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Modified Mat Nursery and SMSRI -A Climate Smart Mechanization Practice in Rice

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Abstract

The conventional method of transplanting rice is labour-intensive, requires more water, and involves drudgery. Keeping this in view, large-scale front-line multi-location demonstrations of a modified mat nursery followed by mechanized rice transplanting under a slightly modified system of rice intensification (SMSRI) was conducted in the erstwhile Karimnagar District of Telangana to overcome the problem of labour, saving time and cost. The demonstrations recorded the highest grain yield (7512 kg ha^{-1}) than the conventional method (7029 kg ha^{-1}). This method saved around Rs. 4500 – 6250 ha^{-1} on nursery raising and transplanting. Timely transplanting was carried out during peak periods of labour shortage. Therefore, there is a need to develop small self-propelled transplanters with suitable power weeders as a national strategy to increase the area under mechanization.

Keywords: Mat type nursery, SMSRI, Economics, Rice transplanting, Conventional method

Introduction

Rice *(Oryza sativa L.)* is one of Asia's major food crops. The crop area under rice in Telangana State covers 25,81,827 hectares (Department of Agriculture, Government of Telangana, 2022). Direct seeding of rice and transplanting are the two common methods of rice establishment (Kumar *et al*., 2016, 2017). The conventional way of rice transplanting is labour-intensive, involves drudgery and requires high energy (Verma, 2010). To overcome these problems in rice, a modified mat nursery followed by mechanized rice transplanting under a slightly modified system of rice intensification (SMSRI) was found cost-effective and time-saving. It helps in maintaining soil physical properties and is better from a crop management and productivity point of view. Despite having the edge over conventional transplanting, the adoption rate of mechanized transplanting is low due to high initial investment and lack of knowledge in growing modified mat-type nurseries. Field demonstrations were conducted on modified mat nurseries followed by mechanized rice transplanting in farmers' fields. Modified mat type nursery and transplanting under SMSRI method recorded the highest grain yield (7512 kg ha^{-1}) over the conventional method of rice establishment (7029 kg ha^{-1}) and saved cost (₹ 4500-6250 ha^{-1}) over the conventional method of rice establishment.

Imparting technical knowledge, ensuring timely availability, and encouraging custom hiring through rural youth may increase India's rice area under mechanical transplanting. Large-scale Front Line Multi-Location Demonstrations were conducted in the erstwhile Karimnagar District of Telangana to overcome the problem of labour, to save the cost, time and to impart the skill by popularizing the technology in raising modified mat nursery and machine transplantation in rice among the rural youth to spread the cost-effective technology **(Figure 1)**.

Methodology

Cluster front-line demonstrations were conducted in erstwhile Karimnagar districts covering Peddapalli, Rajanna Sircilla, Jagtial and Karimnagar of Telangana State during 2019, 2020 and 2021. The treatments are Demo: Raising of modified mat nursery followed by

Transplanting with rice transplanters under a slightly modified system of rice intensification (SMSRI) and Check: Farmer practice (Conventional transplanting) with Recommended Fertilizer dose of 120: 60: 40 N, P_2O_5 and K_2O kg ha^{-1} in 25 farmer's fields under unit Plot size of 0. 40 ha in each farmer's field. The soil types were light textured red loamy soils. Before the operation, the fields were puddled uniformly and left for 24 hours to allow the puddle to settle down completely and to avoid soil flow for better seedling establishment (Kumar and Kumar, 2012; Singh and Vatsa, 2006). The total demonstrations were 25 in the farmers' fields.

Results and Discussion

The results indicated that raising of a modified mat nursery followed by transplanting with rice transplanters under a slightly modified system of rice intensification (SMSRI) recorded the highest grain yield (7512 kg ha^{-1}) than the conventional method of rice establishment (7029 kg ha^{-1}) (**Table 1**). These results were in conformity with the findings of Haytham *et al.,* (2010) who developed a long mat-type nursery using the rice straw seedbed and found the method cost-effective compared to the conventional mat preparation method. The mean rice yield recorded was 6.8 % higher than the conventional method of rice establishment (Kamboj *et al.,* 2013). This method saved costs of ₹ 4500-6250 ha^{-1} on nursery raising and transplanting. The highest cost-benefit ratio was found in demonstration treatments compared to the conventional method (**Table 2**). Timely transplanting was carried out during peak periods of labour shortage (5-6 acres' per day). Earlier

Table 1. Yield and economics of rice under modified mat nursery followed by SMSRI method of establishment

Treatments	Plot Area (ha)	Year	Yield (kg ha^{-1})		Yield increase (%)	Net returns (₹ ha^{-1})		C: B Ratio	
			Demo	Check		Demo	Check	Demo	Check
Demo: Raising of modified mat nursery f/b Transplanting with Rice Transplanters	0.4	2020	7725	7300	5.8	93531	83534	01:02.8	01:02.6
Check: Farmer practice (Manual transplanting)	0.4	2019	7600	7077	7	104054	92722	01:03.8	01:03.5
	0.4	2018	7211	6710	7.5	91498	84357	01:03.8	01:03.7
Mean			**7512**	**7029**	**6.8**	**96361**	**86871**		

Table 2. Operation-wise economics of demonstrations

S. No.	Name of the operation	Mat nursery followed by machine planting method	Conventional Rice Transplantation
1	Seed Rate (kg/Acre)	20	30
2	Seed Cost (₹/Acre)	600	750
3	Land Preparation Cost (₹/Acre)	5000	5000
4	Transplanting Cost (₹/Acre)	350	3000
5	Herbicide cost (₹/Acre)	250	250
6	Manual Weeding (₹/Acre)	750	1000
7	Fertilizer Cost (₹/Acre)	2750	2750
8	Pesticide Cost (₹/Acre)	0	0
9	Labor cost for fertilize & pesticide application (₹/Acre)	0	0
10	Cost of Harvesting (₹/Acre)	7500	7500
11	Cost of Cultivation per Acre	17200	20250

trays became difficult for them, as the modified mat is very useful in saving nursery raising costs. Under the impact of this FLD, young rural farmers purchased the machinery. With the interventions in these districts, approximately more than 56,000 acres of the new area under mechanization was covered under modified mat nursery followed by machine planting newly in Rajanna Sircilla, Jagtial and Karimnagar Districts of Telangana State.

Figure 1: Mat nursery preparation, rolling and transplanting

Conclusions

Mechanical paddy transplanter is one of the possible options to get rid of labour shortage in farm operations. However, the adoption is slower due to poor response from stakeholders because of the cumbersome process of growing paddy nurseries in trays and mats. Providing proper hands-on training to the stakeholders about the operating procedure of nursery raising and handling transplanters would enhance the adoption rate of the presently available transplanters. Therefore, there is a need to develop small self-propelled transplanters with suitable power weeders as a national strategy to increase the area under mechanization. By conducting FLDs under Crop Production with our interventions in the operational area, more than 21,750 acres of the area under modified mat nursery followed by machine transplanting under SMSRI in rice was covered newly in Rajanna Sircilla, Karimnagar, Jagtial and Peddapalli Districts.

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