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Resource Optimisation in Rice through Direct Seeding by Drum Seeder

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Abstract

In Andhra Pradesh rice is the major food crop grown in an area of 28.03 lakh ha in kharif and 15.84 lakh ha in rabi. East Godavari district is known as 'Rice granary of Andhra Pradesh' where rice is cultivated in an area of 4.09 lakh ha both in kharif (2.23 lakh ha) and rabi (1.51 lakh ha) with an average productivity of 3.855 t/ha. Due to labour shortage and high labour cost, rice cultivation is becoming unprofitable. In order to tide over the situation Krishi Vigyan Kendra (KVK) of Central Tobacco Research Institute (CTRI) popularised direct seeding in rice with rice drum seeder developed by Tamil Nadu Agricultural University (TNAU).

During 2010-12 seventy front line demonstrations were conducted in both kharif and rabi in the district. Results revealed that direct seeding reduced the cost of cultivation by Rs 9166/ha by avoiding nursery as well as transplanting cost. Crop duration is reduced by 8-10 days. Yields were increased to an extent of 8.3% in Kharif and 11% in Rabi. Extension activities were carried out in collaboration with ATMA, FTC, NABARD, Farmers clubs and Mass media which resulted in increase in area under direct seeding. During this period the technology was spread to 120 villages covering 17 mandals in the district. In view of its importance, the State Department of Agriculture is supplying the drum seeders on subsidy basis for large scale adoption. In order to make alleys at a regular interval of 2 mts, the present TNAU drum seeder was refined as per the farmers feedback by adding one more

drum to the existing four drums and assessed in comparison to four drum seeder. Results showed that area covered with five drum seeder will be 25% more than the four drum seeder in unit time and also reduced the labour cost (Rs 1500/ha). Future strategy will be on increase in row to row distance to 25 cm instead of 20 cm for mechanical weeding. As the direct sowing shown promising results in resource optimization in rice cultivation all extension methodologies are to be adopted for its popularization.

Keywords: Rice seeder, Direct seeding, TNAU Drum Seeder.

1. Introduction

Andhra Pradesh is the fifth largest state in India accounting for 9 and 8% of the country area and population respectively. The state has three main regions viz., coastal (9 districts),Telangana (10 districts) and Rayalaseema (4 districts) and a fairly extended tribal belt, along the Northern and North-Eastern regions. Andhra Pradesh has three major river basins (Krishna, Godavari and Penna) and five other small rivers which drain into bay of Bengal. Rice is the principle food crop cultivated throughout the Andhra Pradesh state providing food for the growing population, fodder to the cattle and employment to the rural masses. It is cultivated in an area of 28.03 lakh ha in *Kharif* and 15.84 lakh ha in *rabi*. The main source of irrigation is canals (52.0%), tube wells (19.3%), tanks (16.25), Other wells (8.8%) and other sources (3.7%). Any decline in its area and production will have a perceivable impact on the state economy and food security.

East Godavari district in Andhra Pradesh is one of the agriculturally potential districts which is contributing about 10% of the total agricultural production of the state. It has an area of about 10.29 Sq.Km which is broadly divided into three natural zones viz., delta, upland and agency area. The mighty river Godavari passing through the district is the major source of irrigation. The climate is comparatively equitable but it is very warm in May (39^0C-46^0C). The average normal rainfall of the district is 800-1175 mm. East Godavari district is endowed with a variety of soils *viz*., alluvial soils (Godavari delta area), sandy clay soils (some portions of Godavari delta and red loamy soils(upland and agency area of the district). East Godavari district is known as rice granary of Andhra Pradesh where rice is cultivated in an area of 4.09 lakh ha both in *kharif* (2.23 lakh ha) and *rabi* (1.51 lakh ha) with an average productivity of 3.855 tonnes /ha. Rice is being cultivated by raising nursery for about 30 days. Later seedling were pulled and transplanted manually with a spacing of 20X15cm in the main field after puddling. Weeding, fertiliser application, plant protection measures, irrigations were done for raising a good crop, then harvested and threshed. In the last five years the cost of production on different operations is increased by 33% on seed 45% on chemical fertilisers, labour cost 100%, tillage operations by 35-40%. Because of increase in cost of production the cultivation of rice has become unprofitable in

Andhra Pradesh and same is the case in other growing regions. As a result, in 2011 crop holiday was declared by the farmers in *Kharif* season in the Konaseema region of East Godavari district. In order to tide over the situation Krishi Vigyan Kendra under the administrative control of Central Tobacco Research Institute popularised the direct seeding with drum seeder developed by Tamil Nadu Agricultural University by on-Farm demonstrations and training programmes in collaboration with line departments.

