IMPACT OF FRONT-LINEDEMONSTRATION ON DIRECT SEEDED RICE TECHNOLOGY UNDER RICE-WHEAT CROPPING SYSTEM

ABSTRACT

Krishi Vigyan Kendra Satna laid down Front Line Demonstration in the year Kharif 2020 and 2021 direct seeded rice technology. The FLDs were carried out in Naugawan and Shahpur villages of Satna district in supervision of KVK scientist. The productivity and economic returns of paddy in direct seeded rice were calculated and compared with the corresponding farmer's practices. Improved practices recorded higher yield as compared to farmer's practices. The DSR technology recorded higher yield of 43.03 q/ha and 44.14 q/ha in the year 2020 and 2021,respectively than 35.83 and 35.92 q/ha. The average yield increase was observed 21.49 per cent. In spite of increase in yield of paddy, technology gap, extension gap and technology index existed.The improved technology gave higher gross return (80380&85632 Rs./ha), net return (66930& 66685 Rs./ha) with higher benefit cost ratio (2.25&2.41) as compared to farmer's practices. Thevariation in per cent hadincrease ~~in~~ the yield ~~was found~~ due to the use of long duration local rice seedsby following the practices of broadcasting sowing method, poor management practices, lack ofknowledge and poor socio-economic condition. However, under sustainable agricultural practices the study ~~it is~~ concluded that the FLDs programmes were effective in changing attitude, skill andknowledge of DSR adoption.

Keywords: FLD; DSR;Broadcasting, Rice; yield gap; economics.

INTRODUCTION:

Rice is the ~~first most important~~foremost cereals crops, consumed as principal food at global level. Globally, it was cultivated on an area of 165.21 mha with production of 509.32 m tones and 46.00 q/ha of average productivity (USDA 2021). In India, rice is being cultivated on an area of 45.07 m ha with 122.27mt of production and 27.13 q/ha of average productivity. (DAC, 2021). In Madhya Pradesh it is grown on 3.40 m ha area with production 12.31mt and productivity of 36.17q/ha (DFWAD, 2021). Rice–wheat rotation is one of the most widely used crop production systems in the world.Growing of degenerated local seed and long duration variety of rice by broad casting sowing method besides that imbalance use of fertilizers which results in lower productivityin rainfed area of Satna district.Agricultural universities across the country have developed many new technologies that help increase crop yields and reduce crop costs, in particular on-farm mechanization. To reduce the gap between the potential yield and yield of farmer's practices, extension activities such as front-line demonstrations, training and information on new technologies play a key role.KrishiVigyanKendras (KVKs) in the country has taken over numerous extension activities and has reduced this yield gap that helps small and marginal farmers to sustain their economic status.

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This DSR technology has proven effective in saving water and improving rice yield around the world and currently contributes 23% of rice production under direct seeding (Rao et al., 2007).The DSR increase the net profit by reducing the cost of production.Direct seeded rice-drill increases productivity by 8-10% over broadcasting method (Iqbal et al., 2022). Short duration variety suitable for rain fed condition, direct seeded rice, weed & nutrient management. Therefore, the present study is undertaken to create awareness on Direct Seed Rice sowing method through front line demonstration.

