The Pharma Innovation Journal 2023; 12(7): 2879-2881

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 2879-2881

www.thepharmajournal.com
Received: 18-05-2023
Accepted: 28-06-2023

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Effect of mechanized transplanting on yield, yield attributes and economics of rice (*Oryza sativa* L.)

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Abstract
Conventional rice transplanting methods are laboured exhaustive and involves drudgery. On an average only transplanting operation takes one fourth of the total labour requirement of rice production under traditional system. Shifting of agricultural labourer towards urban areas for better remuneration creates labour shortage during peak time of transplanting. Under such circumstances, an affordable and flexible way of rice transplanting without compromising grain yield is the need of the time. In this context, Thirty Front line demonstrations were conducted by Krishi Vigyan Kendra, Jammikunta, Karimnagar district, Telangana state from 2018-19 to 2020-21 to demonstrate mechanically transplanted rice cultivation in a few areas of Karimnagar district using a self-propelled walk behind six-row mechanical transplanter.
The field capacity of rice transplanter was 0.20 ha per hour and time taken to cover one hectare area was 5 hours and 10 minutes. Results of the trials indicated that the yield parameters *viz*., number of productive tillers/hill, panicle length, number of grains/panicle and yield were higher in mechanized transplanting than manual transplanting. Mechanized transplanting recorded more grain yield (7048 kg/ha) and net returns (Rs. 95106/-) with less cost of cultivation (Rs.41508/-) compared to manual transplanting. Mechanized transplanting recorded benefit cost ratio of 3.32, but it was 2.77 in case of manual transplanting. Mechanized transplanting with rice transplanter can be used successfully as an economic, viable and alternative option for obtaining higher yield and reducing cost of cultivation as the manual transplanting involves more labour and drudgery.

Keywords: Rice, mechanization, front line demonstrations, mechanical transplanting

Introduction
Among the cereals, rice (*Oryza sativa* L.) is one of the most vital crop because it is the principal food for the majority of Indian population and grown in an area of 94.99 lakh hectares with a production of 129.66 million tonnes (Paddy outlook, July 2022) [6]. The total area under rice in Telangana is around 28 lakh hectares with total production of 98 lakh million tonnes and average productivity of 35 q/ha. (Socio-Economic Outlook 2020) [1]. Telangana has emerged as ninth largest state in India in terms of area under rice cultivation and eighth largest in terms of rice production. It is fourth largest state in respect of rice yield rate, next to Punjab, Andhra Pradesh and Tamil Nadu.
Conventional manual transplanting is the most preferred way of paddy cultivation in this region. Though, it is an effective means of rice cultivation, however it is tedious, laborious, time consuming and involve drudgery, including shortage of labour during peak periods of agricultural operations. It also results in increased cost of transplanting and delay in transplanting due to non-availability of labour in time. Further, it is very difficult to cover larger area within a short span by using manual labour. Delay in transplanting from normal date causes reduction in rice yield by nine per cent. (Islam *et al.*, 2008) [2]. Ved Prakash Chaudhary and Varshney (2003) [10] reported that transplanting takes about 250-300 man hours per ha which is roughly 25 per cent of the total labour requirement of the crop. Under such situation, a less expensive and labour saving method of rice transplanting without reduction in grain yield is the need of the hour. The mechanical rice transplanting is an alternate and promising option, as it saves labour, ensures timely transplanting and also contributes to higher grain yield. Keeping this in view, Krishi Vigyan Kendra, Jammikunta has conducted thirty demonstrations on mechanically transplanted rice cultivation in Karimnagar district using a self-propelled walk behind six-row mechanical transplanter.

Materials and Methods
The mechanized transplanting demonstrations were conducted in thirty locations during *rabi* season from 2018-19 to 2020-21 in Ellanthakunta, Thimmapur, Chigurumamidi mandals of

Karimnagar district. In mechanized transplanting, seedlings were raised by special mat method of nursery. Raised beds of 10 m length, 1.2 m width and 2.5 cm height were prepared and covered with polythene sheet of 1.2 m width and 50micron thickness. On the plastic sheet, 21x50 cm size iron frames were placed to get the uniform size of nursery mats which is suitable to feed in to the transplanter for easy planting. These frames were filled with softened wet soil free from any trash and stones and mixed with well decomposed farm yard manure for better growth. Sprouted Paddy seed (45 Kg/ha) were spread uniformly on the wet soil and covered with paddy straw, as it prevents any damage from birds and also helps in good seedling growth. These nursery beds were watered using rose cans for 4-5 days and thereafter, the paddy straw was removed and seedlings were grown normally by regular watering. Seedlings were ready for transplanting by 16 to 18 days after sowing, when the height of the plant reaches 10-15 cm height with 3-4 leaves. Self-propelled walk behind six row transplanter was used for mechanized transplanting. After the land preparation and levelling in the main field, the field was allowed for sedimentation for 12 hours to avoid sinking of transplanter. The machine covers 6 rows with spacing of 22.8 cm between the rows and 15 cm between the hills in a row. Rice nursery was raised by adopting the recommended package of practices for manual transplanting.

