Original Research Article

FRONT LINE DEMONSTRATION OF PADDY DRUM SEEDER (8 ROW) UNDER WELL IRRIGATED RICE IN NALGONDA DISTRICT, TELANGANA

ABSTRACT

Front line demonstration was conducted on direct seeded technology with drum seeder among the farmers, assessment of drum seeder implement was done with the assistance of Krishi Vigyan Kendra, Kampasagar, Nalgonda under Professor Jayashankar Telangana State Agricultural University, Telangana for consequently three years during *Kharif,* from 2018-19 to 2020-21. The comparison was made between direct seeded technology with drum seeder and manual transplanting with an objective to reduce the production cost of paddy and subsequently increase farmer's net returns. Demonstrations revealed that, there were more of tillers (395) and panicles (370)/m^2 in direct seeded technology with drum seeder compared to farmer's practice (365 and 346/ m^2). Drum seeder technology influence plant height (68.2cm), number of tillers/m^2 (395) and yield attributing parameters viz., No. panicles m^{-2} (370), Panicle length (16.9 cm) and No. of grains / panicle (182). Direct sowing of paddy has recorded higher grain yield (6,512 kg ha^{-1}) which was 6.4 per cent over farmer's practice (6,094 kg ha^{-1}) with a net saving of Rs. 8,990/- on the cost of cultivation ha^{-1}. The Gross returns and net returns (Rs.1, 20,795and Rs. 69, 265/ha) by the drum seeder method were more compared to farmer's practice (Rs.1, 13,036/ha and Rs. 52, 516/ha). The Drum seeder method saved the cost of cultivation by 14.8 per cent whereas, gross returns and net returns were increased by 6.4 and 24.2 per cent respectively over farmer's practice. The Seed rate was also reduced to 30.0 kg ha^{-1} against farmer's practice (64.5 kg ha^{-1}). Direct seeding technology with drum seeder helps reduce the cost of nursery raising and transplanting the overall cost of cultivation reduction by 14.8 per cent. The crop attained to harvest before 7-10 days duration with early crop harvest.

Keywords: Rice, Frontline Demonstrations, Drum Seeder

Introduction

Rice (Oryza sativa L.) is the most important staple food crop in the Nalgonda district of Telangana cultivated in 87642 ha area during *Kharif* and 63661 ha during Rabi with an average productivity of 3450 kg/ha. The major rice area is under NSP left canal irrigated red soils/ Red soils with wells, tanks, kuntas as irrigation sources. Present management recommendations for rice in Telangana include planting 20 to 25 day-old seedlings @ 2 per hill at 20 x 15 cm spacing with hand weeding and continuous flooding (Vyavasaya Panchangam, 2018). The Majority of farmers use over aged seedlings due to delayed monsoon. Rice is cultivated by raising nursery for about 30 days. Later seedlings are pulled and transplanted manually in a zigzag manner without proper spacing in the main field after puddling. The Cost of cultivation is rising year by year due to many reasons i.e social reasons, situational factors and input costs. The present cost of cultivation per hectare is between Rs.51300/- to Rs 53000/-. This is mainly due escalation of labour wages and scarcity of labour in villages during the agricultural season, labour requirement is very intense at the time of transplanting and increase in the price of fertilizers. To overcome this, direct seeding of Rice with a drum seeder can reduce the labour requirement during transplanting, technology is very simple and can be adopted by the farmers easily, cost of cultivation can be reduced and quality crop harvests at 7- 10 days earlier than normal transplanted field. Direct seeding of Rice with drum seeder holds special significance in the present day production system with regard to saving labour component by 30-50% and increasing productivity by 20-30%. Transplanting is not profitable due to high labour wages and the problem of non-availability of labour during the peak periods of operation (Singh et al., 2005). Non-availability of labour, hike in inputs cost and water shortage have led to uneconomic rice cultivation. In the last five years the cost of production on different operations is increased by

