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Prospects for Direct Sown Rice, a Low Cost Technology for Sustainable Livelihood in Godavari Delta of Andhra Pradesh

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Abstract

Rice is the major food crop grown in Andhra Pradesh, cultivated in an area of 28.03 lakh ha in *kharif* and 15.84 lakh ha in *rabi* seasons. East Godavari district contributes about 10% of the total production predominantly from Central and Eastern Delta. Of late, high cost of cultivation has been considered as a major hurdle for paddy farmers to realize sustainable economic returns. Increased labour wages, indiscriminate application of fertilizers and plant protection chemicals and labour scarcity are the factors responsible for high cost of cultivation. In this paper, we report the outcome of the on farm trials conducted during *rabi* 2012-2013 season with the main objective of improving productivity per unit area, reduced cost of cultivation and conservation of natural resources. Low cost technologies like direct sown method by broadcast on puddled field, timely weed management, soil test based fertilizer application and need based plant protection measures were demonstrated in the trial plots and were compared with farmer's practice. MTU 3626, a locally popular *rabi* variety was selected for the trial and also control plots. The data collected from the trials established the superior performance of direct sown method with higher grain yield of 8529 Kg/ha over conventional method (7930Kg/ha) and CB ratio of 1:2.01. Further, in direct sown method, the water requirement could be minimized due to alternate wetting and drying of the field in the initial stages of crop growth. Moreover, crop duration was reduced by 8 to 10 days in direct sown rice than transplanted rice. On an average, the difference in cost of cultivation varied between Rs. 6,000/ to Rs. 7,000/- among different on farm trial plots. The on-farm trials helped to convince not only the host farmers of the trail plots but also the other farmers of the same village as well as from nearby villages on the benefits of the low cost technologies interms of reduced cost of cultivation coupled with sustainable production. The overwhelming response towards adoption of the technologies was highlighted.

Key words: East Godavari, rice based cropping system, direct seeded rice

Introduction

Godavari District is one of the agriculturally prosperous districts in the state to Andhra Pradesh contributing about 10% of the total food production of the state. Popularly known as Rice Bowl of Andhra Pradesh, the district is geographically divided into four agro climatic groups namely eastern delta, central delta, uplands and agency. The major irrigation source is the river Godavari covering an area of 5,06,409 acres through canal irrigation, followed by medium irrigation projects with an ayacut area of 4870 acres and minor irrigation projects covering 53,414 acres.

Rice based cropping system is highly intensive in the district and rice is cultivated both in *kharif* and *rabi* seasons in about 2.23 lakh ha and 1.50 lakh ha respectively with an average productivity of 3.85 tonnes/ha. Traditionally, rice is grown by transplanting of one month old nursery seedlings in puddle field under flooded soil condition which is a labour intensive process. Studies conducted on economics of rice cultivation revealed that the cost of inputs and cost on different operations has increased substantially. It has been reported that the labour cost has increased by 100%, chemical fertilizers and pesticides by 45%, cost on seed by 33% and tillage operations by 35-40% (Chandrasekhar

et al., 2013). High cost of cultivation has been viewed as a major hurdle for paddy farmers to transform the farming activity into profitable enterprise. Added to these components, labour scarcity is also posing a great threat for the farmers affecting timely cultural operations. To overcome these constraints so as to achieve sustainable income, the scientists of District Agricultural Advisory and Transfer of Technology Centre, East Godavari District conducted on farm trials (OFTs) during *rabi* 2012-2013 season with the main objective of improving productivity per unit area, reduced cost of cultivation and conservation of natural resources. Low cost technologies like direct sown method by broadcast on puddled field, timely weed management, soil test based fertilizer application and need based plant protection measures were demonstrated in the trial plots and compared with farmer's practice of traditional transplanting method and indiscriminate use of fertilizers and plant protection measures. Besides the demonstration of the potential of low cost technologies, the study also highlighted the accomplishment in successful transfer of cost effective technology among the farmers. Further, the prospects for large scale adoption of the low cost technologies in farmer's fields to transform rice cultivation as a sustainable livelihood enterprise in Godavari delta region of Andhra Pradesh are detailed and discussed.

