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Drum seeder –A labour saving technology

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■ **ABSTRACT :** Rice is the major crop of most of the countries. Transplanting of paddy is a major labour and cost intensive work. Experiments were conducted on direct seeded paddy using eight-row drum seeder underpuddled condition in farmer's fields of Jajpur district, Odisha during *Kharif* season for three years to evaluate the performance of the eight row paddy drum seeder. The drum seeder was tested on puddle fields. Drum seeder technology reduced the cost of transplanting and resulted in higher returns to farmers over normal transplanting of paddy seeds. The labour requirement was found to very less as compared to the traditional method of transplanting. The results showed that use of paddy drum seeder increased the grain yield as compared to farmer's practice of transplanting.

■ **KEY WORDS :** Direct sowing, Drum seeder, Pre-germinated seeds, Transplanting, Yield, Field capacity

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Rice (*Oryza sativa*) is the staple food for millions of people. It is one of the major cereal crops cultivated in more than 110 countries in the world with a total production of 527 million tones, of which 78 per cent is contributed the major rice growing countries of Asia (Chandima Ratnayake and Balasoriya, 2013). India is the largest grower of rice in the world and it occupies the largest cropped area of 44.2 M ha with a total production of 87.5 MT and an average productivity of 1.9 T per ha (Duraisamy *et al.*, 2011).

The most important cultivation ways are transplanting and direct seeding methods. Transplanting is done either by manually or by mechanical transplanting methods. In manual transplanting the seedlings are first raised in the seed bed before they are planted in the main field. Though manual transplanting gives uniform crop stand but it is quite expensive, and requires lots of labour besides involving lots of drudgery and it can be substituted by direct seeding that can reduce labour needs by more than 20 per cent (Santhi *et al.*, 1998). Manual transplanting is a labour consuming operation which requires approximately 25 per cent of the total labour requirement of the crop (Sahoo *et al.*, 1994). But the major problem is unavailability of labour during transplanting time. Mechanical transplanting requires a special method of raising nursery either in the tray or mat type seedlings. The mechanical transplanting of rice has been considered the most promising option, as it saves labour, ensures timely transplanting and attains optimum plant density that contributes to high productivity.

There are three principal methods of direct seeding of rice. Dry seeding (sowing dry seeds into dry soil), wet seeding (sowing pre-germinated seeds on wet puddle soils) and water seeding (seeds sown into standing water) (Hassan and Livani, 2011). In direct seeding, the seed is sown directly in the main field either by broadcast or

row seeding in the wet or dry field. Direct seeding is a labour saving technology in the rice crop establishment and is being rapidly adopted by farmers. Direct seeding of rice is helpful to the farmers due to the lesser labour and time requirement, the low cost of cultivation due to the skipping of nursery raising and transplanting, the maintaining of the recommended plant population and also due to the earlier crop maturity by 7-12 days (Gill, 2008).

Transplanting method involves seedbed preparation, nursery growing, care of seedlings in nursery, uprooting of seedlings, hauling and transporting operations. The preparation of seedbed and sowing are done 30 days before planting. The seedbed area required is about 10 per cent of the main area of the field (Khan and Majid, 1989). The transplanting of paddy at right time is also important parameter. A delay in transplanting by one month reduces the yield of rice by 25 per cent and delay by two months results in 70 per cent reduction in yield (Khan and Majid, 1989).

The rice farmers practicing transplanting are facing problems of high cost of cultivation, less plant population, less tillers per plant, low yields, high weed population. To tackle all these problems direct seeding of rice has been found most appropriate alternative. Direct seeding is becoming increasingly popular now days in India.

Broadcasting of pre-germinated paddy in a puddled field results non-uniformity in plant stand and difficulty in adopting the improved intercultural tools for weeding. Hence, it is vital to develop a mechanized direct sowing rice method that allows improved intercultural tools for weeding. The mechanization of direct sowing pre germinated paddy rice via drum seeders has been introduced by various institutes those have 20 cm row-to-row spacing which covers 8 rows at a time. In many forums farmers are requesting for drum seeder with either 25 or 30 cm for ease of inter cultivation.

Advantages of direct wet seeding:

The advantage of drum seeder is that row-row spacing can be easily maintained and dropping of seeds in hills is possible. Lack of labour during peak periods of transplanting may cause delay in the operations. In such situations, the drum seeder is an effective mean for timely sowing of rice. Also directly seeded rice may mature 7 to 10 days earlier than transplanted rice (Subbaiah *et al.,* 2002). This saving of time is important where multiple cropping patterns are followed.

■ METHODOLOGY

Constructional details and working principle of the machine:

Direct paddy seeder is one of the revolutionary equipments that changed the face of sowing paddy seeds in wetland field. Direct paddy drum seeder has eliminated the need of transplantation and hours of manual work which will literally break the back of the farmers involved in sowing the paddy seeds to the field. At one stretch with single operator effort, it covers 8 rows of 20 cm row to row spacing at a time. Made up of plastic material, which makes it easy.

Parts of drum seeder:

Seed drum:

The seed drum is hyperboloid shaped with 200 mm diameter. There are 8 numbers of seeding metering holes of 9 mm diameter hole.

Baffles:

Baffles are provided inside the seed drum between the seed holes to ensure the uniform seed rate in operation as well as to ensure hill dropping of the seeds.

Ground wheel:

Wheels are provided at both ends. These wheels are made up of plastic material to provide floating characteristics. Wheel diameter is 2 feet.

