Short communication

Drum seeding for enhanced profitability of paddy cultivation in Kuttanad region of Kerala

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Abstract

Broadcasting is the most common practice followed by the farmers of Kuttanad region of Kerala for sowing paddy due to the shortage and high cost of labour and lack of suitable machinery for transplanting. But it necessitates higher quantity of seed (120-125 kg ha^{-1}) and the resultant higher plant population leads to increased susceptibility to pests and diseases. Drum seeder for wet seeding (line sowing) as an effective option for overcoming these disadvantages was tested in comparison with the traditional broadcasting. Field trials were conducted in Muttar panchayath of Kuttand region using paddy variety Uma during the Puncha (November-March) seasons of three years from 2011 to 2014. The broadcasted plots had 170-190 hills $sq.m^{-1}$ with less (492-566) number of productive tillers resulting in a grain yield of 5679 kg ha^{-1} whereas the drum seeded plots had only 36 hills $sq.m^{-1}$ but with higher (630-868) number of productive tillers yielding 6470 kg ha^{-1}. The average cost of cultivation using drum seeder was less (Rs. 41240 ha^{-1}) compared to that of broadcasting (Rs. 47343) with a B:C ratio of 2.82 and 2.16, respectively. Drum seeding has advantages like low seed cost, optimum plant population, lesser use of fertilizer and plant protection chemicals, less labour requirement, and its operation does not require any skill thus rendering it an economically and technologically viable practice for adoption in paddy cultivation.

Key words: Paddy, Broadcasting, Wet seeding, Line sowing, Drum seeder, Kuttanad

Paddy cultivation in Kerala has declined at an increasing rate from 5.88 lakh hectares in 1990 to 1.97 lakh hectares in 2013 with a production of 5.08 lakh tonnes in 2013. Small holding size, high cost of inputs, pest and disease problem and labour scarcity are the major reasons for the decline in area under paddy cultivation in the state (Reddy et al., 2001). Alappuzha district, which accounts for 18.34% of the area and 20.57 % of the production of paddy in Kerala (2013), has also shown a similar decline in area and production in recent years. Kuttanad region, where cultivation of paddy is practiced below mean sea level, is the major rice production tract of the district.

Farm mechanisation is an important measure to overcome the labour shortage and high input cost in paddy cultivation. Land preparation and harvesting are the major operations which could be effectively mechanised. So far in the region, majority of the farmers practice broadcasting (direct sowing) to overcome the labour shortage, which necessitates higher seed rate (120-125 kg ha^{-1}), resulting in higher plant population thereby leading to increased susceptibility to pests and diseases. Johnkutty et al. (2002) reported that transplanting results in better crop establishment in rice. Even though transplanting is an ideal practice in terms of the crop health and yield, the high labour requirement for manual transplanting prevents the farmers from resorting to the practice. Further, convenient transplanting machinery suitable to the

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geographical conditions are not available. Hence, line sowing using drum seeders could be an effective option for solving the disadvantages of both these practices, especially in Kuttanad where wet seeding is the common practice followed. Against this background, field trials were conducted during 2011 to 2014 for testing the efficiency and viability of the drum seeder in Kuttanad situation.

Farmer participatory field trials were conducted in Muttar panchayath of Kuttanad taluk in Alappuzha district during the Puncha (November- March) season for three years from 2011 to 2014 in a total area of 33 ha involving 35 farmers. Muttar panchayath is located at 9^0 23'45" N latitude and 76^0 30'2" E longitude. The annual mean rainfall of the region is 2809 mm and average total rainfall for the experimental period (Nov-March) was 188.7 mm with average maximum and minimum temperature of 33.9 and 23.5 ^{0}C, respectively.

The wet paddy lands of Kuttanad region are situated within 2 metres below MSL with clayey soils. Drum seeder, originally devised by TNAU, Coimbatore and marketed by RAIDCO under the brand name 'Aiswarya', is a simple device used for wet seeding of pre-germinated paddy seeds directly on well puddled and levelled fields. The seeder consists of seed drums, baffles, main shaft, ground wheel, floats, and handles (Fig. 1). There are four seed drums with holes of 9 mm diameter at both ends for dropping seeds at a spacing of 20 x 10 cm. Water

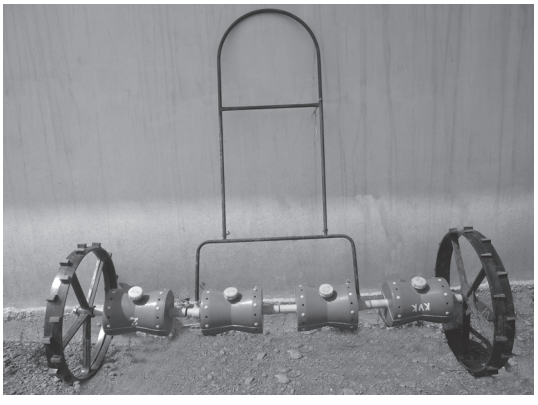

Figure.1. A view of the drum seeder

Figure 2. Wet seeding using drum seeder in Kuttanad region

soaked pre sprouted seeds of paddy variety Uma were used for drum seeding @ 30 kg ha^{-1}. On pulling the seeder, 3-4 paddy seeds were placed at 10 cm intervals at a row spacing of 20 cm (Fig 2). Seeding using this eight row drum seeder was compared with broadcasting of paddy for which water soaked sprouted paddy seeds @100-125 kg ha^{-1} was manually broadcasted in the field. All other management practices were done as per the package of practice recommendations of Kerala Agricultural University (KAU, 2011). Observations were taken on the growth, yield parameters, and yield in both methods of seeding. Average observation on five plants was taken as the value of growth and yield parameters for a location and observations were recorded from 30 such locations in farmers' fields. The actual quantity of paddy marketed (as procurement by Civil Supplies Corporation or other private agencies) was recorded as the yield from each plot. These observations were subjected to paired T test for comparison.

