DIRECT SEEDING IN RICE USING DRUM- SEEDER

Increasing cost of inputs (especially irrigation water and labour) and unavailability of labour for critical farm operations have made rice cultivation extremely difficult for farmers in several areas of Andhra Pradesh which is a major rice growing state in India. To address these issues and to provide an alternative option to traditional system and 'SRI' method of rice cultivation, the Krishi Vigyan Kendra, Chittoor introduced direct seeding method in rice using a fibre bodied 8 row drum-seeder for the first time in 2006. This led to considerable reduction in cultivation costs and the area under direct seeding using drum-seeder increased from 0.2 ha in 2006 to more than 4600 ha in 2012. P. Bala Hussain Reddy, S Sreenivasulu and C Manohar from KVK Chittoor share their experiences with promotion of this technology in this Good Practice Note.

CONTEXT

Over the past few years, labour shortages have been crippling rice farming in Chittoor district of Andhra Pradesh. Implementation of employment guarantee scheme by the Government and reluctance of youth to engage in farm operations have created an imbalance in the supply and demand for labour. Though a contract system for undertaking transplanting, weeding and harvesting evolved during this period, the careless attitude of contract labourers (aggressive pulling of seedlings from the nursery resulting in root damage and transplanting at more depth) to complete the work in the shortest possible time impacted the productivity of rice. Apart from the inconsistency in work done and work force engaged, the contract labourers have been asking for more wages. Though the introduction of SRI (System of Rice Intensification) helped in saving water, seeds and realizing better yields, high labour requirement for transplanting and weeding have constrained wider adoptability of SRI. In response to these practical problems faced by the farmers the KVK Chittoor introduced direct seeding method in rice using a fibre bodied eight row for the first time during rabi 2006.

Box 1: RASS-KVK, Chittoor

Krishi Vigyan Kendra, Chittoor was established in 1992 under the functional management of RASS (Rashtriya Seva Samithi) formerly known as Rayalseema Seva Samithi which is a reputed Non-Governmental Organization operating in Andhra Pradesh, Orissa and Tamil Nadu. The activities of the KVK are funded by the Indian Council of Agricultural Research (ICAR).

The KVK has 15 staff out of which six are subject specialists in Agronomy, Pathology, Horticulture, Agricultural Extension, Sericulture and Home Science. As envisaged by the ICAR, technology assessment and refinement is the primary function of RASS-KVK followed by generation of production data through front line demonstrations. Vocational training courses for the unemployed rural youth and capacity building programmes for the extension functionaries are the other important activities of KVK.

DIRECT SEEDING USING DRUM - SEEDER?

In direct seeding method of rice cultivation, need for a nursery and tasks such as pulling, transporting and transplanting seedlings are avoided as the pre-germinated seeds are directly sown using a in a well puddled and leveled wet field. The seed is dropped in rows @ 20 cm row to row spacing and the seed rate is about 25 – 37.5 kg / ha.

The drum-seeder is made of fibre material and hence requires low pulling force to operate. It allows one person to sow one hectare in 5-6 hours compared to three to four days of transplanting by 30- 40 people in case of traditional cultivation method.

The need for hand weeding is reduced by the use of pre-emergence weedicides coupled with use of a modified cono-weeder in between the rows.

If for any cause application of herbicides is not possible initially, post emergence weedicides like Cyhalofop butyl or Bis pyribac sodium may be applied at 15-30 days after sowing. The rice seeds that are directly sown into the field need moist field conditions and flooded conditions are avoided till panicle initiation stage. Till the panicle initiation stage, intermittent irrigation is followed by irrigating the field every 2 to 3 days depending on the physical properties of the soil.

From panicle initiation stage, flooded conditions are followed similar to that in transplanted rice before irrigation is stopped 10 days before harvest. Direct seeding is helpful due to less labour and time requirement, low cost of cultivation due to skipping of nursery raising and transplanting, maintaining recommended plant population and also due to early crop maturity by 7 -10 days.

