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IMPACT OF FRONTLINE DEMONSTRATIONS ON YIELD OF WHEAT (*Triticum aestivum*) UNDER RAIN FED CONDITION IN UTTARAKHAND

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Abstract: The present study was carried out by Krishi Vigyan Kendra, Jakhdhar, Rudraprayag to know the yield gaps between improved package and practices under Front Line Demonstration (FLD) and farmer's practice (FP) of wheat crop in rainfed condition. Front line demonstrations (FLDs) were conducted on 45 farmers fields each year to demonstrate the impact of improved agro-techniques on production and economic benefits in rainfed condition of Uttarakhand in *Central Himalayan Region* during *rabi* seasons of two consecutive years i.e. 2014-15 and 2015-16. The technologies demonstrated in FLDs recorded additional yield over farmers practice. Under FLDs the grain yield of wheat was increased by 28.83 per cent over FP. The extension gap, technology gap and technology index were calculated as 4.80 q/ha, 3.51 q/ha and 14.28 per cent, respectively. Adoption of improved package of practices in wheat cultivation recorded higher B:C ratio (1.92) as compare to FP (1.63). Yield enhancement and higher net returns observed under FLDs of improved technologies in wheat. Thus, the productivity of wheat could be increased with the adoption of recommended improved package of practices. The present study resulted to convincing the farming community for higher productivity and returns.
Keywords: Client satisfaction index, Economics, Extension gap, FLD, Technology gap, Technology index, Wheat yield,

INTRODUCTION

Wheat (*Triticum aestivum*) is the second most important cereal crop in India after rice and it contributing substantially to the national food security by providing more than 50% of the calories to the peoples. Globally, it was cultivated on an area of 219 m ha with production of 715.9 m tonnes in the year 2013. In India, wheat is being cultivated on an area of 29.6 m ha with 93.5 mt of production and 3.15 t/ha of average productivity (FAO, 2013). In Uttarakhand it is grown on 0.36 m ha area with production 0.84 mt and productivity of 2.33 t/ha (Anonymous, 2014). The requirement of wheat will be around 109 mt for feeding the 1.25 billion populations by 2020 AD (Singh, 2010). India's per capita production is 67 kg against per capita consumption of 73 kg/year. Thus, around 15 mt of wheat production has to be increased by adopting improved production practices. There is no scope for area expansion

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in near future; additional production could be harvested by increasing the productivity per unit area (Nagarajan, 1997). There are several constraints of low productivity of wheat in India, out of which poor extension of improved agronomic practices is on the top. More than 50% area of wheat sowing gets delayed and goes up to last December to early January causing substantial loss due to late harvesting of preceding rice crop which resulted poor grain yield. Moreover, poor agronomic practices such as higher seed rate, unsuitable varieties, faulty nutrient management as well as weed control etc. are responsible for low productivity of wheat in India (Tiwari *et al.,* 2014). Negligence of plant protection measures of crop from insect-pest and wild animals are also responsible for low productivity of wheat. Frontline demonstration is the modern concept with the objective to demonstrate newly released crop production and protection technologies and its management practices at farmer's fields under different farming situations. While demonstrating the technologies in the farmer's fields, the scientists are required to study the various factors contributing higher crop yield, constraints in field production and thereby generate production data and feedback information. Keeping these in view, FLDs of improved production technology on wheat were conducted to enhance the productivity and economic returns and also convincing the farmers for adoption of improved production technologies in wheat crop.

MATERIALS AND METHODS

Front-line demonstration with improved package of practices on wheat were conducted at 45 farmers fields during *rabi* season of two consecutive years of 2014-15 and 2015-16 in different villages ie. Uniyana, Gavani, Ginwala, Kanthar, Mainkhanda and Sansari of Rudraprayag district (Uttarakhand). The soils of the farmer fields were Sandy-loam in texture and medium to low in NPK. Each demonstration was conducted on an area of 0.02 ha. FLD plot was kept for assigning farmers practices. Prior to conducting FLDs, group meeting and specific skill training was given to the selected farmers regarding package of practices of wheat crop.