The results showed that the sowing methods have significant effect on the growth and yield parameters of paddy. Plant height, number of productive tillers per unit area, panicle length, no. of grains per panicle, and 1000 grain weight were higher in drum seeded plots compared to broadcasted plots in all the three years because of the optimum plant population obtained by using the drum seeder (Table- 1). While the broadcasted fields had as high

Table 1. Yield and yield parameters under broadcasting and drum seeding of paddy in Kuttanad

Parameter	2011-12			2012-13			2013-14			Mean (3years)	
	BC	DS	t value	BC	DS	t value	BC	DS	t value	BC	DS
Plant height (cm)	106.8	112.9	2.5*	90.6	99.1	3.32*	91.1	105.3	7.35*	96.2	105.8
No. of hills m^2	177	36	18.17*	189.3	36	17.97*	173.4	36	13.08*	179.9	36
No. of productive tillers $hill^{-1}$	3.2	17.5	19.42*	2.6	24.1	22.35*	3.2	23.5	17.14*	3.0	21.7
No. of productive tillers m^{-2}	566	630	-	492	868	-	555	846	-	537.7	781.3
Panicle length (cm)	21.24	21.43	0.33	19.81	21.78	3.91*	18.9	21	4.19*	19.98	21.40
Grains $panicle^{-1}$	123.0	135.2	1.46*	138.4	165.8	2.29*	126.6	156.9	2.78*	129.3	152.6
1000 grain weight (g)	26.1	27.5	-	26.1	28.5	-	27.1	29.0	-	26.4	28.3
Yield (kg ha^{-1})	5786	6525	2.4*	4500	5760	9.26*	6750	7125	3.41*	5679	6470

BC: Broad casting; DS: Drum seeding
*significant

as 170-190 hills $sq.m^{-1}$ with less number of productive tillers, the drum seeded plots had only 36 hills $sq.m^{-1}$ but with higher number of productive tillers. In addition, larger panicles, higher number of grains per panicle, and higher grain weight resulted in increased grain yield in drum seeded plots in all the three years as compared to direct sowing. The optimum plant population facilitated effective tillering and reduced pest and disease incidence due to the improved microclimate. Infestation of the major pests *viz.,* stem borer, leaf roller, and rice bugs and diseases like blast, sheath blight, and brown leaf spot were well within the economic threshold level (ETL) in drum seeded plots when combined with other preventive bio-control measures.

Comparison of economics of cultivation under broadcasting and drum seeding of paddy in Kuttanad region is presented in Table 2. The cost of cultivation in the case of drum seeding was less compared to direct sowing for all the three years. This is mainly because of the reduction in quantity and cost of seeds and fertilisers, and cost of harvesting. The optimum plant population reduces the cost of inputs like fertilizers, plant protection chemicals, and labour charges for weeding and other operations. Since the plant population is very high in broadcasted plots, farmers are tempted to apply more fertilisers and plant protection chemicals than the recommended quantity per hectare. Another interesting feature observed was the reduction in cost of harvesting using combined harvesters as it could be harvested in less time compared to the broadcasted plots. The drum seeded plots had less number of hills per unit area and the plants were less or not susceptible to lodging and hence the harvesting time could be reduced to 2-3 hours ha^{-1}

Table 2. Comparison of economics of cultivation under broadcasting and drum seeding of paddy in Kuttanad region (Mean of 3 years – 2011-14)

Parameter	Broadcasting	Drum seeding
Cost of inputs (Rs. ha^{-1})		
Seed @Rs.39 kg^{-1}	4875	1170
Fertilizers	6408	5220
Cost of harvesting (Rs. ha^{-1})	9000	6750
Total cost of cultivation & marketing (Rs. ha^{-1})	47343	41240
Yield (kg ha^{-1})	5679	6470
Gross income (Rs. ha^{-1}) @Rs.18 kg^{-1}	102222	116460
Net income (Rs. ha^{-1})	54879	75220
B:C ratio	2.16	2.82

in drum seeded plots against 4-5 hours ha^{-1} in the case of broadcasting. Rao et al. (2014) also reported that the cost of cultivation in broadcasting was higher compared to drum seeding because of the high input cost in the former. Marketing cost (bagging and loading) also was taken into account for working out the B:C ratio and it was found to be 2.16 and 2.82 for broadcasted and drum seeded plots, respectively.

Results of these trials indicate that the broadcasting of seeds can be replaced by wet seeding using drum seeder in Kuttanad region for enhanced yield and profitability of paddy cultivation. Drum seeding has advantages like low seed cost, optimum plant population, lesser use of fertilizer and plant protection chemicals, is labour saving, and its operation does not require any skill. Hence it is an easy and economically better technology for adoption in paddy cultivation.

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