Results and Discussion

Based on the demonstrations conducted during three consecutive rabi seasons 2019, 2020 and 2021, it was observed that the number of seedlings transplanted per hill was 4-6 and the depth of seedlings planted was about 5 cm in case of mechanized transplanting. The field capacity of rice transplanter was 0.20 ha per hour and the time taken to cover one hectare area was 5.10 hours. The transplanter doesn't have the facility to change the row distance, but the distance between the hills in a row can be adjustable to 12 or 15 or 17 cm.

Effect on yield attributes

The data from the Table 1 and Figure 1 revealed that the yield attributes *viz*., productive tillers per hill (15.7), panicle length (16.8) and number of filled grains per panicle (130) were higher in mechanized transplanting than manual transplanting i.e., productive tillers per hill (13.9), panicle length (14.9) and number of filled grains per panicle (118) respectively during three consecutive years. This might be due to maintenance of optimum plant population per unit area and depth of planting which resulted in increased number of productive tillers per hill due to efficient utilization of growth resources. Similar results were reported by Manjunatha *et al.* (2009) [4]. Increased number of panicles per hill and fertile grains per panicle in machine planting were also reported by Sheeja *et al.* (2012) [8] and Sreenivasulu *et al*. (2014) [9].

Table 1: Details of yield attributes as influenced by manual and mechanised transplanting

Year	Method of transplanting	No. of Productive tillers/hill	Panicle length (cm)	No. of grains/panicle
2019	Manual	15.2	16	122
	Transplanter	16.8	17.2	134
2020	Manual	12.5	13.6	112
	Transplanter	14.8	16.4	126
2021	Manual	14.1	15.2	119
	Transplanter	15.6	16.8	130
Mean	Manual	13.9	14.9	118
	Transplanter	15.7	16.8	130

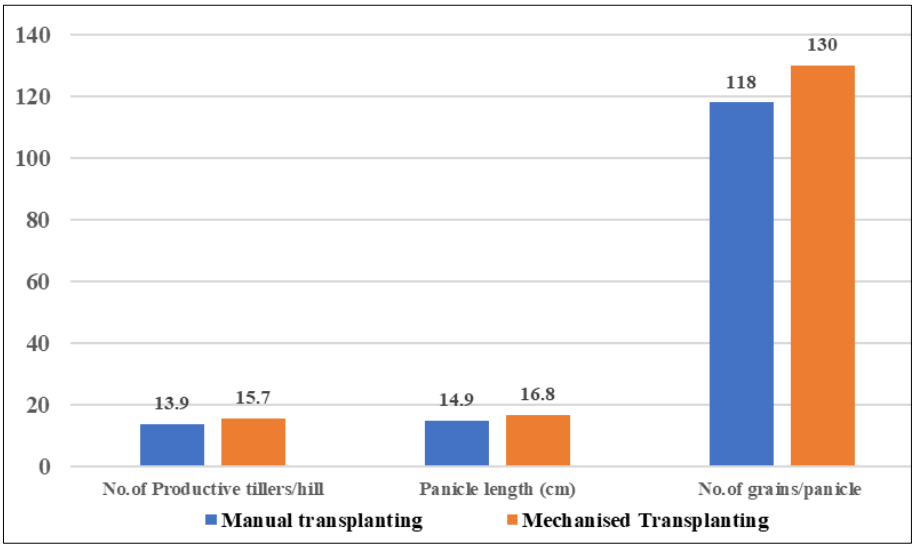

Fig 1: Comparative performances of yield attributes under manual and mechanised transplanting

Effect on yield

From the yield data of three consecutive years presented in Table 2, it was observed that, mechanized transplanting recorded higher grain yield (7048 Kg/ha) than manual transplanting (6671 Kg/ha). Mechanized transplanting recorded 6% increase in grain yield over manual transplanting which might be due to transplanting of younger seedlings with uniform spacing. This enabled better translocation of

photosynthates from source to sink leading to higher number of productive tillers per hill (15.7) which in turn increased the number of filled grains per panicle (130) and ultimately higher grain yield. The results are in conformity with the findings of Vijay Kumar *et al*., (2012) [11], Sheeja *et al*., (2013) [8] and Kang *et al*., (2019) [3].