33 per cent on seed, 45 per cent on chemical fertilizers, 100 per cent on labour cost and 35-40 per cent on tillage operations. Transplanting alone costs about 15 per cent of total rice production cost and delayed transplanting due to labour shortage causes sustainable loss in yield (Ponnuswamy et al., 1999). Because of uncertainty in rainfall and increase in cost of production, the rice cultivation has become unprofitable in Nalgonda and the same is in the other growing regions of Telangana (Visalakshi and Sireesha, 2013). The transplanting of rice seedlings which is a highly labour-intensive and expensive operation can be replaced by direct seeding that can reduce labour needs by more than 20 per cent in terms of working hours required (Santhi et al., 1998). The cost of operation of a drum seeder is Rs. 40.50 per hour and Rs. 320 per hectare (Chavan and Palkar, 2010). So, direct seeding is much helpful as it requires less labour and time by skipping the nursery raising and transplanting to the field manually. Considering the above points, Front line demonstrations were conducted to popularize the drum seeder among the farmers,the feasibility of paddy sowing by drum seeder was done under the supervision of Krishi Vigyan Kendra (Extension unit of Professor Jayashankar Telangana State Agricultural University, Telangana.), Nalgonda for three years during *Kharif*, 2018-19 to 2020-21. The comparison was made between direct sowing of paddy using drum seeder and farmers practice with an objective to reduce the cost of production of paddy and subsequently improve the returns from unit in farmer's fields.

RESEARCH PROCEDURE

The Krishi Vigyan Kendra, Kampasagar, Telanagana has demonstrated an 8 row paddy drum seeder supplied by Farm Machinery Research Centre, Rajendranagar during *Kharif*, 2018. Specifications of drum seeder are given in Table A. A total of 30 demonstrations were conducted (Ten in 2018-19, ten in 2019-20 and ten in 2020-2021) during the *Kharif* season in farmers' fields under puddle conditions. Demonstration details are given in Table B. Test variety was Ankur Puja of 130 days duration in all the locations.

The demonstrations comprised of two treatments viz., T_1-Direct sowing with drum seeder and T_2-Farmers practice (Traditional method of transplanting). The Plot size for each treatment of Front line demonstration was 4000 m^2.

Direct sowing of paddy with drum seeder: Direct sowing with drum seeder, the paddy seeds were soaked in water for 24 hours followed by incubation in gunny bags for 24-48 hours. The field was well puddled and levelled after draining the standing water before sowing to avoid damage of sprouted seed and to enable water to spread uniformly over the field. After puddling, the field was left for 1-2 days for the settling of the puddled soil. Care was taken to maintain a thin film of water in the field at the time of sowing. The Seed rate required for direct sowing of sprouted seed in puddled fields was quantified and pre-germinated seeds were filled in all drums up to 2/3rd of their capacity at a time. The ground wheels make the impression to serve as a marker for the next rows and helps for good movement of drum seeder due to the lugs provided on the periphery of the wheels. After turning the drum seeder for the second row, care should be taken that the first wheel should go through the same line the previous row in order to maintain the inter-row distance of 20 cm, care should be taken to watch for any blocks of the drum. Refill the drums with seed when it reaches 1/4th of its capacity and continues the operation. A Minimum of two labour was required for completing the sowing operation i.e. one labour is for pulling the seeder and the other is for checking the drop of seeds from holes and filling the pre-germinated seeds in the drum. The field was kept moist without standing water in the field up to 20 days after sowing. Uniform dose of FYM @ 5.0 t ha^{-1} and 120-60- 50 kg ha^{-1} NPK were applied through urea, SSP and MOP. Entire P and K and 1/3 N was applied as basal, remaining N were applied in two equal splits at the active tillering and panicle initiation stage. Weed growth was controlled by using pre- emergence herbicide Pyrazosulfuron Ethyl 10% WP@ 80 gm/acre was applied at 1-3 days after sowing and post-emergence application of bis

pyribac sodium @ 80 ml/acre or herbicide mixture Cyhalofop-Butyl 5.1% + Penoxsulam 1.02% @ 800- 1000 ml per acre was applied at 15-20 days after sowing.

