

**RESEARCH ARTICLE :**

Mechanized system rice intensification (MSRI) is boon to farmers to save money and time in rice cultivation in Vizianagaram district of North Coastal Zone of Andhra Pradesh

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ARTICLE CHRONICLE :**Received :**

23.04.2020;

Revised:

04.06.2020;

Accepted :

06.07.2020

KEY WORDS:

Mechanized system rice intensification (MSRI), Cono weeder, OFTs, Yield, Yield attributes, B:C ratio

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SUMMARY : Paddy is major predominant crop during *Kharif* in Vizianagaram district of Andhra Pradesh, cultivated in an area of 112353 ha, out of total cropped area of 117608 ha with productivity of 2524 kg/ha. Farmers grow crop by adopting traditional method of paddy cultivation, use more seed rate, close spacing, late transplanting with over aged seedlings common phenomenon due to erratic rainfall climate change. Scarcity of labour and escalation in labour wages, reduction in labour efficiency are leading to low net returns. In this context DAATT Centre, Vizianagaram district of ANGRAU, in collaboration with Department of Agriculture, Vizianagaram has introduced "Mechanized System Rice Intensification (MSRI). Mechanized system rice intensification (MSRI) is boon to farmers to save money and time. DAATT Centre, Vizianagaram has organized on farm trials (OFTs) in farmer fields in two seasons *Kharif*, 2015 and *Kharif*, 2016. MSRI technology in paddy recorded 20.76 per cent yield over normal transplanting method of paddy cultivation during both *Kharif* seasons. The results from the study showed that the farmers realized the Rs.15038 additional net income due to increased grain yield by 20.76 per cent with reduction of cost of cultivation by Rs.1150, it could be attributed to reduction in manual labour of 3 man labour and 21 women labour per ha and also increase in yield attributes and yield.

How to cite this article : Srinivasa Rao, M.M.V., Roy, G.S. and Lakshmana, K. (2020). Mechanized system rice intensification (MSRI) is boon to farmers to save money and time in rice cultivation in Vizianagaram district of North Coastal Zone of Andhra Pradesh. *Agric. Update*, 15(3): 162-166; DOI : 10.15740/HAS/AU/15.3/162-166. Copyright@ 2020: Hind Agri-Horticultural Society.

BACKGROUND AND OBJECTIVES

Rice area has been decreasing in state like Andhra Pradesh, although overall productivity is increasing, there is a decrease in compound growth rate in rice productivity at national level. There is no scope for

expansion of area for rice cultivation. Rice yields are plateau in the irrigated ecosystem and the rainfed system with low productivity of 2.5 to 3.5t ha⁻¹, it has become imperative to increase rice production per unit area per unit time to feed the teeming millions in the

new millennium. India has to produce 135-145 million tones by 2020 A.D. to feed the additional 350 million people (Anonymous, 2011). To do so, the productivity should be raised to 3.2 t ha⁻¹ a by 2020 AD from the present level of 2.05 t ha⁻¹ (The Hindu Survey of Indian Agriculture, 2006).

Vizianagaram district is the one of the rice growing districts in Andhra Pradesh. Farmers grow rice in 1.17 lakh ha during *Kharif* and 2500 ha during *Rabi*. Cost of cultivation is rising year by year due many reasons *i.e.* social reasons, situational factors and input cost. At present cost of cultivation per hectare is between Rs. 50,000/- to Rs. 60,000/-. This is mainly due escalation of labour wages and scarcity of labour in villages during agricultural season, labour requirement is very intense at the time of transplanting season and increase in price of fertilizers (Yadav *et al.*, 2013).

To overcome this, wet transplanting with mechanized system rice intensification (MSRI) machine can reduce the labour requirement during transplanting season, technology is very simple and can be adopted by the farmers easily and cost of cultivation can be reduced. Mechanized system rice intensification (MSRI) technology holds special significance in the present day production system with regard to saving labour component by 10-20 per cent and increase the productivity by 20-30 per cent. Mechanized system rice intensification (MSRI) technology, a new way of cultivation is gaining more attention of the farmers in Vizianagaram district. But the mechanized system rice intensification (MSRI) technology has its own implications to adopt such as right choice of field, irrigation facilities, varieties, land preparation, weed management and machinery available.

The prime concern of any programme related to agriculture is to enhance productivity and with reduced cost. In order to reduce the cost of cultivation DAATT Centre, Vizianagaram took initiative to promote mechanized system rice intensification (MSRI) technology in Vizianagaram district the following objectives.

