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DIRECT SEEDED RICE (DSR): BOON FOR FARMERS

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Introduction:

Rice *(Oryza spp.)* is the staple food for more than half of the world's population, contributing over 20% of the total calorie intake of humans (Seck *et al*., 2012). It is also the most important cereal food crop of India, where it is cultivated on about 24 per cent of gross cropped area (Guru *et al.* 2013). In India, rice is grown in estimated areas of about 439.49 lakh ha with the production of 106.54 million tonnes and productivity 2424 Kg/ha (Annual Report 2014-15, Department of Agriculture and Cooperation, Govt. of India). Groundwater is the major source of fresh water on the earth and India is the largest consumer of groundwater in the world for agriculture purposes. The excessive exploitation of groundwater for the Traditionally Puddled Rice (TPR) is going to be major threat to the sustainability of the Indian agriculture in near future. The TPR cultivation facing some problems of groundwater depletion, negative impact of puddling on soil, delayed transplanting of rice due to shortage of labour (Guru *et al.*, 2013). Direct Seeded Rice (DSR) requires less water and is more tolerant to water stress compared to Traditionally Puddled Rice (TPR), it has got better adaptive capacity to climate change, which is predicted to increase the variability of rainfall and the risks of drought and water stress. Growing DSR could have substantial impact in reduction of methane emission as DSR fields are not continuously submerged with water. DSR is getting increasingly popular among farmers due to labour savings although it has a lower yield potential than TPR. Earlier, the farmers were not convinced, but DSR technology is disseminated among the farmers through the extension activities such as: OFTs (on farm trial), FLDs (front line demonstrations), trainings, travelling seminars, method demonstrations, printing material and media. These extension activities made them aware of use and benefits of DSR technology.

Benefits of Direct Seeded Rice (DSR):

1. Avoids repeated puddling, preventing soil degradation and plow-pan formation
2. Facilitates timely establishment of rice and succeeding crops as crop matures 10-15 days earlier
3. Saves water by 35-40%, reduces production cost by Rs 3000/ha, and increases yields by 10%
4. Saves energy: labour, fuel, and seed
5. Solves labour scarcity problem and reduces drudgery of labours

Fig. : Soil preparation for dry direct-seeded rice (left) and for traditional transplanted-flooded rice (right)

Fig.: Water management in dry direct-seeded rice system, before irrigation (left) and after irrigation (right)

Site selection:

Medium to low lying land where irrigation facility is available is appropriate for DSR. Proper levelling of fields will facilitates uniform irrigation and better germination.

Land preparation:

Plough the field on the onset of monsoon when moisture is available in the field. Levelling of field with Laser Leveller is prerequisite in DSR since it helps in placement of seed at uniform depth, better establishment of crop and development, weed control and uniform irrigation.

Selection of cultivar:

Early to mid duration rice varieties like Prabhat, Rajendra Bhagwati, Saroj, Pusa-834, Narendra-97 and Private sector hybrid seeds which mature within 90-95 days to 115-120 days should be preferred for direct seeded rice.

Time of Planting: 15 June to 10 July

Seed Rate: 25-30 kg ha^{-1} when sown with seed drill.

Fertilizer Management:

The recommended dose of fertilizer (RDF) for Nitrogen, Phosphorus and Potassium should be in the ratio of 120:60:40 $Kgha^{-1}$. The time of application of above mentioned macronutrients should be;

Basal Dose: half Nitrogen + full potash + full Phosphate of RDF

20 days after sowing (DAS): $1/4^{th}$ of Nitrogen

40 days after sowing (DAS): $1/4^{th}$ of Nitrogen

If rain occurs then irrigation is not necessary before fertilizer application.

Weed Management:

Ploughing of field before sowing with light irrigation reduces most of the weeds in the paddy field. Application of Pendimethalin (400 ml in 200 lit. of water per acre) after 2 DAS does not allow the weeds to emerge up to 20 days. It is a pre-emergence herbicide which kills the weeds before their establishment. For the overall control of weeds in the paddy fields apply Bispyribac Sodium 10 S.C. (@100 ml in 200 lit. of water per acre). Bispyribac Sodium is applied when weeds are at 2-5 leaved stage and moisture is available in the field. For the complete control of broad leaved weeds apply Bispyribac Sodium 10 S.C. with 250 gm. of 2,4-D or 8 gms of Pymix (Metasulfuron+Chlorimuron). To prevent the weed to be emerge out again flood the field after 24-48 hours after application of Bispyribac Sodium.

Application of Ferrous Sulphate:

It has been observed that after 10 days of emergence leaves become yellow which later turns to white and ultimately plants become dry. It occurs due to deficiency of Iron (Fe) in the field which is called as Fe chlorosis. Deficiency of moisture in the field limits the availability of Iron to the plants. To prevent Fe chlorosis, application of 1 % of Ferrous Sulphate ($FeSO_4$) with lemon extract through Knapsack sprayer (15 lit. efficiency) is recommended.

Insect and Disease Management:

In general, direct seeded rice is affected by similar pests and diseases as transplanted rice; however, under some conditions there may be greater chance of outbreak of insect-pests and diseases in DSR with high rice plant densities. Cultivation of resistant crop varieties and summer ploughing is the pre requisite for efficient management of viral and other diseases/pests. Optimum rate of nitrogenous fertilizers avoid the incidence of brown plant hopper and blast attack. Fumigating the rat burrows with cow dung cake, keeping the cow dung balls soaked in kerosene all over the field results in better control of rats and other borrowing animals. Soil application of bio agent as *Trichoderma harzianum* @ 4 g ha^{-1} and T. virens @ 8 g ha^{-1} after one week of nematode infestation, results in better control and optimum yield of DSR crop (Pankaj *et al.,* 2012). Kreye *et al.* (2009b) studied the impact of nematicides and biocides on the grain yield of rice. They concluded that the grain yield was maximum and galling of RKN in roots less under DSR crop treated with biocide (nemagel or dazomet @ 50 g a.i. m^{-2}) as compared to transplanted puddled rice.

Water Management:

If rain does not occur, irrigate the field at least once before ploughing. This will help in control of weeds and uniform establishment of seeds. Intensity of rainfall will determine time and duration of irrigation in the field. Care must be taken that cracks could not be form in the field. Moisture must be available in the field at the time of application of insecticide/fungicide or herbicide.

Harvesting and Storage:

After reaching at physiological maturity harvesting, threshing and proper sun drying of grains should be done before storage. In general, DSR takes 8-10 days less time to attain maturity than the transplanted rice.

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