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MATERIALS AND METHODS

Frontline demonstrations (FLD) were conducted for two consecutive years during Kharif seasons 2020 and 2021 at farmer's fields of Satna district to found theimpact of front-line demonstration on direct ~~seeded~~sowing rice ~~technology~~ under rice-wheat cropping system. 13 FLDs were conducted ~~at~~withrandomly selected farmer's fields inNaugawan and Shahpur villages ofMajhgawan. Geographically Satna is situated in the Satpura and Kaymore Plateau range and lies at 24^0 51' 15" to 24^0 57' 30" N latitude and 80^0 43' 30" to 80^0 54' 15" E longitude at the elevation of 313 m from mean sea level. The location has subtropical climate characterized by hot dry summer and cool winter. The soil of the farmer's fields was sandy loam in texture with shallow in depth and soil was very low in available nitrogen, low in available phosphorus and higher in available potassium. Soil reaction was almost neutral. The conventional rice-wheat rotation was being followed on the field from last 15 years.Each demonstration was of 0.4 ha area and Rice seed was supplied as critical input for partial fulfilment and other inputs were applied as per the recommendation and rice variety MTU 1010 was most commonly grown at their fields. The paddy was sown with tractor operated seed drill in demonstration field and broadcasting sowing was selected as check for analysisof yield and economic feasibility. Critical inputslike seeds, seed treatment fungicide, herbicide, pesticide and ~~F~~fertilizer were managed by a farmers ~~himself~~ as per therecommendation of package of practices as indicated byJawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur. Selected farmers were trained on use of seed drill for sowing and frequent field visits have made for collection of required data during crop growth period and on the harvest day field day had organized to create awareness of selected technology amongvillage people. Farmers were informed to note down all quantities of inputs used in all practices and used for economic analysis. The necessary step for the selection of site and farmers, lay out of demonstration, etc were followed as suggest by Chaudhary (1999). The farmer practices were maintained in case of local check. The data output were collected from both improved practices as well as farmer practices. To estimate the technology gap, extension gap and technology index the following formula as mentioned below were used as suggested by Samui et al. (2000), Sagar and Chandra (2004) and Dayanand and Mehta (2012).

Extension gap = Di (Demonstration plot yield) – Fi (Farmers practice plot yield)

Technology Gap = Pi (Potential yield)- Di (Demonstrated yield)

$$\text{Technology Index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

Table 1. Details of wheat grown under FLD and farmer practice

S.No.	Particulars	Frontline demonstration	Farmer practice	Gap
1.	Variety	Short duration variety (MTU 1010)	Long duration variety (Local)	Full gap
2.	Seed rate (kg/ha)	50	80	High er seed rate
3.	Seed treatment	Carboxin+ thiram @ 2 g/kg seed	No seed treatment	Full gap
4.	Sowing method	Direct Seeded Rice Method	Broadcasting method	Full gap
5.	Fertilizer application N:P:K:Zn (kg/ha)	80:40:20:20	60:30:0:0	Partial Gap
6.	Weed control	Bisbyribac-sodium @ 25 g/ha a.i. at 20 DAS	No weeding	Full gap
7.	Plant protection measures	Need bas ed plant protection measure	No plant protection	Full gap

RESULT AND DISCUSSION

Grain Yield

The crop from all the plots was harvested under the supervision of the KVK scientists. The yield from both the plots, *i.e.* direct seeded rice and farmer's practices were compared and it is evident from the data in Table 2 that the grain yield under demonstrated plots were 43.03 and 44.14 q/ha with an average of 43.59 q/ha from the year Kharif 2020 and 2021. However, it was 35.83 and 35.92 q/ha with an average of 35.88 q/ha under farmer's practice.It is also observed that, 20.09 % and 22.88 % increase in crop yield in DSR method as compared to traditional practices during kharif 2020 and 2021 respectively.The less application of nitrogen in direct sown method minimizes the incidence of pest and diseases which help in enhanced crop yield in demonstration fields.Direct seeded rice-drill increases productivity by 8.51% over broadcasting method.The above findings are in similarity with the findings of Iqbalet al., (2021). The yield of paddy could be increased over the yield obtained under farmers practices (use of nondescriptive local variety, no use of the balanced dose of fertilizer, untimely sowing and no control measure adopted for pest management) of paddy cultivation. The above findings are in similarity with the findings of Singh et al, (2015).

Table 2. Grain yield and gap analysis of demonstrated plots and farmer practices

Year	Yield (q/ha)		Increase (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
	Demo	FP				
2020	43.03	35.83	20.09	7.2	6.97	13.94
2021	44.14	35.92	22.88	8.22	5.86	11.72
Average	43.59	35.88	21.49	7.71	6.42	12.83

Extension Gap

An extension gapbetween demonstrated technology and farmerspractices was also calculated and on an average basis, the extension gap of 7.71q/ha was calculated (Table 2). This gap ~~might b~~eattribute to the adoption of improved technologypractices such as proper seed rate, use of seedtreatment material, nutrient management, pestmanagement etc. followedin thedemonstrated plots which**might**resulted in higher grain yield than the traditionalfarmer's practices. On the basis of

the extensiongap, the farmers were motivated to adopt therecommended package of practices to reducethe extension gap and to increase their grainyield.

