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Performance of Direct Seeded Rice by using Drum Seeder in Chittoor District of Andhra Pradesh

Sreenivasulu S and Bala Hussain Reddy P
RASS - Krishi Vigyan Kendra, Tirupati - 517 501, Andhra Pradesh.

ABSTRACT

Manual transplanting is the most popular method of crop establishment in rice growing areas in Chittoor district, it requires more number of labour leads to increase in the cost of cultivation and results in delayed transplanting. Direct seeding with the help of drum seeder avoids raising of nursery, pulling and transplanting due to which labour requirement is reduced. RASS – Krishi Vigyan Kendra, conducted ninety six front line demonstrations on direct seeded rice using eight row drum seeder consecutively for three years during *rabi* 2008-09, 2009-10 and 2010-11. The results revealed that the increase in grain yield of drum seeded rice was seven percent compared to transplanted rice. The cost of cultivation was low in direct seeded rice (₹ 28,035/- ha^{-1}) than manually transplanted rice (₹ 33,756 ha^{-1}). The average benefit cost ratio was more in the case of drum seeded rice (2.09) than manual method of transplanting (1.62).

Key words : Benefit cost ratio, Direct seeded rice, Drum seeder, Front line demonstrations, Grain yield, Gross and Net returns.

Rice (*Oryza sativa* L) is the most important staple food crop of India, grown in an area of 48.29 lakh ha during rabi season with a production of 153.28 lakh tonnes and with an average productivity of 3174 Kg ha^{-1} (Anonymous, 2013).

In Andhra Pradesh, it is grown in an area of 18.29 lakh ha with a production of 69.08 lakh tonnes and an average productivity of 3777 Kg ha^{-1} (Anonymous, 2013). The transplanted rice crop was grown in an area of 30964 ha with a production of 1.14 lakh tonnes and an average yield of 3.71 tonnes ha^{-1} in Chittoor district during *rabi* season (Hand Book of Statistics, Chittoor).

Manual transplanting is the most common practice of rice cultivation in Chittoor district. Though transplanting is the effective means of rice cultivation, it involves nursery bed preparation, raising of nursery up to one month, pulling of seedlings, transportation to main field and then transplanting. All these operations require more number and timely availability of labour. Hence, the cost of cultivation of transplanted rice significantly increased. Transplanting takes about 250-300 man hours ha^{-1} which is roughly 25 per cent of the total labour requirement of the crop (Ved Prakash and Varshney, 2003). In such situation, direct seeding with drum seeder is the only option to reduce the labour requirement. Direct seeded rice offers low cost of cultivation due to skipping of nursery raising, pulling of seedlings and transplanting, and crop matured earlier by 7-12 days. (Subbaiah *et al.,* 2002, Gill, 2008). The productivity of direct seeded rice with drum seeder was comparable with manually transplanted rice (Gangawar *et al.,* 2008).

Rastriya Seva Samithi – Krishi Vigyan Kendra, Tirupati introduced direct seeded rice with drum seeder in Chittoor district during 2006 using eight row drum seeder developed by TNAU, Coimbatore and assessed its performance for three seasons. After confirming this technology through assessment and owing to the encouraging results of the trials, front line demonstrations were conducted under bore wells.

MATERIAL AND METHODS

The performance of direct seeded rice using drum seeder was evaluated in ninety six front line demonstrations for three consecutive years during *rabi* 2008-09, 2009-10 and 2010-11. The demonstrations were conducted in 12 mandals of

Chittoor district by using popular variety ADT-37, a short duration, blast resistant and coarse grain quality suitable for parboiled rice. The soil texture of the demonstrations area was sandy clay loam with a pH ranging from 6.9 to 8.2 with electrical conductivity ranging from 0.3 to 2.2 dSm^{-1}, low in available nitrogen (92 Kg ha^{-1}), high in phosphorus (32 Kg ha^{-1}) and potassium (298 Kg ha^{-1}).

The eight row drum seeder consisting of four rotating drums with circular holes around the two edges of each drum. These drums are connected to horizontal iron rod of 1.8m length and then it was mounted on two plastic moulded wheels at both the ends. In direct seeding method, 37.5 kg ha^{-1} of seed was soaked in water for 24 hours and incubated for another 24 hours to obtain just sprouted seed. The sprouted seeds were filled in the drums and drum seeder was manually dragged on the field after draining the water to saturation. On pulling the drum seeder, the sprouted seeds are placed on the puddled soil surface in eight rows at a distance of 20 cm between rows and at about 8 cm within the row. The field was kept moist followed by alternate wetting and drying of soil from the second day after sowing to panicle initiation stage and 5cm depth of water was maintained ten days before crop maturity. Butachlor, 1.0 Kg a.i. ha^{-1} was applied uniformly at 5^{th} or 6^{th} day after sowing by mixing with 50 Kg of sand ha^{-1} by maintaining thin film of water followed by mechanical weeding with cono weeder twice at 20 and 30 days after sowing for effective control of weeds. In the case of manual method of transplanting existing package of practices were being adopted by the farmers with the same variety ADT-37.