2. Material and Methods

The difficulties in nursery raising, drudgery in transplanting, uncertainty in rainfall and lack of water in tanks and wells during nursery raising and labour shortage in nursery raising and transplanting time necessitated for alternate method of rice cultivation. In transplanted rice which is a labour intensive and expensive can be replaced by direct seeding that can reduce the labour needs by 20% (Pradhan,1969 and Santhi et.al.1998). Direct seeding in rice is identified as viable technology to over come the problem of high cost of production and to mitigate flood and drought situation in nursery season. Drum seeder initially developed by IRRI, Philippines was later modified by the DRR, Hyderabad.(Fig 1). When it was assessed by KVK in both light soils and black soils during 2002-2004. The problems encountered were seed drum touching in black soils due to heavy weight and smaller wheel size and more seed dropping in light soils. More over poor germination (sprouted seed) is observed due to water stagnation in the foot prints of the person pulling the drum seeder. To over come the problem CTRI-KVK refined the existing model by increasing the wheel diameter from 150 to 180cm, increase the row distance from 20-25 cm to facilitate mechanical weeding by weeders, reduced the grain hole size from 10 to 8mm to get optimum seed dropping, reduced the wheel steps from 12 to 8 nos, increased the distance between the grain wholes from 1.5 to 5 cm and arranged the iron chain for covering the soil. This was assessed during 2005 and found that its performance is better than DRR drum seeder. As the drum seeder is heavy weight, drudgery is involved while pulling and two persons are required for its handling as a result of which the unit area covered is less. Later drum seeder was brought from Tamil Nadu Agricultural University (TNAU), Coimbatore which is light in weight, easy to operate by a single man and more area can be covered by a single man (Fig 2). TNAU drum seeder consists of four seed drums made of fibre mounted over a shaft, ground wheels, floats and handle. The seed rum is hyperboloid shape (truncated cone) with 200 mm diameter having 12mm flat spikes of 25mm length kept parallel to the axis of rotation. The slope of the cone facilitates the free flow of seeds towards the metering holes. Nine numbers of seed metering hole of 10mm diameter were provided along the circumference of the drum at both the ends at a row to row spacing of 20cm. The floats were provided on either side to restrict the shrinkage and to facilitate easy pulling of the drum seeder. The cost of the unit is Rs 4200/-. Advantages are uniformity in seed sowing, reduction in seed rate and cost of thinning is reduced, hill dropping of the seed is achieved and continuous drilling is eliminated. The Drum seeder developed using the hyperboloid drum performed better

when compared to the other types (Sivakumar et.al. 2005). TNAU drum seeder was assessed in comparison to modified drum seeder during 2006-07(Subbaiah and Krishnamurthy,2008) and found that TNAU drum seeder reduced the drudgery and enhanced the unit area coverage (1.0 ha/2 persons). The TNAU drum seeder was popularised during 2010-12 by conducting a total no of 28 on farm trails in 11.0 ha area and 70 front line demonstrations in 30 ha area. TNAU drum seeder was evaluated against the conventional transplanted paddy.

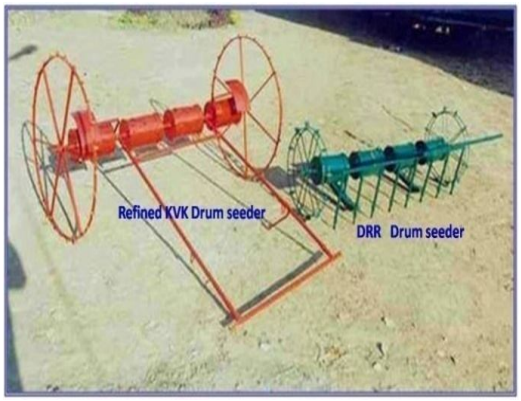

Figure 1: DRR drum seeder and Modified drum seeder by KVK.

Figure 2: TNAU Drum Seeder.