To popularize the improved wheat production practices, constraints in wheat production were identified though participatory approach. Preferential ranking technique was utilized to identify the constraints faced by the respondent farmers in wheat production. Farmers were also asked to rank the constraints they perceive as limiting factor for wheat cultivation in order of preference. Based on top rank of farmers problems identified, front line demonstrations (FLD) were planned and conducted at the farmer's fields. The improved technologies selected for FLDs given in Table 1. The other management practices like seed

treatment, nutrient management and plant protection etc. were applied for improved as well as farmers practice. The wheat crop was sown at 22 cm (row-row) a part in line using seed rate of 100 kg/ha in 2nd fortnight of October during both the years. The average yield of each FLD and farmer practice has been taken in both the years for interpretation of the results. The extension gap, technology gap and technology index were calculated using the following formula as suggested by Samui *et al*. (2000).

Extension gap (q/ha) = Demonstration yield (q/ha) – Yield of local check (q/ha).

Technology gap (q/ha) = Potential yield (q/ha) – Demonstration yield (q/ha).

Technology index (%) = {(Potential yield – Demonstration yield) / Potential yield} x 100

The satisfaction level of participating farmers for the performance of improve demonstrated technology was also assessed. Total 45 farmers each year were selected to measure satisfaction level for the performance of improved technology. The selected respondents were interviewed personally with the help of a pre-tested and well-structured interview schedule. Client Satisfaction Index was calculated as below.

Client satisfaction index = (Individual score obtained/ Maximum score possible) x 100.

The data on yield were recorded and analysed to interpret the results. The economic-parameters (gross return, net return and B: C ratio) were worked out on the basis of prevailing market prices of inputs and minimum support prices of outputs.

RESULTS AND DISCUSSION

Constraints in wheat production

Problems faced by the farmers in wheat cultivation were documented during the study. Perusal of the data from Table 2 indicated that non-availability of improved varieties of wheat (83.33%) was given the top most rank followed by low technical knowledge (80.00%), incidence of insect (77.78%), damage caused by wild animals (75.56%), use of higher seed rate (66.67%), low fertility status (64.44%), weed infestation (44.44%) and yellow rust (22.22%) were the major constraints to wheat cultivation. Dhruw *et al*. (2012) and Meena *et al*. (2014) have also reported similar constraints.

Wheat yield

The data on wheat yield (Table-3) indicated that the FLDs given a good impact on the farming community of Rudraprayag district as they were motivated by the new agricultural technologies adopted in the demonstrations. Average wheat yield under front line demonstrations was observed as 2.15 t/ha which was higher by 28.83% over the prevailing

farmers practice (1.67 t/ha). The results are in close conformity with the research results of Sharma *et al*. (2016).

Extension and technology gap

The extension and technology gap are 480 kg/ha and 351 kg/ha respectively during the period of demonstration emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap. The new agro-techniques will eventually lead to the farmers to replace old varieties with the new one. The technology gap observed may be attributed to the dissimilarity in the soil fertility status and weather conditions. Hence, variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield level in different situations.

Technology index

The technology index indicates the feasibility of the evolved technology at the farmer's fields. The lower the value of technology index more is the feasibility of the technology. The data (Table-3) showed that technology index value 11.0 % was noticed in the year 2014-15 while in the year 2015-16 the value was 17.56%, whereas the average value of technology index was recorded 14.28%, it may be due to uneven and erratic rainfall and weather conditions of the area. The results are corroborating with the findings of Hiremath and Nagaraju (2009) and Dhaka *et al.* (2010).

