



RESEARCH PAPER

Land gradient and configuration effects on yield, irrigation amount and irrigation water productivity in dry direct seeded rice and non-puddle transplanted rice in cauvery delta zone

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Abstract : Field experiments were conducted in two different locations in the Cauvery delta zone - viz., old delta at Tamil Nadu Rice Research Institute (TRRI) Aduthurai, and new delta at Soil and Water Management Research Institute (SWMRI), Kattuthottam, Thanjavur. Laser levelling with 0% gradient significantly reduced irrigation amount and/or increased irrigation water productivity (WPI) in all crops/systems grown on the flat compared to farmer leveling practice. However, water advancement rate in farmer's field generally very low because of flat configuration and or sub – optimal flow rate, resulting in high rates of drainage below root zone, more so at the head end of the field than tail end because of longer period of flooding of soil surface at the head end. It is hypothesized that formation of a uniform gradient from the head to tail end of the field increase the water advancement rate, reduce irrigation input and increase irrigation water productivity. Experiments were conducted during *Kharif (Kuruvai)* 2014, late *Samba* 2014 - 15 and *Kharif (Kuruvai)* 2015 at TRRI, Aduthurai and during early *Kuruvai* 2014, *Samba* 2014 - 15 and early *Kuruvai* 2015 at SWMRI, Kattuthottam, Thanjavur to evaluate the effect of land gradient on water and rice crop and water productivity. The experiments were laid out in Randomized Complete Block Design (RCBD) with three land slope treatments in which three observations are taken on each plots (16 m x 50 m) (at the head, middle and tail of the plot) and three replications (blocks) in dry direct seeded rice (DSR) and non – puddle machine transplanted rice (NPTR). The slopes studied are T_1 - 0.0 per cent slope, T_2 - 0.1 per cent slope (5 cm gradient in 50 m run) and T_3 - 0.2 per cent slope (10 cm gradient in 50 m run) with precise leveling. Short duration (100 – 110 d) rice variety ADT (R) 45 was raised as a test variety in the field experiments conducted during early *Kuruvai* and *Kuruvai* seasons in both the experimental sites. For *Samba* / late *Samba* season, long duration (135 – 150 d) rice variety CR 1009 was used in both the experimental sites. With regard to different slope gradients, it was worked out as 2159 litres as water requirement to produce 1 kg of rice under 0.1 per cent slope as against 2566 litres in 0.0 per cent slope across the seasons which indicated a water saving of 407 litres (15.8%) of water per kg of rice at Aduthurai location, whereas it was 661 litres (20.7%) at Thanjavur experimental site. The results further suggested that the effect of land slope gradients was explicitly pronounced more in the sandy loamy soils as compared to clayey loamy soils.

Key Words : Precision laser land leveling, Slope, irrigation schedule (stingray flow meter), Soil water tension (tensiometers), Dry direct seeded rice, Non – puddle machine transplanted rice, Grain yield, Total water use, Water use efficiency, Water productivity.

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