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Machine Planting: An Improved Technology in Rice Production System

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A B S T R A C T

On-farm trials were conducted at farmer's fields in West Godavari district of Andhra Pradesh during Kharif, 2016 and 2017 seasons to evaluate the yield in machine planted rice in comparison to manual transplanting. Pooled mean of two years indicated that machine planting recorded significantly higher number of tillers (23.46), higher number of productive tillers (18.02) resulting in higher yields (6686.8 kg/ha). Economic analysis was calculated to know the cost of cultivation of rice production in machine planted and manual transplanting. Results indicated that the total production cost i.e, cost of cultivation was low in machine planted crop (Rs. 44,343/ha) compared to manual transplanting (Rs. 52,225/ha). The Benefit Cost ratio was higher in machine planting (1.68) than in manual transplanting (1.36)..

Introduction

Rice is a major crop that is grown in more than 110 countries**.** India is the leading rice (*Oryza sativa* L.) producing country in terms of area and is the second largest producer next to China. The West Godavari District in Andhra Pradesh has played a pivotal role in rice production of India, hence popularly known as, *'The Rice Granary of Andhra Pradesh'*. Therefore the sustainable production of rice in this region is crucial for food security of India. The common practice of establishing rice in rice-rice cropping systems is manual transplanting. Manual transplanting by 3-4 weeks of nursery seedlings after puddling is a predominant practice of rice cultivation in almost all the rice growing areas of India. Manual transplanting results in low seedling placement, reduced plant density, high labor cost and causes serious back pain for the laborer involved in the activity. It is also time consuming and requires 250-350 man hours per hectare that is 25% of the total labour requirement of the crop. Further due to rapid industrialization, urbanization and migration to urban areas and The National Rural Employment Guarantee Programme (NREGP), the availability of labour became very scarce and with the hike in the wages of labour, manual transplanting found costly leading to reduced benefit cost ratio. The unavailability of labour due to transplanting at

same time throughout the district has created manpower scarcity which delays transplanting of rice in West Godavari district. The delay in transplanting causes late harvesting of *Kharif* which leads to delay in *Rabi* rice production also. The entire delay in both *Kharif* and *Rabi* seasons results in fallow (no third crop) during summer. Growing of pulses as third crop during summer results in additional income to the farmers and moreover it improves the soil health conditions like fertility after cereal-cereal cropping system. Cropping intensity can be increased significantly by timely planting *Kharif* season rice by machine planting which facilitates early *Rabi* and there will be a chances of possible cultivation of pulse crop during summer. Under such circumstances, a less laborious, and timesaving method of rice transplanting without yield loss is the urgent need of the hour.

The mechanical transplanting of rice has been considered most promising option, as it saves labour, ensures timely transplanting and maintains plant density uniformly which contributes to high productivity (Sathish *et al*., 2017). Hence in the present study machine transplanted crop with rice transplanter was evaluated against manual transplanting for its performance at field level in West Godavari district for two years in 10 locations.

Materials and Methods

The study was carried out in the farmer's field in west Godavari district at five different locations each during *Kharif*, 2016 and *Kharif*, 2017. The soils of West Godavari under canal irrigation system are alluvial and sandy loams in uplands. The_experiment was conducted with two treatments *viz*. farmers practice (manual transplanting) and machine planting (improved practice). In each season, five farmers within district were selected to conduct this study. The field was prepared using common tillage practice, which involves ploughing (primary tillage) once, followed by puddling (secondary tillage) twice and levelling under flooded condition.

For machine transplanting, plastic trays were used to raise mat type seedlings. Dry soil was filled in tray such a way that soil was free form stone, stubble and weeds. Seeds were soaked in water for 12 hours. Sprouted seeds were spread uniformly over the soil in the tray. These trays were kept in field and water was sprinkled for two times a day until the complete emergence of seedling occurs. Recommended doses of inorganic fertilizers also added along with a small quantity of vermicompost to these seedlings. The trays were kept in water to avoid water shortage for seedlings. Seedlings were transplanted with 3-4 leaves and 16 days old with a height of 10-12 cm.

For farmer practice *i.e.* manual transplanting, seed bed was raised at 20 cm height. Drainage channels were prepared for removing excess water. Sprouted seeds were broadcasted in the seed bed. Fertilizers were added as per the recommendations.

Results and Discussion

The number of tillers per hill, number of productive tillers per hill, duration of crop (days) and yield for the years 2016 and 2017 are presented in Table 1 and 2, respectively. The cumulative data about yield attributes in rice is presented in Table 3 and Figure 1.

Number of tillers per hill

Machine planting produced significantly higher tillers than manual transplanting. In 2016, the average numbers of tillers were 22.4 in machine planting compared to 16.84 under manual planting which were significantly different from each other. The same trend was

followed even in 2017 also. More number of tillers 24.2 per hill was found in machine planting in comparison to 17.76 tillers in manual transplanting of rice seedlings. The cumulative data of the 2 years results reveals that more number of tillers was noticed in machine planting i.e., 23.46 which is highly significant than tillers production in manual transplanting (17.3). The difference in tillering capacity in machine and manual transplanting is due to the difference in age at the time of transplanting *i.e.* 16 day in machine transplanting and 25-30 days in manual transplanting.

