Water Productivity Under Different Puddling Intensities and Organic Amendments in SRI Method of Rice Establishment

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OBJECTIVE

To evaluate Water productivity (kg m^{-3}) of rice as influenced by puddling intensities and treatment combinations of rice establishment methods and organic amendments

PUDDLING INTENSITY

After dry ploughing of land, construction of 1 m wide peripheral buffer bunds around plots of 12.5 m^2 area (5m x 2.5 m) and application of 10cm irrigation, the following puddling levels were affected:

P_1 = Zero pudding: wet-ploughing through one pass of 11-tyne tiller

P_2 = Conventional puddling: Farmer's practice = wet ploughing through two passes of tiller followed by planking.

P_3 = Medium puddling: Two passes of Paddy Puddler (8 ft Agriking) followed by planking.

P_4 = Thorough puddling: Four passes of Paddy Puddler (8 ft Agriking) followed by planking.

ESTABLISHMENT METHODS & ORGANIC AMENDMENTS (S / T)

T_1 = Conventional transplanting of 25 day-old seedlings, with two seedlings per hill & spacing of 20cm x 15cm with 7cm depth of irrigations (deficit irrigation) at 8-day frequency

T_2 = Same as T1, but with application of 3000 kg FYM ha-1, after affecting puddling treatments.

S_1 = SRI methodology of establishment i.e. transplanting of 10 day-old seedlings (single-seedling per hill & spacing of 25cm x 25cm) with 3000 kg FYM ha^{-1} with 5cm irrigation at 8 day frequency to plots after affecting puddling treatments.

S_2 = Same as S1 but replacing FYM with 3000 kg ha^{-1} wheat bhusa (chopped straw).

Table : Physico-chemical Characteristics Of Soil At The Experimental Site

Soil depth	Sand (%)	Silt (%)	Clay (%)	pH	EC (dSm^{-1})	Organic carbon
	International pipette method (Day, 1965)			Potentiometry (Jackson, 1973)	Conductimetry (Jackson, 1973)	Rapid titration method (Walkley & Black, 1934)
0-20 cm	32	34	34	7.62	0.029	0.58
20-40 cm	30	28	42	7.81	0.027	0.41

Table : Bulk Density, Field Capacity, Permanent Wilting Point and Available Water Range

Soil depth	Bulk density ($Mg\ m^{-3}$)	Field capacity		Permanent wilting point		Available water range (cm)
		% w/w	%v/v	%w/w	%v/v	
0-10 10-20	1.54 1.56	26.0	40.3	7.8	12.1	28.2
20-30 30-40	1.66 1.56	27.0	43.5	7.5	12.1	31.4

Volumetric water content in (0-20) cm layer at 50% available water = 26.2% (52.4mm/200mm)
Volumetric water content in (20-40) cm layer at 50% available water = 27.8% (55.6mm/200mm)

Water productivity (kg m^{-3}) =

$$\frac{\text{Grain yield in kg } ha^{-1}}{\text{Total water consumed in } m^3 ha^{-1}}$$

Treatments	P_1	P_2	P_3	P_4	S/C Mean
S_1	0.1191	0.1233	0.1758	0.1395	0.1400
S_2	0.1223	0.1401	0.1680	0.1334	0.1396
C_1	0.1363	0.1535	0.2216	0.1528	0.1855
C_2	0.1556	0.1666	0.2141	0.1476	0.1522
P_i –Mean	0.1333	0.1459	0.1433	0.1543	
$CD_{5\%}$	S/C	0.0212		$\mathbf{CV_a}$	21.36%
	P_i	NS		$\mathbf{CV_b}$	20.29%
	P_i x S/C	NS			

WATER PRODUCTIVITY (KG m^{-3}) OF RICE AS INFLUENCED BY PUDDLING INTENSITIES AND TREATMENT COMBINATIONS OF RICE ESTABLISHMENT METHODS AND ORGANIC AMENDMENTS, *KHARIF* 2006

Treatments	P_1	P_2	P_3	P_4	S/C Mean
S_1	0.2009	0.184	0.1692	0.184	0.1845
S_2	0.1829	0.1935	0.2009	0.1749	0.1881
C_1	0.1619	0.1898	0.1802	0.1811	0.1782
C_2	0.1747	0.1872	0.1559	0.1875	0.1763
P_i –Mean	0.1801	0.1886	0.1766	0.1818	
$CD_{5\%}$	S/C	NS		$\mathbf{CV_a}$	**19.93%**
	P_i	NS		$\mathbf{CV_b}$	**15.47%**
	P_i x S/C	NS			

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Treatments	P_1	P_2	P_3	P_4	S/C Mean
S_1	0.1887	0.2075	0.2187	0.2046	0.2049
S_2	0.1797	0.1866	0.225	0.1814	0.1932
C_1	0.1791	0.208	0.1826	0.1800	0.1874
C_2	0.1676	0.1862	0.1609	0.2016	0.1791
P_i –Mean	0.1788	0.1971	0.1968	0.1979	
$CD_{5\%}$	S/C	NS		$\mathbf{CV_a}$	**17.00%**
	P_i	NS		$\mathbf{CV_b}$	**15.65%**
	P_i x S/C	NS			

WATER PRODUCTIVITY (KG m^{-3}) OF RICE CULT. BASMATI-370 AS INFLUENCED BY PUDDLING INTENSITIES AND TREATMENT COMBINATIONS OF ESTABLISHMENT AND ORGANIC AMENDMENT, *KHARIF 2008*

CONCLUSION

- The organic sources of plant nutrients in the form of compost/decomposed or decomposable biomass as well as incorporation of weeds into soil under SRI system of aerobic rice cultivation would add to this maintenance of ideal soil physical environment, continued into and throughout the succeeding wheat crop
- The new system of rice intensification (SRI) method of aerobic cultivation of rice, has a potential of saving further 29% of irrigation water used under deficit irrigation schedule (deficit irrigation saves 50% of water used under flooding method of irrigation)
- In order to surmise/notice the positive, synergistic impact of aerobic rice culture of SRI method, it takes two to three seasons
- SRI method of rice cultivation has higher water use efficiency
- There is no need of soil puddling as a pre-requisite for establishment of rice on the clay loam soils of sub-tropical plains
- Dry ploughing & wet ploughings to soften the seed bed for the ease of transplanting should suffice

Thanks