In Direct seeding method the cost of cultivation is reduced by about Rs.10000 - 14000 per ha as the operations like nursery field preparation, rising nursery, nursery pulling and manual transplanting as done in traditional transplanting method are skipped off (Table1). Resource efficient principles like low seed rate, intermittent drying of the field, low water requirement, reduced requirement of manual labour, improved productivity due to wider spacing of 20 cms between rows and reduced crop duration by 7-10 days.

Based on the positive results from the initial trials, the KVK began promoting this technology across the district. On realizing the merits of this technology more farmers started using this approach and the area under drum-seeder technology expanded from 0.2 ha in one mandal in Rabi 2006 to 4621 ha spread over 46 mandals of Chittoor District by Rabi 2012.

Table 1: Differences between traditional, SRI and drum-seeder methods (per Ha)

Particulars	Traditional method	SRI method	Drum-seeder method
Seed rate	75 kg	5 kg	37.5 kg
Days to transplant	30 - 40 days nursery	8 - 12 days nursery	0 days
Cost of nursery (Rs)	3000	500	0
Labour required for transplanting /seeding operation	50	30	3
Spacing	Zigzag method	25 cm x 25 cm	20 cm between rows x 5-8 cm hill to hill in a row
Water management	5 cm or more standing water from the day of transplantation to 10 days before harvesting	No standing water after transplantation stage; alternate wetting and drying only. The field is kept wet until panicle initiation stage, and from then on, 2-3 cm standing water till 10 days before harvesting.	No standing water after seeding. The field is kept wet until panicle initiation stage and from then on 2-3 cm standing water until 10 days before harvesting.
Weed management	Manual weeding twice (or) some apply of weedicides 1st time and manual weeding 2nd time. 30-40 manual labour are required	Incorporation of weeds into the soil using cono-weeder in both directions (N-S and E-W) One manual weeding with 3-4 labourers is sufficient. 15-20 manual labour is required.	Weedicide is a must once or twice. Pre-emergence weedicide just 1-2 days after seeding, and if necessary post emergence weedicide at 18-25 days after seeding. Cono-weeder is run in one direction only, either E-W or N-S, i.e., in the direction in which the drum-seeder was pulled.
Yield recovered (Kg/ha)	5784 kg	7125 kg	6469 kg
Total cost of cultivation (Rs/ha)	Rs. 34838/-	Rs.32500/-	Rs. 27962/-
Gross returns @ Rs.900/bag of 75 kg	Rs. 78744/-	Rs. 85500/-	Rs. 77628/-
Net returns per ha (INR)	Rs. 43906/-	Rs. 54000/-	Rs. 49666/-
Benefit-cost ratio	2.26	2.63	2.77

GOOD PRACTICES

Problem Identification

Though the KVK undertook several measures since 2003 to promote SRI in the district, farmers were not following the full package of practices (especially weeding due to shortage of labour) and the yields remained very low. By 2006, it was hard to find out new adopters as well as repeaters for this new method of cultivation.

Search for new solutions and testing in farmer fields

Search for literature to address these problems led to some articles on direct seeding method using drum-seeder. KVK conducted an assessment tidal during 2006 in 0.5 acre in the field of a farmer (Sri Nageswar Rao of Madibaka village, Yerpedu mandal, Chittoor district). Mr.Madheeswaran of K.S.N.M Marketing, Coimbatore who manufactures fibre bodied drum-seeder with the technical assistance of TNAU (Tamil Nadu Agricultural University) was contacted for a piece of drum-seeder. Traditional method, 'SRI' method and drum-seeder method were the treatments of the trial. This trial was successful as the net returns were Rs.10750/ha in traditional method, Rs.23250/ha in 'SRI' method and Rs.24250/ha in drum-seeder method.

Technology Adaptation

Initially cono weeeder designed for 'SRI' was used for weeding purpose but it was found difficult as the inter row spacing 20 cms in drum-seeder method is different from 25 cm spacing of 'SRI' method. KVK modified this two wheeled cono weeder by reducing the width of these

wheels so that they fit comfortably for the spacing in drum-seeder method. Few farmers reported drudgery with the two wheeled cono weeder and KVK tested some single wheeled cono weeders. Finally KVK contacted a Warangal based agri-tools manufacturer and designed a single wheeled cono weeder with a width of 12.5 cm fit to run in between the rows even at 30-40 days after sowing. KVK tested three models of power weeders to minimize the drudgery to possible extent for the farmers.