Table A: Specifications of drum seeder

Power source	**Hand operated**
Row to row spacing	20 cm
Shape of the seed drum	Hyperboloid
Number of rows	8 rows
Diameter of the drum	20 cm
Diameter of the seed metering hole	9 mm
Number of seed metering hole	9 No
Weight of the unit	10 Kg
Type of ground wheel	
Diameter of the ground wheel	Lugged wheel
Operating speed	600 mm
Level of filling the seed drum	1 kmph / Walking speed
Weight of seed drum	Half volume
Weight of seed drum	600 g
Seed requirements	12 kg per acre

Table B: Details of Front Line demonstrations

Sr. No.	Year	No. of villages	No. of locations	Area (ha)
1	2018-19	5	10	4
2	2019-20	5	10	4
3	2020-21	5	10	4

Traditional method of nursery raising and transplanting:

In the farmer's practice of traditional rice cultivation seedlings of 25-30 days old were pulled out manually from the nursery and transplanted in the main field at random @ 30-35 hills m^{-2} using 4-6 seedlings per hill, maintaining 2 cm depth of water up to panicle initiation and 5-7 cm depth of water thereafter up to one week before harvest. The field was drained before the application of fertilizers and one week before harvest. Manual weeding was done once at tillering to control weeds. Uniform doses of FYM @ 5.0 t ha^{-1} and 120-60- 50 kg ha^{-1} NPK were applied through urea, SSP, the MOP. Entire P and K and 1/3 N were applied as basal, remaining N was applied in two equal splits at the active tillering and panicle initiation stage. Both the treatments received uniform plant protection and cultural management practices throughout the period of crop growth. Growth and yield attributes on 10 randomly selected hills were noted in each treatment plot. At harvest, grain yields from the net plots (5 m x 5 m) were recorded. Labour charges and cost of inputs were worked out to compute the cost of cultivation. Gross returns were calculated based on local market prices of paddy and straw. The Benefit-cost ratio was computed by dividing gross returns with cost of cultivation.

RESEARCH RESULT AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Yield parameters: Higher plant height of 68.2 cm was recorded with direct sowing by drum seeder compared to farmer's practice (65.3cm) (Table 2). There were more of tillers (395) and panicles (370) per m^2 in direct sowing by drum seeder compared to 365 tillers and 346

panicles per m^2 in farmer's practice which can be attributed to the sowing of sprouted seeds at wider row spacing (20cm). Early establishment of seedlings in direct sown sprouted seed might be the reason for higher tillers per m^2 than conventional transplanting. These results are in accordance with Visalakshi and Sireesha (2013). A higher number of grains panicle^{-1}(182) and more panicle length (16.9 cm) were recorded in direct sowing by drum seeder compared to farmer's practice (14.5 cm panicle length and 156 grains per panicle). Tiller to panicle conversion ratio was higher in direct sowing by drum seeder which might be due to favourable growth and better translocation of assimilates to the sink as it was revealed by more number of grains panicle^{-1}. Similar findings were reported by Halder and Patra (2007). Where as in farmer's practice planting more seedlings per hill probably led to poor tillering which was also reflected in yield attributes such as number of panicles per metre square, panicle length and number of grain panicle^{-1}. Similar findings were observed by Shekhar et al. (2009). The direct- seeded rice matured in 10 days earlier than the transplanted rice. Wang and Sun (1990) noticed that duration can be shortened by 7-15 days in direct seeded rice compared to transplanted rice.

Grain yield: Grain yield was influenced by sowing methods. Direct sowing of paddy with drum seeder has recorded higher grain yield (6512 kg ha-1) (Table 1) which was 6.4 per cent higher over farmer's practice (6094 kg ha^{-1}). The higher number of grains panicle^{-1} and panicle length (cm) might be the reason behind the yield increase in the direct sowing method. Shekhar and Singh (1991) stated that direct sowing of sprouted seeds under puddled condition results in significant improvement in yield attributes like number of effective tillers and grain yield. Seeding of sprouted seeds with a 8-row seeder after puddling increased grain yield (21.5%) over farmer's practice of transplanting (Halder and Patra, 2007). Lower paddy yields under farmers' practice might be due to planting 4 to 6 older seedlings (25 - 30 days old) with irregular spacing may lead to poor growth, poor tillering, lesser number of panicles

per metre square and yield. Earlier reports indicated that grain yield reduction is due to planting of the older seedlings (Menete et al., 2008) at a higher density (San-oh et al., 2004).