Handle base and handle:

One square shaft, handle base and handle. Four seed drums are assemble together with the square shaft. The handle if meant to pull along.

Methodology for field preparation:

The field was properly puddled with sufficient number of ploughings. Final ploughing should be done a day before the operation of drum seeder and excess water should be removed. For excessive rain water drainage facility should be there.

Seed preparation for drum seeder application:

The sprouted seeds were prepared by soaking the seeds in water for 24 hours followed by 16-18 hours of incubation at room temperature (Chandrasekhararao *et*

al., 2013) and (Islam and Desa Ahmad, 1999). Swarna variety of paddy was used for this purpose.

For drum seeding sprouted seeds, seeds are sown in puddled soils after one day of puddling using perforated drum seeder. Eight row paddy drum seeder is manually operated low cost equipment and it is simple in construction. The advantage of drum seeder is that row to row spacing can be easily maintained and dropping of seeds in hills is possible. Drum seeder is an effective mean for timely sowing of rice.

In present study the drum seeder developed by DRR, Hyderabad (Plate 1 and 2) was assessed by KVK in sandy loam soils during 2009-2012. DRR drum seeder consists of four seed drums made of mild steel mounted over a shaft, ground wheels, floats and handle. The seed drum is cylindrical shape with 200 mm diameter. The cost of the unit was 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. DRR drum seeder was evaluated against the conventional broadcasted paddy.

Plate 1 : Pre-germinated paddy seeds sown by dum seeder

Plate 2 : Paddy crop after 20 days

Laboratory calibration of the drum seeder was done at Krishi Vigyan Kendra, Jajpur and field performance was carried out at farmer's field. Sprouted seeds were used for sowing. For seed preparation, the salt was mixed with water in the proportion of 1:10 and seeds were then soaked in salted water. Lighter seeds and other impurities floating on the water were removed after one hour. Seeds were kept in water for 24 h. After 24 h excess water was drained out. The soaked seeds were placed in gunny bags and kept for incubation for next 24 h. The sprouted seeds (length 1-2 mm) were used for sowing purpose.

The field was kept weed free through pre-emergence application of butachlor@1kg/ha.

■ RESULTS AND DISCUSSION

Sprouted paddy seeds were sown using eight row paddy drum seeder. The pre-germinated seeds were filled in the drums upto 3/4th capacity for easy and smooth falling of pregerminated seeds. The test conditions during the trials are given in Table 1. Row to row spacing was 20cm.

The average field capacity of the drum seeder was 0.13 ha/h. The labour requirement was 1 mandays/ha instead of 36 mandays/ha as in case of traditional method of transplanting. The cost of transplanting reduced from max. Rs. 7200/- to Rs. 200/- per ha. The number of tillers per hill was 18 as against 12 in manual random transplanting. Shekar and Singh (1991) stated that direct seeding of sprouted paddy seed under puddle condition resulted in significant improvement in yield attributes like number of effective tillers.There was saving of Rs. 7000 /- in the cost of production in the direct seeded paddy with 3.5 to 6.3 per cent yield enhancement as compared to manual transplanting. Additional net return was recorded in direct seeded paddy with higher B:C ratio. Chandrasekhararao *et al.* (2013) reported that direct sowing with drum seeder reduced the cost of cultivation to an extent of Rs. 9166/- per ha by avoiding nursery raising and reduction in the cost of transplanting. The grain yield, net return and B:C were increased in the direct seeding method. Hence, to

Table 1: Test conditions during the trials

Sr. No.	Particular	1st yr	2nd yr	3rd yr
1.	Farming situation	Rainfed	Rainfed	Rainfed
2.	Location	Farmers field (Village-Achyutpur)	Farmers field (Village-Rambhadeipur)	Farmers field (Village- Niladeipur)
3.	Type of soil	Sandy loam	Sandy loam	Sandy loam
4.	Field preparation	Ploughing, puddling and levelling	Ploughing, puddling and levelling	Ploughing, puddling and levelling

Table 2: Field capacity and labour requirement

Name of the village	Treatments	Av. Field capacity (ha/h)	Labour requirement (Mandays/ha)	Cost of operation (Rs./ha)
Achyutpur	Direct seeded by drum seeder	0.13	1	200
	Manual transplanting	0.026	36	7200
Rambhadeipur	Direct seeded by drum seeder	0.13	1	200
	Manual transplanting	0.028	36	7200
Niladeipur	Direct seeded by drum seeder	0.13	1	200
	Manual transplanting	0.028	35	7000

Table 3: Yield and economics of production of direct seeded paddy as compared to manual transplanting method

Name of the village	Treatments	Av. number of tillers/hill	Av. yield (q/ha)	Av. cost of cultivation (Rs./ha)	Av. net return (Rs./ha)	B:C
Achyutpur	Direct seeded by drum seeder	18	43.5	22650	32925	2.4
	Manual transplanting	12	41.2	29650	21850	1.73
Rambhadeipur	Direct seeded by drum seeder	17	43.2	21850	32350	2.47
	Manual transplanting	13	41.8	28850	23400	1.81
Niladeipur	Direct seeded by drum seeder	18	44.1	22500	32625	2.45
	Manual transplanting	12	41.5	29500	22375	1.75

reduce the labour problem and cost of production of paddy, the direct seeding of pregerminated seeds through use of drumseeder is one of the solution for the rice farmers.

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