Number of productive tillers per hill

Number of productive tillers i.e., panicle bearing tillers were high in machine planted crop compared to manual transplanting. The average number of productive tillers during *Kharif*, 2016 was 16.72 in machine planting which is significantly different from 13.44 tillers produced in manual transplanting. During Kharif 2017, the average number of productive tillers were 19.32 and 14.24 in machine planted crop and manual transplanting, respectively. The pooled average of 2 years study in 10 locations reveals that highly significant difference in productive tillers between machine planting (18.02) and manual transplanting (14.44). The results were in accordance with Divya *et al.* (2017) and Negalur and Halepyati (2017). Patra *et al.* (2008) and Tzudir and Ghosh (2014) also reported that number of effective tillers per hill varies due to varying agronomic practices.

Duration of crop

The duration of the crop is extended from 2 to 5 days in different locations in machine planting compared to manual planting. The similar trend was observed in all locations during *Kharif*, 2016 and 2017.

Yield

The average grain yields were higher in machine planting compared to manual transplanting. During *Kharif*, 2016 machine planting produced 6380 kg/ha as compared to 6047 kg/ha produced in manual transplanting which are significantly different from each other. During *Kharif*, 2017 machine planting produced 349 kg/ha higher yield as compared to the manual transplanting. During two years of study, overall average grain yield of 6686 kg/ha in machine planting was significantly different from 6356 kg/ha in manually transplanted crop.

Tillering ability and productive tillers were highest in machine planting which resulted in significantly higher yields in machine planting than manual transplanting. This is due to tender seedlings used for planting in machine planting compared to manual transplanting. In general, BPH and Sheath blight are more common during *Kharif* season and effects yields in coastal districts. Less incidence of BPH and sheath blight in machine planting compared to manual transplanting also one of the reason for getting higher yields. Further planting in rows by machine facilitated to takeup fertilizer application, plant protection measures and weed control in an effective manner. Results of Baldev *et al.* (2013), Divya *et al.* (2017), Islam *et al.* (2016), Negalur and Halepyati (2017) also proved the same.

Economic analysis

Economic analysis was carried out for machine planting and manual transplanted rice during *Kharif*, 2016 and 2017. Cost of all inputs like land preparation, seed, nursery management and transplanting, weedicides, fertilizers, pesticides, labour, and harvesting i.e., seed bed preparation to harvesting operation were taken into account for calculating cost of cultivation of rice production.

Table.1 Table 1 Yield attributes for Kharif, 2016

Particulars	Machine Planting	Transplanting	t-cal	t-tab at 5%	t-tab at 1%
No. of tillers	22.24	16.84	20.71**	2.78	4.06
No. of productive tillers	16.72	13.44	7.15**	2.78	4.06
Duration (days)	147.8	142.2	8.26**	2.78	4.06
Yield (kg/ha)	6380.8	6047.2	12.57**	2.78	4.06
**** highly significant**					

Data presented are average of on-farm trails in five locations

Table.2 Yield attributes for *Kharif*, 2017

Particulars	Machine Planting	Transplanting	t-cal	t-tab at 5%	t-tab at 1%
No. of tillers	24.2	17.76	11.2174**	2.78	4.06
No. of productive tillers	19.32	14.24	14.76**	2.78	4.06
Duration (days)	147.6	142.2	7.74**	2.78	4.06
Yield (kg/ha)	7000.4	6655.2	5.159**	2.78	4.06
**** highly significant**					

