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Performance and Adoption of Direct Seeded Basmati in Sri Muktsar Sahib District of Punjab

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ABSTRACT

Direct Seeded Rice (DSR) is a promising resource conservation technology in rice-wheat cropping system. A field study was conducted during *kharif* 2014 to work out the performance of DSR in Sri Muktsar Sahib district of Punjab. The ground water in the district is not fit for irrigation in most of the villages however the canal water in the district is in sufficient quantity. Due to this reason, DSRwas introduced in the district to check its suitability and adaptability. The result of these demonstrations showed that the grain yields under direct seeded basmati and transplanted puddled method were approximately same. The average grain yield of all the demonstrations under transplanted puddled and direct seeded basmati were 55.4 and 55.2 q/ha respectively. Although the average income under transplanted method (Rs 1,55,050/-) was slightly higher as compared to direct seeded method (Rs 1,54,616/-) but the benefit-cost ratio was more in direct seeded basmati as compared to transplanted puddled method. By spending one rupee the farmers get benefits of 5.64 rupees in puddled basmati crop whereas in direct sowing the farmers get benefits of 6.17 rupees. This was due to less cost of cultivation under direct seeded technique.

Key Words: Direct seeded basmati, Yield, Economics, Benefit-cost ratio.

INTRODUCTION

The major emphasis in the rice–wheat cropping system has been on alternative resource conservation technologies (RCTs) for both rice and wheat crops to reduce the cost of cultivation, to sustain productivity, and to increase the profit margin of farmers (Singh *et al*, 2006). Transplanting of paddy seedlings is the major method of crop establishment in the irrigated rice systems in Asia and Punjab but transplanting is labour intensive and land preparation for transplanted paddy (puddling) consumes about 20-40 per cent of the total water required for growing the crop (Walia *et al*, 2011). In Punjab, rice is transplanted after puddling and it make adverse effects on the soil environment for the succeeding wheat and other upland crops. It destroys soil structure and adversely affects soil productivity (Walia *et al,* 2011). It also degrades the soil and water resources thereby threatening the sustainability of the system. The main concern is deepening of water table, which is going down every year at the rate of 74 cm per year. The transplanted puddled rice (TPR), leads to higher losses of water through puddling, surface evaporation and percolation (Farooq *et al*, 2011). There have been concerns related to shortage of labour which raises the cost and delay the planting of the rice crop.

The most promising option for the future is to adopt direct sowing of rice in place of transplanting, reducing its dependence on water and labour, reducing the risk of cracking of soil under limited water supply. Direct seeding of rice (DSR) offers certain advantages such as low labour costs, low soil degradation, early crop maturity by 7 -10 d, less drudgery, high tolerance to water deficit, saving of water, energy and fuel, lower production costs and more profit and less methane emissions (De Datta, 1986). It allows more effective growth period to paddy crop within the same duration. A physiological shock to crop due to uprooting and harmonizing during re-establishment after the transplanting is clearly avoided. With direct seeding, rice seed is sown and sprouted directly into the field, eliminating

laborious process of planting seedlings and also greatly reducing the crop water requirements. DSR is a plough towards a new set of principles based on minimal soil disturbance, management of crop residues and innovative cropping systems is the good option of farming under rice-wheat cropping system (Singh *et al*, 2012; Singh *et al*, 2012). Hence, in order to protect natural resources especially water, there is need to replace puddled transplanted rice with the DSR. Direct seeding of rice is possible provided there is a good crop establishment as well as adequate weed control methods are available to keep the crop free from weeds (Rao *et al,* 2007; Mishra and Singh, 2012) , however in absence of proper weed control, rice yields are reduced by 35-100 per cent in DSR (Kumar *et al,* 2008).

Keeping the above facts in view, the present study was undertaken for resource conservation in basmati by introducing DSR at the farmers' fields of Sri Muktsar Sahib District in Punjab during *kharif* 2014 season.

MATERIALS AND METHODS

A field experiment was conducted during *Kharif* 2014 by Krishi Vigyan Kendra, Sri Muktsar Sahib on farmer's field at Muktsar district of Punjab (lie between 30° 69' and 29° 87' latitude and 74° 21' and 74° 86' longitude, 184 m above mean sea level) to work out the suitability of direct seeded basmati in the district. The area is characterized by sub-tropical and semi-arid type of climate with hot and dry early summers from April-June followed by hot and humid period during July-September and cold winters during December-January. The mean maximum and minimum temperatures show considerable fluctuations during different parts of the year. Summer temperature exceeds 38^{0}C and may go up as high as 45^{0}C with dry summer spells. Winter experiences frequent frosty spells especially during December and January and minimum temperature records as low as 0.5^{0}C. The annual rainfall of the area is 430.7 mm, most of which is received during July to September (Anon, 2007).

Sri Muktsar Sahib district is major rice and cotton growing pockets of Punjab, selected for the present study since direct seeded rice is very popular in this region. In Punjab during *Kharif* 2014, the direct seeded rice/basmati was cultivated on 1,12,000 ha. Out of this 29,000 ha was only in Sri Muktsar sahib district which consisted of 25.9 per cent of total area of Punjab. The ground water in the district is not fit for irrigation in most of the villages however the canal water in the district is in sufficient quantity. Due to this DSR is introduced in the district to check the suitability and adaptability. From district, five suitable fields were selected randomly. Soil sample from each demonstration site was collected and analyzed for pH, EC, OC (%), available P and K status (Table 1).