Front Line Demonstrations

From Rabi 2007, KVK conducted front line demonstrations to show the efficacy and convince the farmers about the technology. With the budget of KVK, five s were purchased and placed in the villages with contact farmers thereby enhancing the availability and access to s in the villages.

Participatory Technology Development

Since there was no standard package from any University about this technology KVK standardized a package for use of this technology primarily based on feedback from adopters of this technology. For instance, if there is a heavy downpour of rain on the same day or next day of seeding with drum-seeder, farmer's experience is to put a thin layer of water covering the seed and protecting it directly hit by the splash of rain water. As soon as the rain stops they remove the water layer and maintain the field under moist conditions. This process avoids disturbance of rows as well as tilting of the seed below the soil which otherwise affects germination. Similarly farmer's observed that application of inorganic fertilizers as basal dose is

intensifying the weeds and based on their experience KVK recommended them to apply only Phosphatic fertilizers as basal dose. Nitrogenous and Potassic fertilizers may be applied as top dressing starting from 20 days after sowing.

Similarly, farmers who prepared their land well from 1-2 months before actual sowing didn't faced much problem with weed emergence. Farmers who instantly prepare land by ploughing and puddling followed by immediate sowing experienced problem with weeds emerging along with the rice seedling. RASS-KVK conducted trials on weed management using pre and post emergence weedicides and finally standardized the weed management using herbicides.

Technology Promotion

The success of the assessment trial on drum-seeder technology in 2006 encouraged KVK to popularize it through training farmers (village, mandal and district levels) and extension staff; conducting demonstrations in farmer's fields; organizing field days and exposure visits; developing publications and DVDs on the technology and using mass media and purchasing more drum seeders for conducting demonstrations. KVK partners with a number of other agencies in promoting this technology (Box 2).

Box 2: Collaboration for technology promotion

Initially pamphlets on drum-seeder method of cultivation were prepared in Telugu language for supplementing the lectures in the training programmes. With the financial support of ATMA, Chittoor, 2000 copies of colour booklet was prepared and distributed to farmers as well as the extension functionaries in the district (available for web users on http://sri.ciifad.cornell.edu/countries/india/extmats/index.html#telugu).

Digital content of the technology in the form of a 'DVD' was brought out and it was distributed to farmers at a nominal price of Rs.50/- during kisan melas and rythu sadassus (available on Youtube http://www.youtube.com/watch?v=iSyVD7fwM-4).

Field days and exposure visits with the financial support of NABARD and ATMA helped in convincing the farmers about the technology. News items in the media on the technology as well as the extension programmes related to drum-seeder also helped in bringing awareness among the farmers all over the district.

With the financial support of ATMA, Chittoor and NABARD, Hyderabad about 200 drum-seeders and 200 modified conoweeders were procured directly from the manufacturers for conducting demonstrations. One drum-seeder and one cono weeder were placed at all Mandal Agricultural Offices (66 mandals) and Asst.Director of Agrl. Offices (11 Agricultural Divisions) as well as the contact farmers and innovative farmers.

Master farmers: Seven innovative farmers were trained as 'Master trainers' who played a major role in faster dissemination of the technology. For the first timer users of drum-seeder method, KVK used the services of 'Master trainers' for demonstrating the technology to the farmers and KVK paid a nominal honorarium for their services. Many farmers use the seeder and weeder placed with the contact farmers or the Agricultural officer (free of cost) for their use.

Entrepreneurship Development: KVK also promoted village youth to become entrepreneurs and serve the farmers by providing drumseeding services. These young entrepreneurs now charge

Rs.300-400/acre and on an average cover 50-100 acres in his jurisdiction and this has also facilitated speedy transfer of this technology.

