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Comparative to study of the different intra row spacing of mechanized rice transplanting in fields of Chittoor district

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■ **ABSTRACT :** Rice is one of the most important cereals that hold the key for food security. SRI has reached certain level of acceptance among the research and scientific community in major rice producing countries. The SRI method of rice cultivation involves planting single seedling in wider row spacing *i.e.*, 25x 25 cm, which involves more labour intensive and laborious process. Hence, the present study was conducted with an objective to compare the mechanized rice transplanting with different intra row spacing with mechanized rice transplanter method with SRI and normal method of rice cultivation. The study was conducted with four treatments *i.e.*,T_1 - Machine transplanting at spacing of (30 x 14 cm), T_2 – Machine transplanting at spacing of (30 x 18 cm), T_3 - Machine transplanting at spacing of (30 x 20 cm), T_4 - Machine transplanting at spacing of (30 x 22 cm) and T_5 - Manual transplanting at spacing of (20 x 15 cm) (control). The study indicated that mechanized transplanting with rice transplanter adopting highest yield of (30 x 20 cm) row spacing recorded more 10.00 per cent more yield, when compared to 30 x 18 cm) method of planting. Mechanised paddy farmers were able to secure a net income Rs. 1.81/- per every rupee of expenditure. While, the convectional paddy farmers realized Rs. 1.42/-.

■ **KEY WORDS :** Mechanised system of rice intensification with SRI principles, Plant height, Economic

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Rice is one of the most important cereals that hold the key for food security. In India, rice is presently grown in an area of 43.42 m. ha. with a production of about 98.95 m.t (Anonymous, 2014). At the current rate of population growth, the country has to produce about 120 m. t. of rice by 2030 to feed the ever growing population (Anonymous, 2011). Meeting the targeted demands of rice is a challenging task for the policy makers, researcher and all other stakeholders. The problem is still confounded as the targeted increase has to be met in the background of declining resource base especially the land, water and labour and increasing environmental concerns. Increasing water scarcity is becoming a real threat for rice cultivation. About 80 per cent of fresh water is being used for agriculture and out of this more than 50 per cent is consumed by the rice crop alone. It is now evident that rice crop cannot have the luxury of water that it had in the past due to acute water shortages. There are some options such as zero tillage, direct seeding, aerobic rice and the system of rice intensification (SRI) which can help to save water and enhance water productivity in rice cultivation.

However, the former methods lead to yield reduction, while SRI has the potential to enhance yield and economize the water use. SRI has reached certain level of acceptance among the research and scientific community in major rice producing countries. The SRI method of rice cultivation involves planting single seedling in wider row spacing *i.e.* 25x 25 cm, which involves more labour intensive and laborious process. Reliance on human and animal power for day to day management of farm operations is showing a continuous decline over the last few years leading to considerable progress in agriculture mechanization.

Mechanical equipments for various farm operations are generally being used by the farming community. Even small farmers are adopting and utilizing selected farm equipments for efficient farm management through custom hiring. Transplanting, weeding and harvesting are the major operations that consume most of the labour requirement in rice cultivation. Mechanization with SRI methods leads to maintain plant-to-plant spacing and reducing seedling age, reducing the seed requirements by 50%, labour requirements reduction by 60%, and the time required for all of the main rice-farming activities by 70%. High labour demand during peak periods adversely affects timeliness of operation, thereby reducing the crop yield. Usage of tools, implements and machineries for puddling, transplanting, weeding and harvesting will lead to reduction in drudgery, cost and time. Hence, the present study was conducted with an objective on compare to the different intra row spacing of mechanized rice transplanting with method of cultivation in fields of chittoor district.

The Data were collected from a representative sample of growers using Paddy machine Transplanter and manual transplanting of paddy in villages of china Rajula Kandrica,Chittoor Districts of Andhra Pradesh during the year 2014-15. The net income Rs. 1.81/- per every rupee of expenditure. While, the convectional paddy farmers realized Rs. 1.42/-. Similarly reported higher benefit cost ratio in mechanical transplanting (Singh and Rao, 2012).

On an average, the total variable cost per ha of mechanised paddy and convectional paddy forms was Rs. 39755/- and Rs. 41,580/-, respectively. Among the variable cost, expenditure on manures and fertiliser was higher than on all other inputs amounting to Rs. 15000/- per ha on mechanised firms and accounted for 26% total variable cost. However it was human labour which was the major item of expenditure in the cultivation of convectional paddy amounting to Rs. 15,460/-. This item of expenditure accounted for mechanized and convectional paddy forms spent an amount of Rs. 18,875/- (47.47%) and Rs. 8,875/- (27.34%) per ha on machinery use, respectively. The yield realized in traditional method was 4.83 t ha^{-1} and it was 5.70 t ha^{-1} in self-propelled paddy transplanting method. The cost of cultivation in both the methods was more or less the same (Rs. 30,387 ha^{-1} in traditional method and Rs. 31,750 in self-propelled paddy transplanting). The benefit cost ratio was 1.87 in self-propelled paddy transplanting technology as compared to 1.65 in manual transplanting (Singh and Rao, 2012).

