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Impact of Frontline Demonstration on Rice Cultivar in Patna District of Bihar, India

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A B S T R A C T

Bihar lies in the river plains of the basin of the river Ganga. It is endowed with the fertile alluvial soil with abundant water resources. This makes the Agriculture of Bihar rich and diverse. The state has about 3.2 million ha under rice cultivation, which is mostly rainfed covering both uplands and shallow lowland ecosystems. The area has decreased from 36.57 to 32.22 lakh ha during the last six years. Rice is cultivated in 37 districts of Bihar. Out of 37 districts one district (Rohtas) having high productivity (above 25 quintal/ha) of rice, four districts namely Buxer, Bhabhua, Bhojpur and Patna comes under medium productivity (20- 25 quintal/ha) and rest 32 districts having less productivity (below 20 quintal/ ha), which accounts for 63% of 36.57 lakh hectares of total area under rice in the state. Area coverage under rice with high yielding varieties is about 65% and irrigation facility is available for about 40% rice area in the State. If the productivity of low productivity zone is increased, the rice production can be increased considerably without increasing the area under rice. Frontline demonstration (FLD) is an important tool for transfer of technology by the Krishi Vigyan Kendra. Keeping in view of an effective extension approach of FLDs for dissemination of improved cultivar of Rice, an impact assessment of FLDs conducted by KVK, Barh, Patna was conducted. The same also recorded grain yield 3652 kg/ha which is 23.08 % higher yield than local check (Komal). In spite of increase in yield with the use of improved technology, the technological gap, extension gap and technology index observed were848kg/ha, 685kg/ha and 885% respectively. The results improved technology in rice provided higher gross returns of Rs. 63225/ha with a benefit-cost ratio of 1.92 and additional net return of Rs. 29723/ha as compared to the local check. It could be recommended to replace the existing local HYV Komal with the improved rice variety RajendraSweta to adapt the existing farming situation with higher productivity and income.

Introduction

Bihar lies in the river plains of the basin of the river Ganga. It is endowed with the fertile alluvial soil with abundant water resources. This makes the Agriculture of Bihar rich and diverse. The state has about 3.2 million ha under rice cultivation, which is mostly rainfed covering both uplands and shallow lowland ecosystems. The area has decreased from 36.57 to 32.22 lakh ha during the last six years. Rice is cultivated in 37 districts of Bihar. Out of 37 districts one district (Rohtas) having high productivity (above 25 quintal/ha) of rice, four districts namely Buxer, Bhabhua, Bhojpur and Patna comes under medium productivity (20-25 quintal/ha) and rest 32 districts having less productivity (below 20 quintal/ ha), which accounts for 63% of 36.57 lakh hectares of total area under rice in the

state. Rice is one of the main crops of Bihar but its productivity is very poor. More than 60% rice area is concentrated in Bihar in low productivity zone and this zone contributes more than 50% of rice production of the State. Area coverage under rice with high yielding varieties is about 65% and irrigation facility is available for about 40% rice area in the State. If the productivity of low productivity zone is increased, the rice production can be increased considerably without increasing the area under rice.

Rice is the most popular stable food in Asia. It is estimated that over 90% of rice is produced and consumed in Asia. Also, in many of the Asian counties, rice yield per hectare has doubled within the 20 years of the Green Revolution (Baker *et al.*, 2007). This is mainly due to the adoption of high yielding rice varieties along with the increase in the cropping intensity and farm inputs (FAO, 2013). With varied geographical conditions suitable for the rice cultivation, Patna district in Bihar state of India boats of varied topographical soil condition ideally suited for the cultivation of cereal, cash crops, and horticultural and other plantation crops. Paddy is one of the most important cereal crop which sown in Palliganj, Dulhinbazar, Masaurhi, Dhanarua, Bikram, Naubatpur, Bihta, Punpun, Maner and Fatuha block of Patna district. In order to minimize the adoption gap and increase the productivity, Frontline Demonstrations (FLDs) play a major role. The general objectives of FLD is "to demonstrate under farmer's field condition, the superior production, potentials and benefits of the latest improved technologies including new production technologies, high yielding crop varieties and recommendations for different region, agro ecological crop growing situation vis-à-vis traditional practices". The present study is an attempt to appraise the yield of Paddy variety RajendraSweta among the benefiaries and non-beneficiaries as a part of FLD through the Krishi Vigyan Kendra (KVK), Barh, Patna, Bihar state, India.