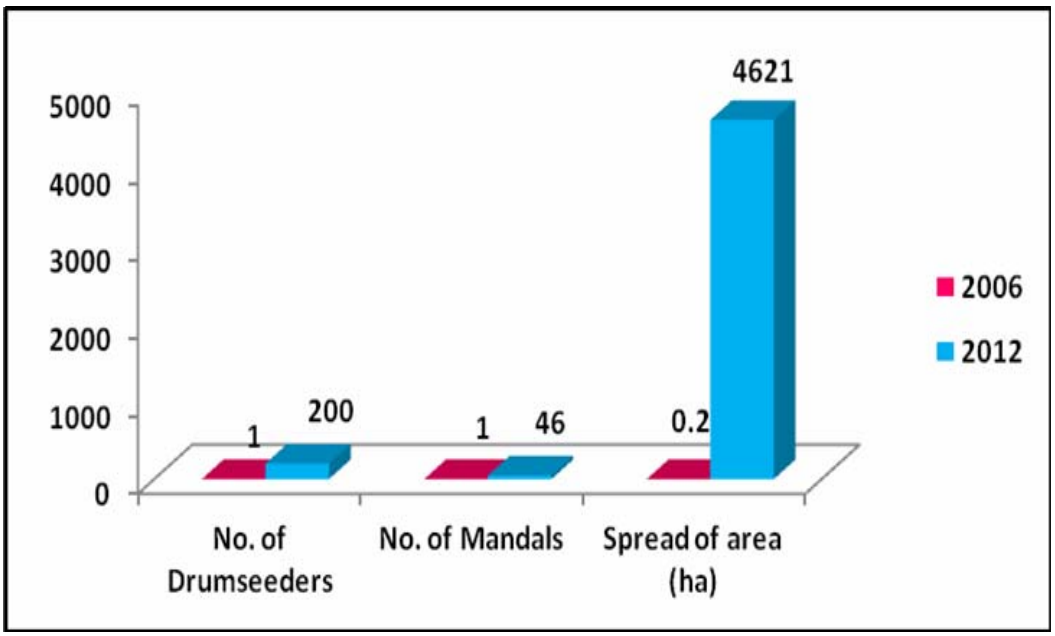
Considering its limited manpower, the KVK could promote this technology all over the district only because of using these different extension approaches. The KVK is also helping popularize this technology in other districts of the state. Farmers from other districts visited drum-seeder demonstrations plots in Chittoor as a part of their exposure visit organized by the Department of Agriculture.

BENEFIT AND IMPACT

Operationally, the direct seeding with drum-seeder method differs from traditional transplanting method in nursery raising, seed rate, transplanting, weeding and irrigation operations. The rest of the things like fertilization, plant protection, harvesting, threshing and bagging remain same in both cases. The cost of cultivation is reduced by Rs.9000-10000/ ha in drum-seeder method compared to traditional method of rice cultivation and hence direct seeding method using drum-seeder is profitable for farmers even if they the same normal/ regular yields they are getting.

SUSTAINABILITY AND SCALING UP

There is a growing acceptance of drum-seeder version due to factors like low seed rate, low irrigation water requirement, skipping of nursery and transplanting operations and subsequently reduction in drudgery, early crop maturity by 7-10 days and higher productivity in drum-seeder method. This is evident from rise in area under drum-seeder method in Chittoor district from 0.2 ha in 2006 to 4621 ha in 2012.



WAYS FORWARD

Direct seeding is rice using drum seeders is a technologically viable and economically feasible technology that could be adopted by even small and marginal farmers and hence Government should promote this technology in all rice grown areas. Some of these specific steps would definitely help:

- Government may enhance the subsidy component for promoting this technology (drum-seeder and weeder) from 50 per cent subsidy basis @ Rs.2700/- currently to 75 per cent so that each farmer own a drum-seeder and weeder and can do timely operations.

- Before distributing these implements to farmers, efforts should be made to build the knowledge and skills of extension functionaries on use of these implements

- Enhance subsidy component of the power weeders and include these in the custom hiring centres of department of Agriculture.

- Promote entrepreneurs who can fasten the pace of adoption of this technology and include entrepreneurship development as part of all technology transfer programmes.

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