Objectives :

– To popularize the mechanized system rice intensification (MSRI) technology in the Vizianagaram district through on farm trials (OFTs) and method demonstrations.

To record the yield in mechanized system rice

intensification (MSRI) technology in comparison with normal method to convince the farmer.

– To analyze the economics of paddy cultivation in Vizianagaram district.

RESOURCES AND METHODS

Scientists in DAATT Centre, Vizianagaram district of ANGRAU in collaboration with Department of Agriculture, Vizianagaram district has introduced mechanized system rice intensification (MSRI) technology with comparing normal method of cultivation through organizing on-farm trials (OFTs) during *Kharif*, 2015 and *Kharif*, 2016 in 7 locations.

Details and advantages of mechanized system rice intensification (MSRI):

India is one of the world's largest producers of white rice and brown rice, accounting for 20 per cent of all world rice production. Rice can be cultivated by different methods based on the type of region. But in India, the traditional methods are still in use for harvesting rice. A traditional method includes nursery preparation, field preparation, transplanting and frequent irrigation. Though the improved methods were emerged for high productivity like system of rice intensification, alternate wetting and drying etc. and were appreciated by the small farmer, operational difficulties involved (young single plant transplanting and weeding) in adopting true such technologies made them non-practiced and practical. The attempts were made to improvise these improved technologies such as SRI and AWD with mechanized rice cultivation, so as to reap the benefits of improved technologies with reduced drudgery (manual labour involvement). Mechanized transplanting with young (12-14days), minimum number (two- three) seedling per hill and maximum (20 cm) intra row space adjustment to suffice number matrix of hills per square meter is adjusted. The irrigation scheduling was manipulated for creating more aerobic soil conditions that are beneficial for the rice crop upto milky stage. The yields were improved upto 15-20 per cent with 10-25 per cent less water requirement was recorded in farmers' field. More over the requirement of manual labour was reduced by 20-25 per cent over conventional method of manual transplanting.

Veeramani *et al.* (2012) reported that tiller production could be optimized by transplanting seedlings

at younger ages compared to modified rice mat nursery. The maximum number of tillers produced by the rice plant is inversely proportional to the length of the phyllochron.

Salient features :

- Labour cost is reduced
- Cost of cultivation is reduced because, cost on nursery raising, nursery pulling and transplanting can be saved
- Uniformity in seed sowing and Plant population
- Reduction in seed rate and thinning cost.
- An area of 2 hectare per day can be shown
- Saving in seed requirements: 10-12 kg per acre is sufficient depending on variety

Farmer fields are selected to conduct on farm trials (OFTs) with proper drainage facility and regulation of water. The varieties cultivated in paddy mechanized system rice intensification (MSRI) technology were in *Kharif*, 2015 and 2016 with MTU-1001.

Since planting of crop in both mechanized system rice intensification (MSRI) technology and normal transplanting method data pertaining to crop stand with number of tillers per hill, incidence of pests and diseases if any at regular intervals followed by yield contributing parameters like effective tillers and number of grains per panicle are recorded. Yield per 5x5 m² was collected and calculated per hectare area.

Means of yield attributes, yield and cost of cultivation were arrived for yield in both mechanized system rice intensification (MSRI) technology and normal transplanting methods. Percentage yield increase over normal method was calculated and comparative analysis of cost benefit ratio per hectare was arrived and presented in the tables.

OBSERVATIONS AND ANALYSIS

The on-farm demonstrations on mechanized system rice intensification (MSRI) technology is conducted for

two seasons both in *Kharif*, 2015 and *Kharif*, 2016 in innovative farmer fields and yield attributes and yield are depicted in following tables.

Yield attributes :

All yield attributes, during all the years were recorded better in MSRI technology than normal method (Table 1). During the two years of demonstrations and in all the locations with MTU-1001(Vijetha) variety recorded the number of productive tillers per/sq.mt and number of grains per panicle are 248 and 205 are more than normal practice 200 and 189. The results were in conformity with the findings of Sreenivasulu and Bala Hussain Reddy (2014).

Yield :

Grain yield (Table 1) increase was achieved to a tune of 20.76 per cent in MSRI method (6756 kg ha⁻¹) over normal method of cultivation (5859 kg ha⁻¹). The paddy cultivation in MSRI technology is superior to normal conventional method of transplanting of rice crop. Higher yield in MSRI technology is contributed by more number of productive tillers by supported by profuse root system resulted in more number of panicles. This results were in conformity with the findings of Vijaykumar *et al.* (2012) and Sheeja Raj *et al.* (2012).