Materials and Methods

Frontline demonstrations (FLDs) on paddy were conducted by KVK, Patna (Bihar) during the year 2014-15 to 2016-17 in different blocks like Barh, Pandarak, Palliganj, Dulhinbazar, Masaurhi, Bihta, Belchi, Bakhtiarpur, Daniyama, Patna sadar, Dulhin bazar and Fatuha of Patna district. A total of 123 demonstrations were conducted in 16 villages in 12 blocks. In general, soil of the study area was clay loam to sandy clay loam with medium soil fertility status. The major components of the FLD were improved variety "RajendraSweta", proper tillage operations, proper seed rate, sowing methods, balance dose of fertilizer (100 kg N+60 kg P_2O_5 + 40 kg K_2O/ha), proper irrigation, weed management and plant protection measures. A total of 40.20 ha area were covered in three consecutive years in the villages of the above mentioned blocks (Table 1). The necessary steps for selection of site and farmers, layout of demonstration etc. were followed as recommended by Choudhary (1999). The traditional farmer practices were maintained in case of local checks. A comparison between the Frontline demonstrations and Farmer practices is mentioned in Table 2. The data output were collected from both FLD plots as well as control plots and finally the extension gap, technology gap, technology index along with the benefits cost ratio were calculated (Samui *et al.*, 2000) as below:

Technology gap = Potential yield ─ Demonstration yield

Extension gap = Demonstration yield ─ Farmers yield

Technology index (%) = Technology gap / Potential yield × 100

Results and Discussion

The experimental findings obtained from the present study have been distributed in yield and economics of rice cultivation as per table 3 and 4. From the data presented in table 4, it is observed that demonstration yield of RajendraSweta variety performed better than traditional farmer practices. The maximum and minimum yield for the variety RajendraSweta estimated in the *kharif* year 2015-16 and 2017-18 was 3580 kg/ha and3725 kg/ha, respectively. The average yield of three years was recorded 3652 kg/ha as compared to local variety 2967 kg/ha. The percent increase in yield was ranging from 21.36 to 24.17 during the study period. The results are in conformity with the finding of Tomer *et al.,* (2003) and Tiwari and Saxena (2001).

The results clearly indicate the positive effects of FLDs over the existing farmer practices toward enhancing the yield of paddy. The results of table 3 reveal that yield of the Frontline Demonstration and potential yield of the crop were compared to estimate the yields which were further categorized into technology and extension gaps

Technology gap

The FLD of paddy variety RajendraSweta during the year 2015-16 recorded the technology gap as 920kg/ha, similarly during 2016-17 it was found to be 850kg/ha and during 2017-18 it was 775 kg/ha.

The technology gap decreased by 145 kg/ha than compared to the year 2015-16 (Table 3). The result of Frontline Demonstration indicated that technological gap reduced under the demonstration of a wide range of technological input which was provided to the beneficiaries as a result of which was applied in the actual field.

Extension gap

Higher extension gap 725 kg/ha was found during 2015-16 and lower 630 kg/ha was observed in 2016-17 (Table 3). More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap.

The new improved technologies will eventually lead to the farmers to discontinue the old varieties and to adopt new variety. Similar results were reported by Sharma *et al.,* (2011).

Technology index

The Technology index was reduced from 20.44 to 17.22 per cent during 2015-16 to 2017-18 (Table 3) which shows the higher feasibility of the demonstrated technology of RajendraSweta. This finding is in corroborated with the findings of Raj *et al.,* (2014).

The technology index shows the feasibility of the improved technology at the farmer's fields. The lower the value of technology index more is the feasibility of the technology. These findings corroborate with the finding of Mokidue *et al.,* (2011) and Tomar (2010).

Economics

The paddy variety RajendraSweta recorded the higher gross return of Rs.63225/ ha and additional net return of Rs.30276/ha over local check (Table 4). Higher B: C ratio (1.92) was found in improved technology of RajendraSweta due to higher net return as compared to local check (Komal). These finding are similar with the findings of Nirmala *et al.,* (2012). The year wise economics of rice cultivation with adoption of improved technology and farmers results have been presented in table 3.

