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Evaluation of Water Saving Rice Production Systems in Krishna Western Delta of Andhra Pradesh

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ABSTRACT

Different low land rice production systems have been studied in the farmer's field at Chintalapudi village, Guntur district of Andhra Pradesh for their grain yield and water use efficiencies during kharif 2004. System of rice intensification (SRI) recorded highest grain yield (8380 kg ha^{-1}) followed by semi-dry Rice (650 kg ha^{-1}) and rotation system of irrigation (6420 kg ha^{-1}) when compared with farmer's practice of growing rice with continuous flooding (6250 kg ha^{-1}). SRI also resulted in 34% yield advantage with 26% of irrigation water saving over farmer's practice of flood irrigation.

Key words : Evaluation, Rice, Systems, Water saving

Agriculture is the largest water user in most river basins where irrigated rice forms the main activity. In many irrigation projects the competition for water is increasing day by day. Hence the intensive water use in traditional wet rice cultivation comes into question. Under this scarce water situaiton, water saving irrigation technologies such as rotational system of irrigation, semi-dry rice and system of rice intensification (SRI) are receiving greater attention by the indivdiuals and Government. These technologies reduce water input with similar or slightly higher yields and there by becoming popular among farmers in some parts of Asia who confornt scarcity of water or high cost of water. However no systematic research on these systems appears to have been conducted to understand the performance of water saving rice systems and to advocate adoption of such systems in Andhra Pradesh. Hence the study was conducted to identify the best economically viable water saving rice production system with higher grain yield and water use efficiency suitable to Krishna Western Delta command of Andhra Pradesh.

MATERIAL AND METHODS

An experiment was conducted in the farmers field at Chintalapudi, Guntur district, Andhra Pradesh during *kharif* 2004-2005 with 5 rice production systems. The soil was clay loam in texture with a pH of 7.6 and ECe varying from 0.57-0.74dS m^{-1}. The treatments include T_1-Transplanting with farmers method of irrigation (continuous flooding), T_2-Transplanting with rotational irrigation (irrigation once in 48 hours after disappearance of 5cm depth of water), T_3-Semi dry rice (dry seeding, initially grown as rainfed crop & as and when water is available in canlas, i.e, 50days after sowing the crop was converted into wet with rotation irrigation upto panicle initiation), T_4-Semi dry rice (dry seeding, initailly grown as rainfed crop & as and when water is avilable in canals i.e 50 days after sowing the crop was converted into wet), T_5 - System of rice intensification (planting with younger seedlings of eight days old, field saturation upto panicle initiation stage there after 5cm depth of irrigation water). BPT-5204 was the test variety (long duration) sown on same day for all the treatments (10.07.2004). In treatments 1&2, 25 days old seedlings were transplanted at a spacing of 20cm x 15cm and in treatments 3&4 dry seed was sown @ 50 kg ha^{-1} by adopting 22.5cm spacing between two rows while 8day old seedlings were transplanted in T_5 at a spacing of 25cm x 25cm. In case of SRI weeding was done with rotary weeder while manual weeding was adopted in other treatments. Fertilizer application, plant protection and other operations were common to all the treatments and adopted as per the recommendations. A Rain gauge and water meter were installed near the experimental plot to measure the amount of rainfall received and also the quantity of irrigatiobn water applied through bore well during the crop growth period to each treatment. Data on crop yield, rainfall and depth of water given through bore well during the crop growth period were recorded. Finally water use efficiency and benefit cost ratios for all the treatments were calculated.

Table 1 Grain yield, depth of water applied, water use efficiency and benefit cost ratio as influenced by different rice production systems.

Rice Production systems	Grain yield kg ha^{-1}	Amount of water applied through irrigation and rainfall (mm)	Water use efficiency (kg ha^{-1} mm)	Benefit cost Ratio
T_1-Farmers' practice with continuous flooding	6250	1209	5.2	0.85
T_2-Farmers' practice with rotational irrigation	6420	1063	6.0	0.91
T_3-Semi-dry paddy with rotational irrigation	6580	1026	6.4	1.23
T_4-Semi-dry paddy converted in to wet	6500	1099	5.9	1.21
T_5-System of Rice Intensification (SRI)	8380	969	8.6	1.45

RESULTS AND DISSCUSSION

The results presented in Table-1 indicated that, SRI (T_5) cultivation of rice registered higher grain yield (8380 kg ha^{-1}) compared to other treatments. However the semi dry cultivation of rice (T_3 & T_4) also registered equal or slightly higher grain yield over farmers practice (T_1) due to more number of plant population per unit area in spite of less number of productive tillers per hill. The higher grain yield with SRI cultivation can be attributed to rotary weeding, keeping the moisture condition of the field at saturation level, better aeration and optimum utilization of nutrients which helped the plant to put forth better root system and plant growth there by more number of productive tillers, more panicle length and filled grains over other systems. Similar positive results with SRI cultivation over traditional farmers practice were also reported by Abu Yamah (2002) and Bruno Andrianaivo (2002).

SRI utilized less quantity of 969 mm water (through irrigation and rainfall) compared to other treatments during the crop growth period. The per cent of water saving through irrigation in T_5, T_4, T_3 and T_2 over T_1 was 26, 12, 20 and 16 respectively. Bhagat *et al* (1999) reported 40% water saving with moisture level at field saturation point compared to continuous shallow ponding with similar yields. Higher Water Use Efficiency (8.6 kg ha^{-1}mm) was recorded with SRI cultivation followed by semi dry rice (6.1 kg ha^{-1} mm) compared to farmers practice (5.2 kg ha^{-1} mm). Similar results of higher water use efficiency and water saving was reported by Raju *et al* (1992) with saturation level of moistrue and alternate drying and wetting. However, transplanting with rotational irrigation and semi dry rice also resulted in high water use effeciency compared to farmers' practice (T1). Similarly higher Benefit Cost ratio was also observed with SRI cultivation (1.45) compared to other treatments.

From the results it could be concluded that the System of Rice Intensification registered higher grain yield with higher water use efficiency and is economically viable compared to the traditional system of rice cultivation. However, semi dry rice and rotational system of irrigation were also found to give similar or slightly higher grain yield with higher water use efficiency when compared to farmers' practice of rice cultivation in Krishna Western Delta Command area of Andhra Pradesh.

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