3. Results and Discussion

3.1 Yield and Economics

Average yields of five seasons revealed that *rabi* yields were more than *kharif* yields. In *Kharif* the yield increase was 8.3% where as in *rabi* the yield increase was 11%. The B:C ratio was also high in *rabi* season. The performance of drum seeder was better in *rabi* season compared to *kharif* because of uncertain rains there is a possibility of seed washout. It is very difficult to maintain the required water level in the field after direct seeding due to the monsoon rains and also lack of proper drainage facilities in *kharif*. Net returns and benefit cost ratio was higher with TNAU drum seeder compared to conventional transplanting (Table 1 and 2). Shekar and Singh (1991) stated that direct seeding of sprouted seed under puddled condition results in significant improvement in yield attributes like number of effective tillers and grain yield.

Table 1: Yield Improvement in rice by direct sowing with rice drum seeder- *Kharif*

Treatment	Average Yield q/ha	Net Returns (Rs)	C:B ratio	% Increase in yield
Direct sowing with TNAU drum seeder	48.75	23,466	1.74	8.3
Farmers practice (conventional transplanting method)	45.00	6,477	1.15	

Table 2: Yield Improvement in rice by direct sowing with rice drum seeder- *Rabi.*

Technology	Average Yield q/ha	Net Returns (Rs)	C:B ratio	% Increase in yield
Direct sowing with TNAU drum seeder	81.86	59,448	3.08	11.0
Farmers practice (conventional transplanting method)	73.75	41,884	2.02	

3.2 Labour saving and cost reduction

Direct sowing will reduce the cost of cultivation to an extent of Rs 9166/ha by avoiding nursery raising and also due to reduction in cost of transplanting. Row sowing facilitated to take up fertilizer application, plant protection measures and weed control in an efficient manner. In addition, crop duration is reduced by 8-10 days and more area is covered per unit time. Wang and Sun (1990) noticed that duration can be shortened by 7-15 days in direct seeded rice compared to transplanted rice. Seed rate is reduced to 30 kg/ha in drum seeder as against 62.5-75.0 kg/ha in nursery cum transplanting method. An area of 1.0 ha can be covered in a manday of 8.0 hrs.

3.3 Extension activities

Extension activities like training programmes, front line demonstrations, group discussions, exposure visits, field days, kisan melas, news paper coverage, radio and TV and Popular articles etc were conducted by KVK in collaboration with ATMA, FTC, NABARD, Farmers clubs and mass media to popularize the drum seeder. A total no of 98 on and off campus training programmes were conducted for 1335 beneficiaries. Two district level seminars were conducted for State Agriculture Department officials and ‘Adarsh Rytus’. Due to concerted efforts by KVK this technology was spread in 120 villages in 17 mandals (9 mandals in low lands and 8 mandals in uplands) in East Godavari district. A total area of 3200ha area was covered with 1400 farmers . A total amount of 2.93 crores of rupees was saved by adopting the

drum seeder technology in the above period. State department of Agriculture is supplying the drum seeders to the farmers on 50% subsidy .

3.4 Farmers 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 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 application of selective weedicides (Jitendranath et.al 2012). The width of present drum seeder with four drums is 1.6 mts which is not suitable for making alleys at 2mts interval as recommended by the Acharya N.G. Ranga Agricuture University, Andhra Pradesh. In order to make the alleys at regular interval of 2mts, the present TNAU drum seeder was refined as per the farmers feed back by adding one more plastic drum to the existing four drums and assessed in comparison to four drum seeder (Fig 3).

Figure 3: Training programmes

Figure 4: Modified TNAU Drum seeder

Results shown that the area covered with five drum seeder will be 25% more than the four drum seeder in unit time and also reduced the labour cost (Rs 1500/ha) towards preparation of alleys. Five drum seeder increased the net returns and also the benefit : cost ratio (Table 3). Five drum seeder facilitates the formation of alleys at 2 mts interval which will help in better aeration and sunlight penetration.

Table 3: Comparison of Five Drum Seeder with Four drum seeder.

Technology	Average Yield q/ha	Net Returns Rs	B:C ratio	% Increase in yield
Direct sowing with modified TNAU drum seeder (Five drum seeder)	52.50	26,875	1.74	7.6

Direct sowing with TNAU drum seeder (Four drum seeder)	52.50	25,375	1.67	7.6
Farmers practice (conventional transplanting Method)	48.75	7,900	1.15	-

4. Conclusion

It can be concluded that direct sowing with drum seeder will help in reducing the labour shortage, increases the yield (8-11%), reduces the crop duration, drudgery and cost of cultivation. Hence, all extensions activities are to be adopted for its popularization. Future strategy will be increase in row to row distance to 25 cm from the existing 20 cm along with five drum seeder which will help in easy mechanical weeding in addition to increase in unit area coverage.

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