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Impact of improved technology of hybrid rice production on yield at farmers' field of Seoni district

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Abstract
The study was carried out at Krishi Vigyan Kendra, Seoni during *Kharif* from 2015-16 to 2016-17. Ten demonstrations were conducted in 4.0 ha area on the farmer field with an aim to disseminate improved technology of hybrid rice production. The improved technology consist high yielding hybrid rice variety (JRH-19), soil test value based nutrient application and need based diseases and pest management. The results from two years data revealed that the average yield of demonstrated plot was 49.12 q/ha over farmers practice (42.07 q/ha) with an additional yield of 7.05 q/ha and the increase average hybrid rice productivity by 23.61%. The average technology gap, extension gap and technology index were 10.88 q/ha, 8.54 q/ha and 18.83%, respectively.

Keywords: FLD, rice, production, economics, technology gap, extension gap, technology index.

Introduction
Rice is the important staple foods, which cover 65 percent of the population in India. It is the largest consumed calorie source among the food grains [11, 12]. It plays key role in food security in India [3, 9, 13, 14]. India is the second largest producer of rice in the world next to China. In M.P. rice is grown in the area of about 27.94 Lakh ha with production of 78.58 lakh tons and productivity 2813 kg/ha [1, 6].
The JRH-19 hybrid rice variety is renowned for its superior characteristics, including high-yield potential, better tolerance to biotic and abiotic stresses, and improved grain quality. Developed through advanced breeding techniques, this variety embodies the culmination of years of research and innovation aimed at addressing the evolving needs and challenges of rice farming [15, 16].
It indicates that the productivity of rice in Seoni district is comparatively low, primarily due to lack knowledge of improved production technologies. The productivity of rice may be increased by adopting recommended scientific and sustainable management production practices [17, 18]. Front line demonstration has main objective to demonstrate newly released variety with improved technologies and management practices at farmers' field under different agro climatic regions of the country with varying farming situations [10, 19, 20]. Adoption of feasible, scientific, sustainable management practices and selection of suitable variety can improve productivity and wide adoptability of the hybrid rice [2, 8]. With this in view front line demonstration held at farmers' field in a systemic manner to convince them about the potential of improved production technologies of hybrid rice.

Materials and Methods
Present study was conducted during *kharif* season of the year 2015-16 and 2016-17 at Seoni district. An area of 4.0 ha (2.0 ha in each year) was covered with plot size 0.4 ha under front line demonstration. The necessary steps for the selection of sites and farmers, layout of demonstration *etc* were followed as suggest by [1]. Thereafter group meetings and specific skill oriented trainings given to the selected farmers regarding package of practices of hybrid rice. The soils of demonstration sites were loamy in texture with pH range between 5.9 and 6.8. The available nitrogen, phosphorus and potassium varied between 180-260, 15-24, 280-330 kg/ha, respectively. In demonstration plots use of quality seeds of hybrid rice, seed treatment, timely sowing, weed management, recommended dose of fertilizers, need based pest management and disease management were emphasized and comparison has been made with the farmers practice (Table 1). The tradition practices/ farmers' practices maintained in case of local check. Opinion of the farmers about technologies used under demonstration collected for further improvement in research and extension activities.

The data collected from front line demonstration's fields as well as from control field (Farmers Practices) and finally the technology gap, extension gap, technology index were calculated as formula given by [5] as follows.

Technology Gap = Potential yield - Demonstration yield

Extension Gap = Demonstration yield - Farmer's yield

Additional Return = Demonstration Return- Farmer practices return

Technology index = Potential Yield - Demonstrated Yield/ Potential Yield

The results were analyzed statistically using analysis of variance (P=0.05) ANOVA [4].

Results and Discussion

Yield

Technologies undertaken in demonstration fields and practices adopted by farmers in control are presented in Table 1. The seed yield of hybrid rice (JRH-19) under front line demonstrations recorded as 48.72 and 49.52 q/ha, however in farmer's practice grain yield recorded as 39.40 and 41.75 q/ha in the year 2015-16 and 2016-17, respectively. Significant higher mean grain yield (49.12 q/ha) was recorded under intervention as compared to farmer practices (40.57 q/ha) (Table 2). In recommended intervention, there was increase in seed yield of hybrid rice (JRH-19) that 23.65 and 18.61% during the respective year (2015-16 and 2016-17) over the farmers practice.