Materials and Methods

On farm trials were conducted by the scientists of the District Agricultural Advisory and Transfer of Technology Centre (DAATTC), East Godavari District during *Rabi* 2012-2103. Three low cost technologies *viz.,* direct sown rice; soil test based fertilizer application and need based application of plant protection chemicals were selected for the study. In all, trials were conducted in 12 locations covering the delta area and the extent of the trail plot was one acre each. The treatments imposed were common to all the 12 trial plots. Correspondingly, 12 plots raised following the farmer's practice of conventional transplanting method in similar extent of area (1 Acre) at each location, were used as check plots for comparison with direct sown method. MTU 3626, the locally popular variety in *rabi* was sown both in trial plot and check plots. In the trial plots, recommended seed rate, timely weed management, soil test based fertilizer application and need based plant protection measures were the treatments imposed. In the check plots, the farmer's practices for conventional transplanting method were adopted. The operations wise treatments imposed in the trial plots are as follows. The data collected with respect to yield and other related parameters was subjected to the test of significance.

i) **Sowing method and seed rate in trial plots and farmer's practice**: In transplanting method which is a commonly followed practice in the district, the farmers used 25 to 30 kg of seed for raising nursery which is sufficient for transplanting in one acre field. In the OFT plots, direct sowing was followed with 12 kg of seed for one acre area. Further, dry seed treatment with Carbendazim was followed for trial plots and sprouted seed was sown in puddled condition. Thin film of water was maintained at the time of sowing.

ii) **Weed management in trial plots and farmer's practice:** In farmer's practice of transplanted paddy, farmers have resorted to application of pretilachlor @ 400ml/acre, pre emergence weedicide at 3 days after planting (DAP) followed by one hand weeding. In the trial plots, both pre emergence weedicide, pyrazosulfuran ethyl @100g/acre at 3days of sowing (DOS) and post emergence weedicide, bis pryi bac sodium @ 80ml/acre at 20 DOS were applied as weeds are the major problem in direct sown rice.

iii) **Soil test based fertilizer application in trial plots and farmer's practice:** Analysis of soil samples collected from trial plots of the selected farmers revealed that available 'P' was medium to high, 'N' was low to medium and available 'K' was also medium to high. As per the zonal recommendation, 72 +36 + 24 kg NPK per acre has to be applied during *rabi* for soils with medium level of NPK. Thus, in the trial plots, only recommended doses of fertilizers were applied but in the farmers practice, the farmers applied as high as 100 kg N and 45 kg 'P' per acre irrespective of soil analysis and moreover, the time of fertilizer application was also not scrupulously followed by the farmers as the 'P' fertilizer which needs to be applied during last puddle was applied at 10 DAP and at tillering stage.

iv) **Plant protection in trial plots and farmers practice** In the trial plots, need based plant protection measures were adopted. Carbofuran 3G granules were applied at panicle initiation stage to protect the crop from stem borer and BPH. Additionally, two sprays in crop season, one at tillering stage for control of blast and the other at milky stage for the control of BPH were taken up in the trial plots. On the other hand, in check plots, the farmers have resorted to calendar based sprayings even though the pest and disease incidence was low during the corresponding *rabi*. On an average, six sprays with combination of different chemicals were given by the farmers in the control plots.

Results and Discussion

i) Yield parameters

The investigators performed five field visits at regular intervals to monitor the crop condition and observations were recorded from both the trial and control plots. Data pertaining to yield parameters was recorded at 30, 45 and 90 days of sowing and BC ratio was also worked out. The data pertaining to yield parameters is furnished in Table 1. It is apparent from the data that the average number of hills/ sqm in direct sown rice was 64 as against 34 hills/sq m in the transplanted plots. In general, the optimum number of hills per sq m required for realizing good yields during *rabi* is 44 hills per sq m. In the direct sown method, the sprouted seeds are broadcast uniformly on the puddled field while in transplanted rice, 3 to 4 seedlings were planted per hill at an approximate spacing of 15 x 15 to 16 cm. With regard to maximum number of tillers per sq m recorded at 45 days, it was observed that the direct sown plots on an average recorded 844 tillers per sq m while the transplanted plots recorded 712 tillers per sqm. On the other hand, the direct sown plots on an average recorded 623 productive tillers per sq m and transplanted pots recorded 581 tillers per sqm. Similar findings were reported by Shekar and Singh (1991) where direct seeding of sprouted seed under puddle conditions resulted in significant improvement in yield attributes like number of effective tillers and grain yield. The differences among various parameters were found statistical significant at 5% level.

ii) Crop duration and Yield

It was noticed that the direct sown plots came to harvest 8 to 10 days earlier than check plots of transplanted rice. Generally, the crop duration of the MTU3626 variety chosen for the trials is 130 days. It was observed that the crop duration in the trial plots of direct sown method ranged from 120-122 days while in control plots the crop was ready for harvest by 130 days. The findings are in agreement with the study of Wang and Sun (1990) who reported that the duration can be shortened by 7-15 days in direct seeded rice compared to transplanted rice. Due to early harvest, water requirement was also less in direct sown rice compared to transplanted rice. As regards to plot yields, the trial plots of direct sown rice recorded higher yield (8529 kg/ha) over conventional method (7930 kg/ha). Bhushan *et al.* (2007) also reported similar findings with regard to direct sown rice which demonstrated an added advantage of minimizing the water requirement in addition to the realizing of higher yields compared to transplanted rice.