Table.1 Demographic Situation of the Study Area

Year Covered	Blocks Covered	No. of Blocks	No. of Villages	No. of Demo*	No. of Farmers	Technology Demonstrated
2015-16	Barh, Pandarak, Belchi, Masaurhi, Palliganj	05	05	32	32	Improved cultivars
2016-17	Barh, Pandarak, Belchi GhoswariFatuha	05	06	52	52	Improved cultivars
2017-18	Barh, Pandarak, Belchi GhoswariFatuha	05	06	52	52	Improved cultivars
TOTAL		15	16	123	123	

*Area of Demonstration – 01 Acre / Farmer

Table.2 Comparison between frontline demonstrations and farmer practices

SN. No	Particulars	Existing Farmer practices	Improved Practices on Demonstration
1.	Variety	Jaya, Kanak	RajendraSweta
2.	Time of Sowing	Last week of July	Second week of July
3.	Method of Sowing	Broadcasting	Broadcasting
4.	Seed rate	40 Kg / ha	25 Kg / ha
5.	Seed treatment	No Seed treatment	Seed treatment
6.	Fertilizer dose	150 N : 30 P : 0 K	100N: 60P: 40K
7.	Weed management	Manual	Manual and Herbicide
8.	Plant Protection	No	Yes

Table.3 Area, productivity, technology gap, extension gap and technology index of rice under FLDs

Year	No. of farmers	Area (ha)	Yield (kg/ha)			% increase Over control	Tech.gap (kg/h)	Ext. gap (kg/h)	Tech. index (%)
			Potential	Demo	Control				
2015-16	32	13.06	4500	3580	2950	21.36	920	630	20.44
2016-17	52	21.22	4500	3650	2950	23.73	850	700	18.89
2017-18	39	15.92	4500	3725	3000	24.17	775	725	17.22
Mean	41	16.73	4500	3652	2967	23.08	848	685	18.85

Table.4 Gross realization (Rs. /ha), cost of cultivation (Rs. /ha), net return (Rs. /ha) and B: C ratio as affected by Demonstrated and local practices

Year	Gross realization (Rs./ha)		Cost of cultivation (Rs./ha)		Net return (Rs./ha)		B:C ratio	
	Demo	Farmer practices	Demo	Farmer practices	Demo	Farmer practices	Demo	Farmer practices
2015-16	60860	41300	31459	30038	29401	11262	1.93	1.37
2016-17	62050	41300	32558	31220	29492	10080	1.91	1.32
2017-18	63325	41200	33049	31449	30276	10551	1.92	1.34
MEAN	62078	41533	32355	30902	29723	10631	1.92	1.34

The adoption of improved technology under FLDs recorded higher average gross returns Rs.62078/ha, average net returns Rs. 29723/ha and B: C ratio (1:1.92) compared to farmers practice. Varietal characters of RajendraSweta (straw yield and price of rice grain) play additional role for higher gross return. Straw yield and price of rice grain were 21% and Rs. 10/qt. more over local variety. This fluctuating income trend was obtained due to variable price of rice and improper marketing system. These results are in conformity with the findings of Katare *et al.,* (2011). The present study observed that cultivation of rice with improved technologies has been found more productive and grain yield might be increase up to 23.08 per cent. Wide technological and extension gaps existed between research recommendation and traditional farmer practices.

However, the yield level under FLD was superior over local rice variety and performance & potentiality of this variety could be further improved by adopting recommended management practices. Thereof, it can be concluded from the study that increased yield was due to adoption of variety RajendraSweta and conducting frontline demonstrations of proven technologies yield potentials of crop can be increased to greater extent. This will subsequently increase the yield as well as the livelihood of the farming community.

Reason of low yield of rice at farmer's field

Delay in sowing due to irregular onset of monsoon and non-availability of quality seed of suitable variety cause low yield in paddy. Application of imbalanced dose of fertilizers and non-availability of labour on time also causes the lower yield in paddy.

It can be concluded that the cultivation of rice with improved technologies has been found more productive with grain yield increase up to 24.17 per cent. Technology gap was reduced and extension gap extended which can be bridged by popularizing package of practices with emphasis of improved variety. Replacement of local variety with RajendraSweta will increase the production and net income potential. The existing local paddy variety komal can be replaced with RajendraSweta because of higher productivity and income. Also, it fits well in the existing farming conditions.

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