RESULTS AND DISCUSSION

Yield attributes

The results revealed that direct seeded rice with drum seeder recorded significantly more number of productive tillers $hill^{-1}$ (13.2) and number of grains $panicle^{-1}$ (137) than manual transplanting i.e. 11.8 and 126, respectively (Table.1). This might be due to lack of transplanting shock and early seedling vigour resulted in more number of tillers. Further mechanical weeding with cono weeder between the inter rows leads to loosening of the soil, better aeration at root zone depth and reduction of weed competition which inturn recorded more number of tillers and panicles per unit area. Higher number of tillers and number of panicles $hill^{-1}$ obtained by broadcasting and drum seeder methods than manual transplanting was also reported by Manjunatha *et al.* (2009) and Veeresh *et al*. (2011). The number of productive tillers per m^{-2} increased about 11 percent in drum seeded rice than manual transplanting.

Grain yield

The results indicated that direct seeded rice with drum seeder recorded significantly higher grain yield over manual transplanting in all the three consecutive years (Table.1). The average grain yield in drum seeder method was 6.47 tonnes ha^{-1} as compared to 6.02 tonnes ha^{-1} in case of manual transplanting. The higher grain yield in direct seeded rice might be due to more number of productive tillers per unit area and higher stature of filled grains per panicle and test weight owing to better translocation of photosynthates from source to sink. Higher grain yields obtained in broadcasting method and direct seeded rice with drum seeder than transplanting was also reported by Manjunatha *et al.* (2009). The grain yield of drum seeded rice was increased about seven percent compared to transplanted rice.

Economics

The present study revealed that the cost of cultivation was low in direct seeded rice (₹ 28,035 ha^{-1}) than manually transplanted rice (₹ 33,756 ha^{-1}). An amount of ₹ 5721 ha^{-1} can be saved by adopting direct seeded rice with drum seeder. It is mainly due to ease in operation without raising of nursery, pulling and transport of seedlings to main field for transplanting. Similar findings were also reported by Senthilkumar and Kasthuri Thilagam (2012).

Gross and net returns were significantly more in direct seeded rice compared to manual transplanting. Direct seeded rice with drum seeder fetched higher gross and net returns of ₹ 58,904 and ₹ 30869 than manual transplanting of ₹ 54,831 and ₹ 21135 ha^{-1} respectively. The data from three consecutive seasons shows that the average benefit cost ratio was more in direct seeded rice with drum

Table 1. Yield attributes, grain yield, gross returns and net returns as influenced by the Direct seeded rice with drum seeder and manual transplanting.

Year	Particulars	Number of productive tillers hill^{-1}	Number of grains panicle^{-1}	Yield t ha^{-1}	Cost of cultivation ha^{-1}	Gross returns ha^{-1}	Net returns ha^{-1}	Benefit Cost Ratio
2008	Transplanted rice	12.1	128	6.36	33055	55120	22065	1.66
	Drum seeded rice	13.5	142	6.59	27593	57113	29520	2.06
	S.E (m)	0.177	2.422	0.123	631.29	239.76	865.51	0.050
	CD (P=0.05)	0.369	5.061	0.257	1865.92	708.67	2558.20	0.146
2009	Transplanted rice	11.7	119	5.85	33800	58500	24700	1.73
	Drum seeded rice	13.0	130	6.37	27925	63700	35775	2.28
	S.E (m)	0.191	1.851	0.148	840.33	602.68	1274.64	0.064
	CD (P=0.05)	0.399	3.868	0.309	2483.79	1781.34	3767.47	0.188
2010	Transplanted rice	11.8	130	5.87	34412	50873	16461	1.48
	Drum seeded rice	13.3	138	6.45	28588	55900	27312	1.95
	S.E (m)	0.219	1.752	0.179	763.44	587.03	1250.93	0.055
	CD (P=0.05)	0.457	3.661	0.374	2256.52	1735.11	3697.38	0.163
Average	Transplanted rice	11.8	126	6.02	33756	54831	21135	1.62
	Drum seeded rice	13.2	137	6.47	28035	58904	30869	2.09
	S.E (m)CD	0.195	2.008	0.150	745.02	476.49	1130.36	0.072
	(P=0.05)	0.408	4.196	0.313	2187.07	1408.37	3341.01	0.165

Price of 75 Kg grain: ¹ 650/-, ¹ 750/- and ¹ 650/- in 2008, 2009, and 2010 respectively.

seeder (2.09) than manual transplanting (1.62). This might be due to low cost of cultivation and increased grain yield in direct seeded rice than transplanting.

These results are in conformity with those of Manjunatha *et al.* (2009) and Gangawar *et al.* (2008). Labour intensive and costly method of transplanting in rice could be substituted by direct seeding with drum seeder without sacrifice in productivity, if effective water control is possible (John Kutty *et al,* 2002).

Conclusion

By the present front line demonstrations it could be concluded that by adopting direct seeding in rice with drum seeder recorded more number of productive tillers m^{-2}, grains per panicle including higher gain yield and net returns in sandy clay loam soils of Chittoor district under bore wells during three consecutive rabi seasons.

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