A field experiment was conducted during November to march 2014-15 at dry land in agricultural in fields of chittoor district of Andhra Pradesh to optimize the spacing of transplanting in rice cultivation using rice transplanter (Yanmar with 8 rows) (Duraisamy *et al.*, 2011). Higher DMP (24231 kg ha^{-1}), root length (16.63 cm), number of panicle m^{-2} (862 Nos.m^{-2}) and grain yield (7167 kg ha^{-1}) was produced when transplanting was done at 30 x 22 cm spacing (15 hills m^{-2}). Among the depth of planting, increased plant dry matter production (17498 kg ha^{-1}), root length (17.28 cm), number of panicle m^{-2} (812 Nos.m^{-2}), filled grains panicle1 (113 Nos.) panicle length (22 cm) and grain yield (7667 kg ha^{-1}) was produced in 4 cm depth. 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.

■ METHODOLOGY

A trial was conducted during *Rabi* 2014-15, at fields of Chittoor district of Andhra Pradesh by comparing four treatments detailed below with the variety NLR-34449, with Different treatments in the experimental plot was as follows :

T_1 - Machine transplanting at spacing of 30x14 cm

T_2 - Machine transplanting at spacing of 30x18 cm

T_3 - Machine transplanting at spacing of 30x20 cm

T_4 - Machine transplanting at spacing of 30x22 cm

T_5 - Manual transplanting at spacing of 20x15 cm (control)

Nursery for machine planting was raised in trays. The trays were filled with media consisted of mixture of decomposed coir pith, farmyard manure and well sieved field soil. A seed rate of 75 g/tray was used. Fourteen days old seedlings were planted at a spacing of (30 x 14 cm) using eight row machine transplater and other management practices like weeding, fertilization and irrigation was done as per the standard procedure followed for SRI techniques. The experimental block was divided into two plots. The first plot was again divided into four sub plots to accommodate four treatments of (30 x 14cm, 30 x 18 cm, 30 x 20cm and 30 x 22 cm) intra row spacing. Each subplot seedlings were transplanted in four lines with rice transplanter. The control was planted with manual planting (20 x 15 cm) in 0.5 acre in second plot.

The transplanted seedlings were maintained carefully through crop period. Gap filling was done one week after seedling emergence with the reserved seedlings of the same variety. In farmers method nursery was raised and 22 days old seedlings were planted randomly with manual labours. The recommended package of practices was followed as per the treatments. The operational view of rice transplanter is shown in Fig. A and the transplanted field is shown in Fig. B. The Cost of cultivation for each treatments were calculated by taking considerations of all inputs and labour cost based on the requirements of the each treatment and cost benefit ratio was calculated. The data recorded were statistically analyzed.

Fig. A : Rised beds ready to transplanting and transplanting the main field

Fig. B : Mechanical rice transplanted the field

RESULTS AND DISCUSSION

Grain yields were significantly higher under all the treatment when compared to the farmers practice, in this greatest yield was found in treatment 3 (30 x 20 cm) as 7267.50 kg/ha followed by treatment 4 (30 x 22 cm) as 7212.50 kg/ha. Whereas lowest grain yield, 5831 kg/ ha was observed in treatment 5 (20 x 15 cm) conducted experiment on the different intra row spacing's. The results were found about 10 per cent increase in yield of treatment 3 over the other remaining practices. This results were in conformity with the findings of Vijaykumar *et al.* (2012), Sheeja *et al.* (2012). The similar results found in Panicle length of rice was highest with treatment 3 (30 x 20 cm) as 20.769 cm followed by treatment 2 (30 x 18 cm) as 20.24 cm and T_5 as (20 x 15 cm), T_4 (30 x 22 cm) as 19.811cm, whereas lowest, Panicle length 19.59 cm was observed in treatment 1 (30 x 14 cm). The results were in conformity with the findings of Singh and Singh (1993) and Sreenivasulu and Bala (2014). Number of productive tillers was highest with treatment 2 (30 x 18 cm) as 47.77 followed by treatment 3 (30 x 20 cm) as 47.66, treatment 4 as 42.17 and treatment 1 as 27.71, whereas lowest, no of productive tillers in 19.81 was observed in treatment 5 (20 x 15 cm). The similar results were reported by Manjunatha *et al.* (2009) and Gani *et al.* (2002). On an average, the total variable cost per ha of mechanized paddy and convectional paddy forms were Rs. 39,755/- and Rs. 41,580/-, respectively.