Out of these five demonstrations, the soil was loamy sand to loam in texture. However, the soil is medium in OC and available P and rich in available K in the entire demonstration site. After proper ploughing of field, basmati variety pusa basmati 1121 seeds were directly sown in the field using seed cum fertilizer drill. All P, K and N were applied by soil test basis. Recommended chemical weed control was applied during study period and irrigations were applied according to the requirement of the crop. Desired data were collected through field observations. Collected data were further analyzed by using appropriate statistical tools.

RESULTS AND DISCUSSION

Grain yield

Direct seeded rice (DSR) was demonstrated in the selected farmers' field along with recommended IPM techniques in an area with pusa basmati 1121variety. It has been observed

Table 1. Soil Characteristics of different demonstrations.

Villages	pH (1:2)	EC (dS m^{-1})	OC (%)	P (kg/ha)	K (kg/ha)	Soil Texture
Bhullar	8.6	0.40	0.48	24.6	235.2	Loam
Buttar Sharinh	8.7	0.35	0.58	23.2	532.0	Sandy loam
Kothe Dashmesh	9.1	1.17	0.44	20.5	148.3	Loamy sand
Lalbai 1	8.5	0.27	0.53	24.3	199.0	Sandy loam
Lalbai 2	8.7	0.36	0.43	22.3	130.6	Sandy loam

Table 2. Grain yield, economics and benefit-cost ratio of different demonstrations.

Village Name	Transplanted puddled basmati					Direct seeded Basmati				
	Cost (Rs/ha)	Yield (q/ha)	Income (Rs/ha)	Benefit (Rs/ha)	B:C Ratio	Cost (Rs/ha)	Yield (q/ha)	Income (Rs/ha)	Benefit (Rs/ha)	B:C Ratio
Bhullar	23,100	57.0	1,59,600	1,36,500	5.91:1	19,600	57.0	1,59,600	1,40,000	7.14:1
Buttar Sharinh	26,400	55.0	1,54,000	1,27,600	4.83:1	24,300	54.6	1,52,880	1,28,580	5.29:1
Kothe Dashmesh	24,300	52.4	1,46,720	1,22,420	5.04:1	23,850	51.0	1,42,800	1,18,950	4.99:1
Lalbai 1	21,500	52.5	1,47,000	1,25,500	5.84:1	19,750	52.5	1,47,000	1,27,250	6.44:1
Lalbai 2	21,500	60.0	1,68,000	1,46,500	6.81:1	20,300	61.0	1,70,800	1,50,500	7.41:1
Average	**23,360**	**55.37**	**1,55,050**	**1,31,690**	**5.64:1**	**21,560**	**55.22**	**1,54,616**	**1,33,056**	**6.17:1**

that puddling doesn't have much influence on rice yields. In transplanted puddled basmati the higher grain yield was recorded with Lalbai 2 site (60 q/ha) and lowest with Kothe Dasmesh site (52.4q/ha). The average grain yield obtained under transplanted puddled basmati in all the demonstrations was 55.4 q/ha. The grain yield under direct seeded in Kothe Dasmesh was low due to medium textured soil as compared to heavy texture soil at other demonstration. The average grain yield under direct seeded basmati of all the demonstrations was obtained as 55.2 q/ha. The grain yield under direct seeded basmati and transplanted puddled method were approximately same. On considering individual demonstration, it was found that one farmer obtained higher yield, two obtained at par and two obtained lesser yield under direct sowing as compared to traditional transplanted method.

Economics and benefits-cost ratio

The income obtained was calculated by grain yield obtained under both methods of planting and multiplying it by Rs 2,800/- quintal grains. A perusal of data revealed that there was an higher average income obtained from transplanted puddled method as compared to direct seeded due to slightly higher grain yield obtained from TPR where as the average cost of cultivation was much higher in transplanted puddled method as compared to direct seeded. Due to this, the benefit obtained from the direct seeded was higher from the transplanted method. However, the benefit-cost ratio was more in direct seeded basmati as compared to transplanted method. Singh *et al* 2012 also observed the similar results that direct seeded rice gave the higher profit as compared to transplant method. On an average by spending one rupee the farmers get benefit of 5.64 rupees in puddled transplanted basmati crop where as in direct sowing demonstration the farmers get benefit of 6.17 rupees (Table 2) . This indicates that DSR production can be a profitable venture.

Direct seeded rice facilitates timely establishment of rice and succeeding crops as crop matures 7-10 d earlier. It saves water, saves energy, labour and fuel besides solving labour scarcity problem and reduces drudgery of labours significantly well in the district.

CONCLUSION

During *kharif* 2014, efforts have been made for resource conservation in basmati by introducing direct sowing method. In some demonstration the yield under direct sowing was less, in some yield remaining same and in some demonstrations it's more from the puddled basmati crop. The grain yield was higher in heavy textured soil as compared to light texture soil. The grain yield was slightly higher in transplanted method as compared to direct seeded. Whereas if we considered the benefit-cost ratio, which is more in direct seeded basmati demonstration as compared to transplanted method due to less cost of cultivation in direct sowing method. The study concludes that the direct sowing is well suitable and had good adoption among the farmers due to its less availability of water and it reduces the dependence on labour for transplanting rice. It allows more effective growth period to paddy crop within the same duration.

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