Technology Gap

The technology gap was calculated by deducting the demonstrated plot yield from the potential yield of the wheat crop. The recorded technology gap was 6.97 and 5.86 q/ha during the study period. The average technology gap was found 6.42 q/ha. The difference in technology gap during two years could be due to more feasibility of recommended technologies like sowing time, seed rate, seed treatment, nutrient management and plant protection measures.

Technology index:

The technology index shows the feasibility of the demonstrated technology at the farmer's field. The technology index varied from 13.94 and 11.72 per cent. ~~On~~In an average technology the index ~~was~~ observed that12.83 per cent, during the both the years of ~~and~~ FLDs programme, ~~which~~this shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of paddy.

Economic feasibility of DSR method in rice cultivation

The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and benefit: cost ratio (Table-3). The cultivation of paddy under direct seeded rice gave higher net return Rs. 47372 per ha as compared to farmer's practices. The benefit: cost ratio of paddy cultivation under DSR were 2.33 as compared to 1.98 under farmer's practice. This may be due to higher yield obtained under DSR compared to farmer's practice. This finding is in corroboration with the findings ofIqbal et al., (2021).

Table 3. Economic analysis in demonstrated plots and farmers' practice

Year	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Net return (Rs/ha)		B:C ratio	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP
2020	35721	34612	80380	66930	44659	32318	2.25	1.93
2021	35546	34521	85632	69685	50086	35164	2.41	2.02
Average	35634	34567	83006	68308	47372	33741	2.33	1.98

CONCLUSION

Farmers of Satna district under rainfed condition generally grow local ~~variety~~ seed by broad casting method besides that imbalance use of fertilizers ~~which results in~~showed a low yield. To overcome this problemthe direct seeded rice (DSR) drill method was introduced for rainfed area.The average crop yield of paddy under DSR method was 43.59 q/ha andin farmer's Ppractices it was 35.88 q/haagainst potential yield of 50 q/ha.Adoption of DSR method in paddy cultivation enhanced thecrop yield upto21.49 % by using 30 % less crop inputs such as seed andfertilizer, thismethod ~~and it~~ minimizes the pest and disease incidence. Increase in cropyield under DSR stretched the B:Cratio

up to Rs. 2.33 higher than farmer's practicesprofit. The study suggests that, adoption of DSR method inpaddy cultivation minimizes the inputs, weeds, pest and diseasesincidence.

REFERENCE

Chaudhary, B N (1999). Krishi Vigyan Kendra- A guide for KVK managers. Division of Agricultural Extension, ICAR, pp. 73-78.

DAC 2021.Agricultural statistics at a glance 2021.Department of Agriculture and Cooperation. https://eands.dacnet.nic.in/

Dayanand VRK and Mehta SM.2012.Boosting mustard production through front line demonstrations. *Indian Research Journal of Extension Education* 12(3):121-123.

DFWAD 2021.Department of Farmer Welfare and Agriculture Development, Government of Madhya Pradesh, Bhopal. http://mpkrishi.mp.gov.in/

Iqbal, S, IqbalN, KhalidUB, SaleemMU, IramA, RizwanM, Sabar M and AwanTH. 2021. Growth, yield and economic analysis of dry-seeded basmati rice. Sarhad Journal of Agriculture, 37(1): 200-208.

Kuchanur P, SinghYK, RajakumarRH, AnandSR, PatilSG, JatML, vanLoonGW. Resource Conservation through Direct Seeded Rice. Agri Res & Tech: Open Access J. 2018; 14(1): 555905. DOI: 10.19080/ARTOAJ.2018.14.555905.

Rao AN, Johnson DE, Sivaprasad B, Ladha JK, Mortimer AM, 2007. Weed management in direct-seeded rice. Advance in Agronomy 93: 153–255. DOI: 10.1016/S0065- 2113(06) 93004-1.

Sagar RL and Chandra G.2004. Evaluation of front line demonstrations on mustard in Sunderban, West Bengal. *Indian Journal of Extension Education* 40:96-97.

USDA 2021. Wheat data, Economic Research Service, U.S. Department of Agriculture https://www.ers.usda.gov/data-products/rice-data/