Table 2: Details of yield and economics of manual and mechanised transplanting

Year	Method of transplanting	Grain yield (Kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C
2019	Manual	6970	42950	130200	87250	3.03
	Transplanter	7215	38450	134776	96326	3.50
2020	Manual	6460	45575	125324	79749	2.74
	Transplanter	6850	40825	132890	92065	3.25
2021	Manual	6584	50750	130363	79613	2.56
	Transplanter	7081	45250	140204	94954	3.09
Mean	Manual	6671	46425	128629	82204	2.77
	Transplanter	7048	41508	135956	95106	3.32

Effect on economics

The study revealed that the average cost of cultivation in mechanized transplanting was reduced by Rs. 4917/ha compared to manual transplanting. Conventional method of rice transplanting needs more man power in the operations like land preparation for seedling rising, uprooting of seedlings, carrying of seedlings to main field and transplanting over mechanical method (Sreenivasulu *et al*., 2014) [9]. It is observed from Table 2 that the cost of cultivation in both the methods was gradually increasing from 2019 to 2021 due to increase of labour wages and prices of fertilizers. An additional benefit of Rs.12902/- was obtained in mechanized transplanting compared to manual transplanting. This was due to lower cost of labour for nursery and transplanting in mechanical transplanting. Mohapatra *et al.*, (2012) [5] and Sheeja *et al.*, (2012) [8] also reported that the cost of cultivation was reduced and net returns were increased by using transplanter in rice. Similarly, the highest benefit cost ratio (3.32) was obtained with mechanized transplanting compared to manual transplanting (2.22). Sajitha Rani and Jayakiran, (2010) [7], Sreenivasulu *et al*., (2014) [9] also reported higher benefit-cost ratio in mechanical transplanting.

Conclusion

Mechanized transplanting was found to be the best method to obtain more number of productive tillers per hill, panicle length, number of filled grains per panicle, grain yield, net returns and benefit -cost ratio compared to manual transplanting. Cost of cultivation was reduced by Rs. 4917/ha in mechanized transplanting than manual transplanting. It can be concluded that the rice transplanter can be used successfully as an alternative option to manual method of transplanting for obtaining higher grain yield and reducing cost of cultivation as it involves more labour and drudgery.

References

1. Directorate of Economics and Statistics, Min. of Agriculture, Govt. of India; Socio-Economic Outlook Govt. of Telangana; c2020.
2. Islam MS, Hossaln MA, Chowdhury MAH, Hannan MA. Effect of nitrogen transplanting date on yield and yield components of aromatic rice. Journal of Bangladesh Agricultural University. 2008;6:291-296.
3. Kang JS, Kaur J, Sandhu SS. Performance of mechanically transplanted Basmati rice (*Oryza sativa* L.) under different age of seedling and planting densities. Indian Journal of Agronomy. 2019;64(2):200-203.
4. Manjunatha MV, Masthan Reddy BG, Shashidhar SD, Joshi VR. Studies on the performance of self-propelled rice transplanter and its effect on crop yield. Karnataka Journal of Agricultural Sciences. 2009;22(2):385-387.
5. Mohapatra PC, Din M, Parida BC, Pate SP, Mishra P. Effect of mechanical planting and weeding on yield, water use efficiency and cost of production under modified system of rice system of intensification. Indian Journal of Agricultural Sciences. 2012;82(3):280-283.
6. Paddy outlook. Agricultural Market intelligence centre, PJTSAU; c2022 July.
7. Sajitha Rani T, Jayakiran K. Evaluation of different planting techniques for economic feasibility in rice. Electronic Journal of Environmental, Agricultural and Food Chemistry. 2010;9:150-153.
8. Sheeja K Raj, Reena Mathew, Nimmy Jose, Leenakumary S. Enhancing the productivity and profitability in rice cultivation by planting methods. Madras Agricultural Journal. 2012;99(10-12):759-761.
9. Sreenivasulu S, Bala P, Reddy H. Effect of mechanized transplanting on yield, yield attributes and economics of rice (*Oryza sativa*). The Journal Research ANGRAU. 2014;42(2):9-12.
10. Ved Prakash Chaudhary, Varshney BP. Performance evaluation of self propelled rice transplanter under different puddle field conditions and sedimentation periods. Agril. Mech. Asia, Africa, Latin America. 2003;34:23-33.
11. Vijay Kumar D, Hari Babu B, Madhusudhana Reddy K. Self-propelled walking behind type rice transplanter – A better alternative for manual transplanting. The Andhra Agricultural Journal. 2012;59(4):630-634.