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Direct Seeded Rice (DSR) - A Climate Resilient Technology

DSR is the cost effective and eco-friendly technology which implies on time saving, water saving, labour saving and resource conservation in paddy cultivation. It is a sustainable alternative technology over conventional puddled transplanted rice (CT-PTR) to tackle the adverse climatic changes. It maximizes the net income of farmers by decreasing the cost of cultivation per unit area. The quantitative and qualitative yield can be obtained by timely sowing, selection of suitable cultivars according to land profile, optimum seed rate, weed and water management. In future, it mitigates the hunger and food insecurity by adopting economical feasible technology as compare to conventional puddle transplanted rice.

INTRODUCTION

Paddy is a principal/ cereal crop in India. Mainly north-eastern regions are prominated with paddy crop under rainfed condition. Crop can grow in hot, high humidity and water stagnate region. Although climate change is more challenging to grow crops in adverse climatic conditions during recent years due to irregular monsoon patterns, modern technologies are the main weapon to overcome food scarcity in our country (Singh & Shahi, 2015) . The state Bihar has large scale of small to marginal farmers, where 60-70% farmers depend on rainfall for their cultivation. The state receives less rainfall during recent monsoon which impacts on cultivation of paddy and productivity in the state. However, DSR technology is the cost effective and climate resilient methods to enhance the cultivation of paddy and its productivity of this region. DSR is the only cost-effective option to reduce the puddling cost, labour cost, wastage of water, soil erosion and emission of methane gas. Although, the requirement of labour is high for establishment of nursery, uprooting of seedlings and

transplanting in conventional puddled transplanted rice (CT-PTR), advanced methodology for cultivation is the best sustainable practices in paddy cultivation (Yadav *et al.*, 2013; Kaur & Singh, 2017). Weed intensification is more challenging in DSR which can reduce the production upto 30-90% of grain yield. However, proper time management in application of herbicides starting from 10 days to 30 days (critical period) is the productive method in production of grain yield. Dry-DSR and wet-DSR are the main weapon to overcome the food scarcity in our state.

DSR PRACTICES FOR PADDY CULTIVATION

1. LAND PREPARATION

Table: 1 shows the land preparation for paddy cultivation.

Table 1. Land Preparation for Paddy Cultivation

Zero tilled DSR (Dry)	Tilled DSR (Dry)	Puddled DSR (wet)
<ul style="list-style-type: none"> No need to plough the soil Apply herbicides to kill unwanted weeds such as Paraquat, Glyphosate before 2-3 days of sowing 	<ul style="list-style-type: none"> Plough the fields when soil is little bit moist The field should be leveled 	<ul style="list-style-type: none"> Deep ploughing to break soil clods into smaller pieces. The puddled field should be leveled and drained out excess water.

Table 2. Estimation for cost of cultivation

Sl. No.	Type of cost	Manual Transplanting (Rs/acre)	Zero-tilled DSR (Dry) (Rs/acre)	Tilled DSR (Dry) (Rs/acre)	Wet-DSR (Rs/acre)
1	Field Preparation cost	7,920	-	2,200	4,600
2	Nursery establishment cost	1000	-	-	-
3	Sowing/Transplanting cost	3,600	1,200	1,200	600
4	Seed cost (hybrid)	4,000	4,000	4,000	4,000
5	Fertilizer cost	2,100	2,100	2,100	2,100
6	Herbicides cost	700	1,050	700	700
7	Irrigation cost* (*as when needed)	2,200	2,200	2,200	2,200
8	Insecticides cost	2,150	2,150	2,150	2,150
9	Harvesting cost (manual)	11,000	11,000	11,000	11,000
	Total (Rs.)	34,670	23,700	25,500	27,350
		35,000	24,000	26,000	27,000

2. SEED TREATMENT FOR DSR

Seed should be treated with Carbendazim 50 WP (Bavistin) @ 2 g/lit for 1 kg seed. Soak the seeds in water for 24 hrs and drain the excess water. Spread the soaked seed in shade for air-drying for 1-3 hrs. It is suitable for dry DSR (before rain). After seed treatment, line sowing is preferable with seed-cum-

fertilizer drill machine. In addition, keep the soaked seed in gunny bag and cover it with extra gunny bags for 24 hrs for sprouting. The gunny bag should be placed in dark. It is suitable for moist land/ wet DSR (after rain). Line sowing with seed-cum-fertilizer drill machine and drum seeder are preferable after seed treatment for dry and wet seeding, respectively.

3. METHODOLOGY FOR DSR

3.1 DSR (FOR DRY LAND)

After one rainfall during May, sowing of paddy should be started using seed cum fertilizer drill machine. DSR can be done in dry or moist land. In dry land, one light irrigation is required to germinate the seed as germination will affect if sown in dry land. The seeding should be placed 1-2cm depth with a spacing

of row-row at 20cm and plant-plant at 10-15 cm (Bairwa *et al.*, 2019).

3.2 DSR (FOR WET LAND)

DSR in wet land can be possible by high puddling and using drum seeder. Pre-germinated seeds are used for drum seeder in wet land. The sprouted seeds should be sown shortly in moist land. The maintained

distance between row to row is 18-20 cm and plant to plant is 10-15 cm. Drum seeder is more eco-friendly with capacity 5-6 acre/day.

4. WEED MANAGEMENT

Weed management in DSR foremost crucial to obtain optimum productivity. It can be achieved by proper and timely application of pesticide and herbicide. Apply Bispyribac Sodium 10% SC (100 ml/acre) + Pyrazosulfuron Ethyl 10% WP (80 gm/acre) at 18-22 DAS. At the time of spraying, the field should have optimum moisture. If the available moisture is not there, flash a light irrigation to the field. One hand weeding is required at 30-35 DAS if post-emergence herbicide is not worked properly. Weeding with star/rotary weeder is recommended.

5. ESTIMATION FOR COST OF CULTIVATION

Table 2. Shows the estimation for the cost of cultivation of paddy.

CONCLUSION

DSR successfully works on time saving, water saving and resource conservation for paddy cultivation. This technology is better than CT-PTR by reducing field preparation cost, labour cost, nursery establishment cost per unit area. Total cost of cultivation is reduced to approximately 30% by adoption of DSR technology in adverse climatic change condition. However, weed intensification can be controlled by timely application

of herbicides and awareness creation among farmers. It can overcome the hunger and food scarcity in upcoming days.

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