iii) Labour and cost reduction

The cost incurred towards nursery raising, quantity of seed and transplanting cost was remarkably reduced in direct sown rice. The input costs like fertilizer, plant protection chemicals were also minimized in the on farm trials as these inputs were used rationally based on soil test values and ETL of pests and diseases, respectively. In direct sown rice, the cost of cultivation could be brought down by Rs. 6,000/- to Rs.7,000/- per acre. A comparison on cost of cultivation between direct sown rice and transplanted rice is presented in Table 2. Transplanted rice is a labour intensive method which requires additional labour for nursery raising (sowing & pulling) and transplanting, compared to direct sown method. Based on studies conducted on direct sown rice in Pakistan, Akther Ali *et al*. (2014) concluded that direct sown rice requires less labour and also recorded higher yields compared to transplanted rice.

Conclusions

The direct sown rice method was established to be superior with respect to total crop yield and minimizing the labour input. However, this method is still considered as a novel method for the farmers who have been traditionally practicing the transplanting method for decades. Nevertheless, the onfarm trials conducted on low cost technologies demonstrated the potential of these technologies in bringing down the cost of production and in realizing better economic returns, to the farmers. The trials provided an opportunity not only to the farmers who hosted the trial plots but also to the farmers of respective villages and also from nearby villages to observe the efficiency and positive benefits of the low cost technologies, in the trial plots. As a result, the response towards adoption of these technologies in the succeeding season was overwhelming. Rice based system being predominant in the delta area of the East Godavari District, the farmers are left with no other option than rice in both the seasons unlike the upland farmers who can take up irrigated dry (ID) crops in place of paddy during *rabi*. Moreover, the delta areas are low lying and more suitable for paddy cultivation. Hence, in the light of labour shortage, increasing labour wages, and growing input costs, any new technologies that ensure reduced labour requirement and rational input use with improved production naturally attracts the attention of the farmers and such technologies are adopted at a faster rate. Hence, in order to popularize these proven technologies and to create awareness among farming community, large scale field demonstrations and capacity building programmes need to be organized by the extension personnel.

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References

Akther, Ali., Olaf E. and Rahut D.B. 2014. Impact of direct rice sowing technology on rice producers earnings: empirical evidence from Pakistan. *Development Studies Research: An open Access Journal* 1(1): 244-254.

Bhusahan, L., Landha, J.K., Gupta, R.K., Singh, S., Padre, A.T., Saharwat, Y.S., Gathala, M. and Pathak, H. 2007. Saving of water and labor in a rice-wheat system with no tillage and direct seeding technologies. *Agronomy Journal* 99(5): 1288-1296.

Chandrasekhar Rao, C., Jitendranath S., and Murthy T.G.K., 2013. Resource optimization in rice through direct seeding by drum seeder *International Journal of Agriculture and Food Science Technology* 4(3): 239-246.

Sekhar, J. and Singh, C.M. 1991. Influence of methods and dates of stand establishment on growth and yield of rice. *Oryza* 28:45-48.

Table 1. Comparison of yield parameters between direct sown rice and transplanted rice

Yield parameters	Direct sown rice	Transplanted rice
Hills /sq m	64	34
Maximum tillers/sq m	844	712
Productive tillers/sq m	623	581
Duration in days	120-122	130
Yield Kg/ha	8529	7930
CB Ratio	1: 2.1	1: 1.57
t value	1.91*	

* significant at 5% level

Table 2. Comparison of cost of cultivation between trial plot and farmer's practice of transplanted Rice

Inputs/operations	Cost of Cultivation in Rs./acre	
	Trial plot (Direct sown)	Farmers practice (transplanted rice)
Seed	600-00	1000-00
Land preparation	4000-00	4000-00
Nursery	--	1000-00
Sowing/planting	1200-00	2500-00
Weeding	1200-00	2000-00
Fertilizer	3200-00	
	4200-00	
Irrigation (labour cost)	1000-00	1000-00
PP measures	1800-00	2,500-00
Harvesting, threshing	5000-00	5000-00
Total	18,500-00	23,200-00
Gross returns	39,000-00	36,500-00
Net profit	20,500-00	13,300-00