

Effect of stand-establishment techniques on yield and economics of lowland irrigated rice (*Oryza sativa*)

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ABSTRACT

A field experiment was conducted in red sandy loamy soils at Regional Research Station, Tamil Nadu Agricultural University, Paiyur, to compare and assess the practical feasibility of different stand-establishment techniques in lowland irrigated rice (*Oryza sativa* L.) during wet and dry seasons of 1999 and 2000. Four stand-establishment techniques, viz. transplanting, throwing of seedlings, direct (wet) seeding by manual broadcasting and wet seeding by drum seeder, were tried in randomized block design with 5 replications. Pooled analysis of data revealed that wet seeding by manual broadcasting (57.22 q/ha) and wet seeding by drum seeder (56.57 q/ha) has recorded higher yield and it was on a par with the traditional transplanting method (55.76 a/ha). However, both the direct seeding practices registered the maximum net income of Rs 19,039 and Rs 18,587/ha with benefit : cost ratio of 2.33 and 2.29 in manual broadcasting and drum seeder, respectively, besides reducing the 50% flowering duration by 7 days from traditional transplanting method.

Key words : Rice stand establishment, Direct (wet) seeding, Yield, Economics

Transplanting of rice seedlings is an age-old practice and in recent years non-availability of labours for transplanting at appropriate time leads to the reduction in yield. This method of stand establishment is also laborious, time consuming and causes drudgery to the women folk. Hence an alternative method is needed to overcome the problems encountered in the transplanting technique. Direct seeding and throwing of seedlings under puddled condition are the viable alternative

techniques for transplanting (Matsushima, 1980). Hence a study was conducted to compare and assess the practical feasibility of these methods in terms of yield and economic returns in lowland irrigated rice.

MATERIALS AND METHODS

The field experiment was conducted in red sandy-loam soils during 1999 wet (August–December) and 2000 dry (February–March) seasons at Regional Research Station, Tamil Nadu Agricultural

University, Paiyur, under puddled condition. Four stand-establishment techniques, viz. transplanting (T_1), throwing of seedlings (T_2), direct seeding by manual broadcasting (T_3) and wet seeding by drum seeder (T_4), were tried in randomized block design with 5 replications.

The test variety was 'ADT 43' (119 days) and the recommended dose of N:P:K (125:50:50 kg/ha) was applied. In transplanting method, the recommended spacing of 15 cm $\times$ 10 cm was adopted. The throwing of seedlings was done by separating 2 or 3 seedlings as done by normal transplanting and thrown at random on puddled and levelled field in a standing position.

An additional 20% seedlings were used in seedling throwing method to overcome the possible losses in the establishment of seedlings (Esther and Kandasamy, 1998). The 20-day-old seedlings were used for direct seeding. An 8-row-drum seeder used in this trial was developed by Tamil Nadu Agricultural University, Coimbatore (TNAU, 1999). The crop was sown under lowland puddled condition and need-based

plant-protection measures were adopted. The economics of different treatments were worked out by considering the present market price of the inputs and produces.

RESULTS AND DISCUSSION

Yield attributes

In both seasons, plant population was significantly more in wet seeding by drum seeder, followed by manual broadcasting. The population recorded in transplanting was on a par with throwing of seedlings. The yield attributes, viz productive tillers/hill, filled grains/panicle and test weight, were significantly influenced by stand-establishment techniques (Table 1).

The wet seeding practice either by manual broadcasting or drum seeder recorded the maximum values and it was on par with transplanting. The direct seeding practices, viz. manual broadcasting and drum seeder, reduced the time in 50% flowering by 7–9 days compared with transplanting and throwing of seedlings.

Yield and economics

The stand-establishment techniques, viz. wet seeding by manual broadcasting or

Table 1. Effect of stand-establishment techniques on yield attributes of lowland irrigated rice

Treatment	Plant population/ m ²		Productive tillers/ hill		Filled grains/ panicle		Test weight (g)		Days to 50% flowering	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
T_1	67.2	68.4	11.1	7.4	92.3	89.8	16.32	16.31	85.6	78.6
T_2	65.8	66.0	10.4	7.1	81.7	80.8	15.28	14.79	85.2	79.0
T_3	173.6	214.4	10.5	6.3	75.8	91.0	16.98	15.76	76.8	73.0
T_4	206.2	228.8	11.0	7.4	92.6	85.4	16.66	16.41	76.8	72.8
CD (P=0.05)	21.4	35.5	NS	0.7	1.8	NS	0.70	0.64	2.0	1.7

Details of treatments are given under Materials and Methods

Table 2. Effect of stand-establishment techniques on yield and economics of lowland irrigated rice

Treatment	Grain yield (q/ha)			Straw yield (q/ha)			Cost of cultivation* (Rs/ha)			Net income (P s/ha)			Benefit : cost ratio		
	Wet	Dry	Pooled	Wet	Dry	Pooled	Wet/dry	Wet	Dry	Mean	Wet	Dry	Mean	Wet	Dry
T ₁	59.99	51.53	55.76	96.10	75.25	85.68	16,928	18,666	12,984	15,825	2.10	1.76	1.93		
T ₂	49.44	46.97	48.21	81.24	68.60	74.92	14,706	14,853	12,605	13,732	2.01	1.86	1.93		
T ₃	61.11	53.33	57.22	92.63	75.73	84.12	14,286	21,551	16,529	19,039	2.51	2.16	2.33		
T ₄	60.83	52.31	56.57	91.17	75.38	83.28	14,365	21,214	15,959	18,587	2.48	2.11	2.29		
CD (P = 0.05)	1.37	1.39	1.07	5.34	5.50	4.06	NA	NA	NA	NA	NA	NA	NA	NA	NA

Details of treatments are given under Materials and Methods

*Common for both seasons; NA, not analysed

drum seeder or transplanting, showed no significant difference on grain yield of rice (Table 2).

In pooled analysis, the grain yield was the highest in wet seeding by manual broadcasting, followed by wet seeding by drum seeder and traditional transplanting practice.

Though the wet seeding by manual broadcasting and drum seeding registered no significant difference in grain yield, the intercultural operations, via. weeding and spraying, could be easily adopted in wet seeding by drum seeder, since there is definite row arrangement. The similar trend was observed in straw yield as well. In both the wet seeding practices and throwing of seedlings, due to less labour involvement, the cost of cultivation was lesser than transplanting practice. The net income and benefit:cost ratio was the highest in wet seeding by manual broadcasting, followed by wet seeding by drum seeder. The wet seeding by manual broadcasting and drum seeder could realize higher net income of Rs 19039/ha and Rs 18587/ha with benefit ; cost ratio of 2.33 and 2.29, respectively, compared with traditional transplanting practice. Similar findings of advantages of wet seeding over transplanting was reported by Santhi *et al.* (1998).

Thus, it was concluded that the direct (wet) seeding preferably drum seeding may be recommended wherever the labour is scarce and costlier for getting higher yield and net income besides reducing the field duration in lowland irrigated rice.

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