can be grown in unsaturated soils to reduce the use of freshwater resources.
• Researchers in India compared conventional irrigation to drip irrigation systems for rice cultivation.
• Drip irrigation had 50% water savings and a 29% increase in rice yield compared with conventional dryland cultivation.

Dig Deeper

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