Economics: A saving of Rs. 8990/- on the cost of cultivation per hectare was realized through indirect sowing of paddy with drum seeder besides increasing paddy yield. Gross returns (Rs. 1, 20,795/ ha) and net returns (Rs. 69, 265/ ha) (Table 1) was realised with drum seeder method compared to farmers practice (Rs. 1, 13,036 / ha gross returns and Rs. 52, 516/ ha net returns). This might be due to a reduction in cost of cultivation and higher grain yield with drum seeder method. Higher Net returns of Rs. 69, 265/ha were obtained with the drum seeder method due to lesser cost of cultivation and higher grain yield compared to farmer's practice. The cost of cultivation was comparatively lesser in drum seeder method which resulted in an additional net profit of Rs.16749/ha as compared to the conventional method of rice cultivation. Similar findings were reported by Halder and Patra (2007). Simultaneously benefit-cost ratio was higher with drum seeder method (2.3) compared to farmers practice (1.8) because of lower cost of cultivation and increased yield with the drum seeder method. Higher net returns and B:C ratio were recorded with the drum seeder method due to no nursery raising and transplanting, less seed cost, reduced labour for weeding denoting lower cost of cultivation in the drum seeder method resulted in increased profitability compared to farmer's practice. In the drum seeder method cost of cultivation was reduced by 14.8 per cent whereas, gross returns and net returns were improved by 6.4 and 24.2 per cent, respectively over farmers practice.

Table 1: Yield improvement in rice by direct sowing with rice the drum seeder

Treatment	**Average Yield kg/ha**	**Gross returns (Rs. ha^{-1})**	**Cost of cultivation (Rs. ha^{-1})**	**Net Returns (Rs)**	**C:B ratio**	**% Increase in yield**
Direct sowing	6,512	1, 20,795	51530	69, 265	**2.3**	**6.41**

with drum seeder						
Farmers practice (Conventional transplanting method)	6,094	1, 13,036	60520	52, 516	**1.86**	

Table 2: Growth parameters of paddy as influenced by direct sowing with the drum seeder

(Mean of 3 years)

Particulars	Direct sowing with drum seeder	Traditional method of transplanting (Farmers practice)
Seed rate (kg/ha)	30	68.7
Days to transplant	0	25-30
Cost of raising nursery (Rs./ha)	0	3950
Labour required for transplanting (for one hectare	2	15-20
Spacing (cm)	20*5-8	Zig zag method
No. hills m^{-2}	26	30-35
Plant height (cm)	68.2	65.3
Number of tillers m^{-2}	395	365
Number panicles m-2	370	346
Panicle length (cm)	16.9	14.5
Number of grains / panicle	182	156
Crop duration (days)	125	135

Extension Activities

Extension activities like Front line demonstrations, training programmes, exposure visits, field days, group discussions, Popular articles, kisan melas,radio and TV and newspaper coverage were conducted by KVK to popularize the drum seeder. A total no of 12 on and off -campus training programs were conducted for 360 beneficiaries.

Farmer Feedback

Farmers accepted the technology as it is viable and easy to practice. Good relief from labour shortage during the peak periods. As the crop duration is reduced by 7-10 days it facilitates in raising the summer pulse on conserved soil moisture without any moisture stress. The weed problem in the initial stage of the crop growth can be managed by the application of selective herbicide (Jitendranath et.al 2012).

Conclusion: These demonstrations clearly established an advantage of direct sowing of paddy using drum seeder in puddled condition over conventional method of transplanting. Seed rate can be reduced to 30 kg ha^{-1}as against 68.7 kg ha^{-1} in farmers practice. Direct sowing with drum seeder helps in reducing the cost on nursery raising and transplanting besides increasing yield by 6.4 per cent, reducing the crop duration and cost of cultivation. The cost of cultivation was reduced by 14.8 per cent and net returns increased by 24.2 per cent.

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