Among the variable cost, expenditure on manures and fertilizer were higher than on all other inputs amounting to Rs. 15,000/- per ha on mechanized firms and accounted for 26% total variable cost. However it was human labour which was the major item of expenditure in the cultivation of convectional paddy amounting to Rs. 15,460/-. The response of yield components to SRI also indicated that the increased grain yield using the SRI system with mechanical transplanting methods might be attributed to the improved number of panicle length and Number of productive tillers. Our result indicates that SRI might play an important role in single panicle development in mechanical transplanting, which provided evidence for the importance of a strong individual tiller. It also found that promoting early tiller

Table 1 : Comparative performance of machine planting with different intra row spacing normal cultivation practices on yield parameters, grain yield of the rice and net income per every rupee of expenditure

Treatments	Panicle length (cm)	No. of productive tillers	Grain yield (kg/ha)	Cost of cultivation (Rs. ha^{-1})	Net income per every rupee of expenditure
T_1	19.59	27.71[ab]	6925.00 [d]	39,755/-	1.81/-
T_2	20.24	47.77[a]	7060.00 [c]		
T_3	20.76	47.66[ab]	7267.50 [a]		
T_4	19.81	42.17[ab]	7212.50 [b]		
T_5	20.24	19.81[b]	5831.00 [e]	41,580/-	1.42/-
Mean	19.99	35.30	6859.20		
C.D.(P=0.05)	NS	42.19*	36.94*		
CV (%)	3.616	86.02	0.49		

NS=Non-significant

emergence as a response to transplanting young seedlings increased grain yield. This might partly explain the yield increase in SRI treatment in the mechanical transplanting with different intra row spacing and manual transplanting systems. The results revealed that the higher yield under mechanized planting was attributed to adoption of required plant population with wider spacing resulted in more number of productive tillers and panicle length. Here, the cost of cultivation under mechanized planting was also considerably less (Rs. 39,755/- ha^{-1}) as compared to farmer practice (Rs. 41,580/- ha^{-1}).

Conclusion :

The study indicated that mechanized transplanting with rice transplanter adopting four intra row spacing's *i.e*. the highest 30 x 20 cm row spacing with SRI principles recorded 10.00 per cent more yield when compared to farmer practices. The total labour requirements for mechanized and conventional paddy production were 26 man days and 85 man days per hectare, respectively. The total variable costs per hectare mechanized paddy and conventional paddy were Rs. 39,755/- and Rs. 41,580/-, respectively. On an average, the yield advantage of 4.75 quintals per hectare was observed in mechanized compared to conventional paddy. The higher productivity on mechanized paddy farms were relatively better and timely management practices (like young seedling transplantation, aerated field with more row space and mechanical weeding) were followed. The by -products from the mechanized and conventional fields were 2.5 and 2 tones, respectively. The Mechanized paddy farmers were able to secure a net income Rs. 1.81/- per every rupee of expenditure. While, the convectional paddy farmers realized Rs. 1.42/-.

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■ REFERENCES

Anonymous (2011). *Vision 2030*. Published by ICAR, Central Rice Research Institute, Cuttack, India

Anonymous (2014). Agricultural Statistics at a Glance, 2014, Directorate of Economics and Statistics,Ministry of Agriculture, Govt. of India (Website: http://www.dacnet.nic.in/eands).

Duraisamy, V.M., Sentilkumar, T. and Subbulaksmi, S. (2011). Studies on standardisation of spacing and transplanting depth for a self propelled rice transplanter. *Agric. Mechanization Asia, Africa, & Latin America,* **42** (1): 42-44.

Gani, A., Rahman, A., Dahono, Rustam and Hengsdijk, H. (2002). Synopsis of water management experiments in Indonesia. In: Water and Rice production- IRRI. 29-37.

Manjunatha, M.V., Masthana Reddy, B.G., Shashidhar, S.D. and Joshi, V.R. (2009). Studies on the performance of self propelled rice transplanter and its effect on crop yield. *Karnataka J. Agric. Sci.*, **22**(2) : 385-387.

Sheeja, Raj, K., Mathew, Reena, Jose, Nimmy and Leenakumary, S. (2012). Enchancing the productivity and profitability in rice cultivation by planting methods. *Madras Agric. J.,* **99** (10-12):759- 761.

Singh, G. and Singh, O.P. (1993). Effect of method of seeding and level of nitrogen on yield and yield attributes of rice under flood-affected conditions. *Indian J. agron.,* **38**: 551-554.

Singh, R.S. and Rao, K.V.R. (2012). Impact of self propelled paddy transplanter in Kerala. Book chapter in Rural Development. International Conference of Agricultural Engineering - CIGR-AgEng 2012: agriculture and engineering for a healthier life, Valencia, Spain, 8-12 July 2012 pp. C-1698.

Sreenivasulu, S. and Bala, Hussain Reddy, P. (2014). Effect of mechanized transplanting on yield, yield attributes and economics of rice (*Oryza sativa*). *J. Res. ANGRAU,* **42**(2) : 9-12.

Veeramani, P., Singh, R. Durai and Subrahmaniyan, K. (2012). Study of phyllochron - system of rice intensification (SRI) technique. *Agric. Sci. Res. J.,* **2**(6): 329-334.

Vijay Kumar, D,. Hari Babu, B. and Madhusudhana Reddy, K. (2012). Self – propelled walking behind type rice Transplanter- a better alternative for manual transplanting. *Andhra Agric. J.*, **59** (4) : 630-634.