The potential yield level could be obtained by adoption of improved package of practices. Front Line Demonstration conducted on rice crop with hybrid variety HRH-19 in Madhya Pradesh the improve practice yield was 49.12 q/ha and farmers yield was 40.57 q/ha. The results revealed the increase the yield over check was 21.13%. From the table 2, it is clearly seen that productivity of hybrid rice (JRH-19) is higher under intervention as compare to farmer practice. Based on the above criteria for Madhya Pradesh has potential for increasing production of hybrid rice (JRH-19) by adoption of recent technologies. In Madhya Pradesh, moong bean production can be increased in five years by reducing 10% yield gap every year. Farming communities practicing traditional methods of the hybrid rice production finds the lower yield as compared to the improved techniques [2, 15, 16].

Technology and extension gap

Mean technology gap was 10.88 q/ha and extension gap was 8.54 q/ha. Mean technology index was 18.83%. According to these results, farmers needs to convince for adoption of the new suggested technology for increasing yield of the hybrid rice (JRH-19). Corroborative findings also reported for chickpea and wheat crop under front line demonstrations [17, 18].

Economic returns

The cost of cultivation in farmers practice increased from Rs. 40,000/- in 2015-16 to Rs. 41,800/- per ha in 2016-17. In case of demonstrated intervention, it was increased 6.75% in 2015-16 and 3.34% in 2016-17. Gross and net return in farmers practice was also increased from Rs. 59,100/- and Rs19,100/- per ha in 2015-16 to Rs. 64,712/- and Rs. 22,912/- per ha in 2016-17, respectively. Gross return in demonstrated intervention was increased 23.65% in 2015-16 and 18.61% in 2016-17 over the control. Net return also increased in demonstrated intervention as 59.05% in 2015-16 and 46.45% in 2016-17 over the farmers practice, respectively. In case of B: C ratio was improved under demonstrated interventions in consecutive both years of an experimentation. Highest B:C ratio was observed in demonstrated intervention in 2016-17. [7, 19]. also reported similar results such as front line demonstration recorded higher gross return and net return as compared to local check.

Table 1: Difference between technological intervention and farmers practices for moong crop

S. No	Particular	Technology Interventions	Farmers Practice
1.	Variety	JRH 19	Local variety
2	Seed rate	6 kg/ha	15 kg/ha
3	Seed treatment	Thiram @ 3 g/kg of seed	Not applied
4	Azotobactor culture	10g/kg seed	Not treated
5	Time of transplanting	01-05th July	25-30th April15-20th July
6	Weed management	Pendimethylene@ 1.5 kg/ha Pretilachlore Pyrozosulfuron Bispyribac sodium salt	Not applied
7	Fertilizer dose	150:80:60 kg NPK per ha +ZnSo4 @ 25 kg/ha (On soil test basis)	Irrational use of nitrogenous fertilizers and non-application of DAP
9	Insect-pest management	Need based spray of insecticide at Economic threshold level (ETL)	Overdoses/ un recommended brands of insecticide

Table 2: Grain yield and gap analysis of demonstration intervention in hybrid rice (JRH-19)

Year	Area (ha)	No. of farmers	Yield (q/ha)			Increase over farmer practices (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Farmers Practice	Demonstration	Potential				
2015-16	2	5	39.40	48.72	60.0	23.65	11.28	9.32	18.80
2016-17	2	5	41.75	49.52	60.0	18.61	10.48	7.77	17.46
Mean	2	5	40.57	49.12	60.0	21.13	10.88	8.54	18.83

Table 3: Economics of demonstrated intervention in hybrid rice (JRH-19)

Year	Cost of cultivation (Rs/ha)		Gross Return (Rs/ha)		Net return (Rs/ ha)		Benefit cost ratio		% increase
	Farmers Practice	Demonstration	Farmers Practice	Demonstration	Farmers Practice	Demonstration	Farmers Practice	Demonstration	
2015-16	40,000	42,700	59,100	73,080	19,100	30,380	1.47	1.71	21.15
2016-17	41,800	43,200	64,712	76,756	22,912	33,556	1.54	1.77	17.02
Mean	40,900	42,950	61,906	74,918	21,006	31,968	1.50	1.74	19.08

Conclusions

Findings concluded as the seed yield of the hybrid rice (JRH-19) increased under demonstrated technology. Extension of the technology knowledge was given to the farmers, but the gap in technology adoption by the farmers is the concerning issue for the farming communities. During 2015-16, the percent increase in gross and net return was higher as compared to the year 2016-17.

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