Data presented are average of on-farm trails in five locations

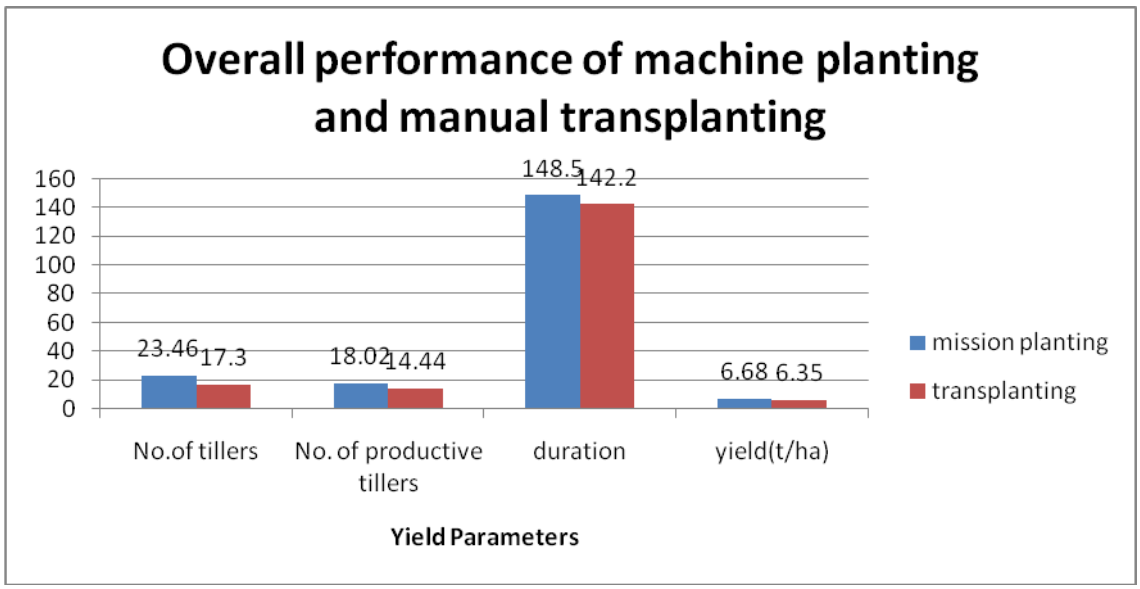
Table.3 Cumulative data on yield attributes of rice by machine planting for *Kharif*, 2016 and 2017

Particulars	Machine Planting	Transplanting	t-cal	t-tab at 5%	t-tab at 1%
No. of tillers	23.46	17.3	17.05**	2.78	4.06
No. of productive tillers	18.02	14.44	6.68**	2.78	4.06
Duration (days)	148.5	142.2	8.03**	2.78	4.06
Yield (kg/ha)	6686.8	6356.4	14.93**	2.78	4.06
**** highly significant**					

Table.4 Cost economics of rice under machine planting and manual transplanting

Name of the operation	Machine planting	Manual transplanting
Land preparation	2350	2600
Seed cost	600	1000
Nursery management & transplanting	3550	4800
Weedicides	1400	1340
Fertilisers	2650	3100
Plant protection chemicals	4300	5150
Harvesting	2900	2900
Total cost/acre	17,737	20890
Total cost/ha	44,343	52,225
Yield/ha	6687	6356
Total returns/ha	74,894	71,187
Benefit-cost ratio (B:C)	1.68	1.36

Figure.3 Cumulative data on yield attributes of rice by machine planting for *Kharif*, 2016 and 2017



The Benefit Cost ratio (B:C) is presented in Table no. 4. Results indicated that the total production cost i.e, cost of cultivation was low in machine planted crop (Rs. 44,343/ha) compared to manual transplanting (Rs. 52,225/ha) because of less seed rate, less pesticide usage due to low incidence of BPH and sheath blight, reduced the cost of pesticides for their control. Further, good aeration and high penetration of sunlight reduced the BPH spread and sheath blight in machine planting. Gross returns are higher in

Machine planting due to the higher yields. Benefit cost ratio was superior in machine planting because of higher net returns and low cost of production. It is concluded that machine planting is more remunerative compared to manual transplanting.

References

Baldev Raj Kamboj, Dharam Bir Yadav, Ashok Yadav, Narender Kumar Goel, Gurjeet Gill, Ram K. Malik, Bhagirath Singh Chauhan, 2013. Mechanized Transplanting of Rice (Oryza sativa L.) in Non-puddled and No-Till Conditions in the Rice-Wheat Cropping System in Haryana, India. American Journal of Plant Sciences, 4: 2409-2413.

Divya Pyngrope, Gautam Ghosh, Teruo Miura and Amit Masih, 2017. Growth and Yield of Rice (*Oryza sativa* L.) as Influenced by Different Crop Establishment Methods and Nitrogen Levels. Int.J.Curr.Microbiol.App.Sci., 6(7): 3968-3974

Islam A K M S, Rahman, M A, Rahman, A B M Z, Rahman M and Kim Y J. 2016. Comparison of Tegra and Conventional Rice Cultivation in Bangladesh. Bangladesh Rice J. 20 (1) : 33-43.

Negalur, R.B. and Halepyati, A.S. 2017. Growth and yield of machine transplanted rice (Oryza sativa L.) as influenced by age and number of seedlings. Int. J. Curr. Microbiol. App. Sci., 6(6): 376-385.

Patra, P.S., Sonowal, M. and Biswas, S. 2008. Studies in tillering habit and yield of some Kharif rice cultivars as influenced by transplanting date under Terai region of West Bengal. J. Crop Weed., 4: 7-9.

Satish Kumbhar, Sangram Khot,Suraj Mohite and S.V.Pandit, 2017. Design Analysis and Fabrication of Manual Rice Transplanter. International Journal of Innovative Research in Science, Engineering and Technology, 6(3). *www.ijirset.com*. ISSN(Online): 2319-8753

Tzudir, l. and Ghosh, R.K. 2014. Impact of Integrated Nutrient Management on performance of rice under rice intensification (SRI). J. Crop Weed., 10: 331-333.

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