Economic analysis

The higher cost of cultivation Rs 25,908 involved in FLDs as compared to Rs. 23,604 under Farmers practice (Table-4). The FLDs plots fetched higher mean gross returns (Rs. 49,540/ha) and net returns (Rs. 23,632/ha) with higher benefit: cost ratio (1.92) as compared to (gross returns Rs. 38,417), (net returns Rs. 14,812) and (benefit: cost ratio 1.63) with farmers practice. Hiremath and Nagaraju (2009), Sreelakshmi *et al*. (2012) and Joshi *et al*. (2014) also reported higher net returns and B:C ratio in the FLDs on improved technologies compared to the farmers practices and are at par with results of the present study which also resulted in higher net returns through FLDs on improved technologies.

Additional cost of cultivation and returns

Further, data (Table-4) revealed that the average additional cost of cultivation (Rs. 2,303/ha) under integrated crop management demonstrations and has yielded additional net returns of

Rs. 1,1123 / ha. The results suggest that higher profitability and economic viability of wheat demonstrations under local agro-ecological situation.

Farmer's satisfaction

Client satisfaction index (CSI) presented in Table 5 observed that majority of the respondent farmers expressed high (53.33%) and medium (30.00%) level of satisfaction regarding the performance of FLDs, whereas, very few (16.67 %) of respondents expressed lower level of satisfaction. Majority of responding farmers under higher and medium level of satisfaction with respect to performance of demonstrated technology indicate stronger conviction, physical and mental involvement in the frontline demonstrations which in turn would lead to higher adoption. The results are corroborated with the results of Kumaran and Vijayaragavan (2005) and Dhaka *et al.* (2010).

Conclusion

Thus, it may be concluded that the yield and returns in wheat crop increased substantially with the improved production technologies. However, the yield level under FLDs was better than the farmer practice and performance of these varieties could be further improved by adopting recommended production technologies. So, there is need to disseminate the improved technologies among the farmers with effective extension methods like training and field demonstrations. The farmers should be encouraged to adopt the recommended agro-techniques for getting maximum returns in specifc locations.

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Table1. Details of package of practices followed in the frontline demonstrations (FLDs) vs farmers practice (FP).

S No	Inputs	FLDs	FP
1.	Wheat cultivar	UP 2572	Local
2.	Seed rate	100 kg/ha	150 kg/ha
3.	Seed treatment	Propioconazol 1.0 g/kg seed	-
4.	FYM	400 kg/ Nali	200 kg /Nali
5.	Weed management	Two hand weeding, first at 25 days after sowing and second 45 days after sowing	-

Table 2. Ranks for different constraints given by farmers.

Constraints	Percentage	Rank
Improved Varieties of wheat	83.33	I
Low technical knowledge	80.00	II
Insect	77.78	III
Damage by wild animals	75.56	IV
Use of higher seed rate	66.67	V
Low soil fertility	64.44	VI
Weed infestation	44.44	VII
Yellow rust	22.22	VIII

Table 3. Yield performance of wheat under FLDs.

Year	No. of demo.	Area (ha)	Yield (t/ha)		% yield increase over FP	Techo logy gap (kg/ha)	Extension gap (kg/ha)	Techno logy index (%)
			FLD	FP				
2014-15	45	0.90	2.237	1.732	29.17	26.3	50.5	11.00
2015-16	45	0.90	2.061	1.606	28.48	43.9	45.5	17.56
Mean	45	0.90	2.149	1.669	28.83	35.1	48.0	14.28

Table 4. Economics, additional cost and returns in wheat under frontline demonstrations (FLDs) vs framers practice (FP).

Year	Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		Additional cost of cultivation (Rs./ha) in FLD	Additional returns (Rs./ha) in FLD	B: C Ratio	
	FLD	FP	FLD	FP	FLD	FP			FLD	Farmers practice
2014-15	25,867	23,567	48,814	37,735	22,947	14,167	2,300	1,1079	1.89	1.60
2015-16	25,949	23,642	50,267	39,100	24,318	15,457	2,307	1,1167	1.94	1.65
Mean	25,908	23,604	49,540	38,417	23,632	14,812	2,303	1,1123	1.92	1.63

Table 5. Extent of farmers satisfaction over performance of FLDs.

Satisfaction level	Number	Percent
High	48	53.33
Medium	27	30.00
Low	15	16.67