Labour involvement in rice cultivation :

There is reduction in labour utilization (Table 2) is observed in mechanized system rice intensification (MSRI) *i.e.*, 3 man labour and 22 women labour when compared to normal method of transplanting method.

Economics :

Additional grain yield and straw yield (Table 3) of 1157 kg ha⁻¹ and 1338 kg ha⁻¹ recorded in MSRI technology compared with normal practice of transplantation, this could be due to uniform plant population, good tillering capacity. Additional net income of Rs.15038 ha⁻¹ received in MSRI technology with

Table 1: Mean data on yield and yield attributes of front line demonstrations on paddy mechanized system rice intensification (MSRI) conducted during *Kharif*-2015 and *Kharif* 2016

Season	No.of locations	No.of productive tillers/Sq.mt		No.of grains/panicle		Yield kg/ha		Percentage increase over check
		Demo	Check	Demo	Check	Demo	Check	
<i>Kharif</i> - 2015	4	254	211	203	188	6975	5860	19.02
<i>Kharif</i> - 2016	3	242	188	206	189	6537	5337	22.50
Average		248	200	205	189	6756	5859	20.76

reduction of cost of cultivation of Rs.3950 ha⁻¹ realized over normal transplanting. The net income increased by Rs.15038 per hectare in MSRI technology. It was mainly due to the reduction in cost of sowing operation and

transplanting operations. It was observed that the cost-benefit ration was higher in MSRI method (1.94) when compared to conventional method (1.59). The similar result were reported by Manjunatha *et al.* (2009).

Table 2: Mean of comparative analysis of cost of cultivation including labour per hectare of paddy recorded during Kharif-2015 and Kharif, 2016

Sr. No	Practice	Mechanized system rice intensification (MSRI)					Conventional transplantation method				
		Labour cost		Input cost		Total cost in Rs./ha	Labour cost		Input cost		Total cost in Rs./ha
		No	Cost	Input	Cost Rs.		No.of labour	Cost Rs./ha	Input	Cost Rs.	
1.	Nursery management	0	0	0	0	0	2 M preparation	600	FYM	500	1100
2.	Seed quantity and cost	0	0	40kg/ha @Rs. 30	1200	1200	0	0	75kg/ha @R30	2250	2250
3.	Land preparation of main field	10 M Puddling	6600	0	0	6600	8M and puddling	5600	0	0	5600
4.	Nursery pulling and spreading	4M 2W	1700	0	0	1700	15M 3 W	4950	0	0	4950
5.	Transplanting/ sowing	10M 4W	4000	0	0	4000	25W	3750	0	0	3750
6.	Manures and fertilizers management /ha	8M	2400	DAP-125kg Urea 150kg Mop :85 kg	8000	10400	8M	2400	DAP-125kg Urea 150kg Mop :85 kg	8000	10400
7.	Weeding and herbicide inter-cultivation	3M 20W	4000	Herbicides	2500	6500	1M 20W	3300	Herbicide	1000	4300
8.	Plant protection	2M 2W	1000	PP Chemicals	3500	4500	4M 4W	1800	Pp Chemicals	4500	6300
9.	Irrigation management	8 M	2400	0	0	2400	10M	3000	0	0	3000
10.	Harvesting	27 W	5400	0	0	5400	25 W	5000	0	0	5000
11.	Threshing, winnowing and bagging	16M 16W	8000	0	0	8000	16M 16W	8000	0	0	8000
	Total	61 M 71 W	35500		15200	50700	64M 93W	38400		16250	54650

M-Male, F-Female

Table 3: Economics of the mechanized system rice intensification (MSRI) vs normal transplantation method recorded during Kharif-2015 and Kharif, 2016

Sr. No.	Particulars	Mechanized system rice intensification (MSRI) method	Conventional transplantation method	Difference
1.	Grain yield kg/ha	6756	5599	1157
2.	Straw yield kg/ha	7567	6229	1338
3.	Grain value (Rs.14/kg)	94584	78379	16205
4.	Straw value (Rs.0.5/kg)	3784	3205	579
5.	Gross income Rs./ha	98368	87280	11087
6.	Total cost of cultivation Rs./ha	50700	54650	-3950
7.	Net income Rs./ha	47668	32630	15038
8.	C:B ratio	1.94	1.59	0.35

Conclusion:

The results from the study showed that the farmers realized the Rs.15038 additional net income due to increased grain yield by 20.76 per cent with reduction of cost of cultivation by Rs. 3950/-, it could be attributed to reduction in manual labour of 3 man labour and 21 women labour and also increase in yield attributes and yield.

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