INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

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YIELD ENHANCEMENT AND POPULARIZATION OF IMPROVED PRODUCTION TECHNOLOGIES IN WHEAT THROUGH FRONTLINE DEMONSTRATIONS

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ABSTRACT
The present study was carried out by Krishi Vigyan Kendra, Bijnor to study the yield gaps between improved package of practices under frontline demonstration (FLD) and farmer's practice (FP) of wheat crop. Frontline demonstrations (FLDs) were conducted on 20 farmers' fields to demonstrate the impact of improved techniques on production and economic benefits under the irrigated *NWPZ* region of Uttar Pradesh during *rabi* seasons of two consecutive years *i.e*. 2010-11 and 2011-12. The technologies demonstrated in FLDs recorded additional yield of 10.25 q/ha over farmers practice. Under FLDs the grain yield of wheat was increased by 24.62 percent over FP. The extension gap, technology gap and technology index were calculated as 10.25 q/ha, 10.50 q/ha and 16.83 percent, respectively. Adoption of improved package of practices in wheat cultivation recorded higher B: C ratio (2.73) as compare to FP (2.33). 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, Yield, Technology gap, Technology index, Wheat.

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. During 2013, globally it was cultivated on an area of 219 m ha with production of 715.9 m tonnes. In India, wheat cultivated on 29.6 m ha area with 93.5 m tonnes of production and 31.5 q/ha of average productivity (FAO, 2013). In Uttar Pradesh, it is grown on 9.73 m ha area with production 30.3 m tons and productivity of 31.14 q/ ha (Anonymous, 2013). The requirement of wheat will be around 109 million tonnes 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. Thus, wheat production has to increase by another practice 15 million tonnes. There is no scope for area expansion, additional production has to come by increasing the per hectare productivity (Nagarajan, 1997). There are several constraints for low productivity of wheat in India, >50% sowing of wheat gets delayed till December or early January causing substantial loss in grain yield due to late harvesting of preceding crop like rice, sugarcane which ultimate results in poor seed yield. Moreover, poor agronomic practice such as higher seed rate, unsuitable variety, faulty nutrient as well as weed control and improper irrigation etc. are responsible for low productivity of wheat in India (Tiwari *et al.,* 2014). Frontline demonstration is the modern concept with the objective to demonstrate newly released crop production and protection technologies and its management practices at farmers' fields under different farming situations. While demonstrating the technologies in the farmer's fields, the scientists are required to study the factors contributing higher crop production, field constraints of 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 to adoption the improved production technologies in wheat.

MATERIALS & METHODS

Front-line demonstration on improved package of practices *i.e.* HYV, seed treatment, nutrient management, disease management, weed management and sowing by seed drill on wheat were conducted at 20 farmers fields during *rabi* season of two consecutive years of 2010-11 and 2011-12 in different villages *i.e.* Khushalpur Matheri, Khanpur, Harvabshpur Dharam, Jhilmila, Bishnoiwala, Daheri, Maheshwari Jatt and Harganpur of Bijnor district (UP). The soils of the farmer fields were loam in texture and medium to low in NPK. Each demonstration was conducted on an area of 0.4 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.

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 farmers problems identified, front line demonstrations were planned and conducted at the farmer's fields. The improved technologies selected for FLDs given in table 1.

TABLE 1: Details of package of practices followed in the frontline demonstrations *vs* farmers practice

S No	Inputs	FLDs	Farmers practice
1	Wheat cultivar	PBW-550	PBW-550
2	Seed rate	100 kg/ha	180 kg/ha
3	Seed treatment (Propiconazol)	1.0 g/kg seed	-
4	NPK (12:32:16)	180 kg/ha	100 kg/ha
5	Urea	280 kg/ha	200 kg/ha
6	MOP	50 kg/ha	-
7	Gypsum for sulphur	200 kg/ha	-
8	Zinc sulphate (21%)	25 kg/ha	25 kg/ha
9	Weed management	Sulfosulfuron @ 33 g + Carfentrazne @ 25 g/ ha	Isoproturon @ 1.0 kg/ha

The other management practices like seed treatment, recommended fertilizers dose and plant protection etc. were applied for improved as well as farmer practice. The wheat crop was sown at 22.5 cm (row-row) apart in line using seed rate of 100 kg/ha in 2nd week of November during both the years. The average yield of the individual FLD/ local practice for the two years has been taken for interpretation of the results. The extension gap, technology gap and technology index were calculated using the 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 as well as neighbouring farmers' for the performance of improve demonstrated technology was also assessed. In all, 120 participating farmers' were selected to measure satisfaction level of farmers' for the performance of improve 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 (CSI) = (Individual score obtained / Maximum score possible) x 100.

The data on yield were recorded and statistically 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 & DISCUSSION

Constraints in wheat production

Problems faced by the farmer's in wheat cultivation were documented during the study. Perusal the data from table 2 indicated that non-availability of improved varieties seed (70%) was given the top most rank followed by low technical knowledge (67%), use of higher seed rate (65%), low fertility status (61%), weed infestation (55%) and damage of wheat by wild animals were the major constraints to wheat cultivation. Dhruw *et al*. (2012) and Meena *et al*. (2014) have also found similar constraints *i.e*. lack of suitable varieties, low technical knowledge *etc*.

TABLE 2: Ranks for different constraints (n=120) given by farmers

Constraints	Percentage	Rank
Improved Varieties seed	70	I
Low technical knowledge	67	II
Use of higher seed rate	65	III
Low soil fertility	61	IV
Weed infestation	55	V
Damage by wild animals	50	VI
Yellow rust	42	VII

Wheat Yield

The data on wheat yield (Table 3) indicated that the frontline demonstration had given a good impact on the farming community of Bijnor district as they were motivated by the new agricultural technologies adopted in the demonstrations. Frontline technology gave mean wheat yield of 51.9 q/ha which was higher by 24.6% over the prevailing farmers

practice (41.65 q/ ha). The results are in close conformity with the Sharma *et al*. (2016).

Extension and Technology gap

The extension gaps ranged from 10.1 to 10.4q/ ha 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 technologies will eventually lead to the farmers to discontinuance of old varieties with the new technology. 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 farmers' fields. The lower value of technology index more is the feasibility of the technology. The data (Table 3) showed that maximum technology index value 16.19 % was noticed in the year 2009-10 followed by 17.47% (2010-11) whereas, average value of technology index of 16.83 %, 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).

TABLE 3. Yield performance of wheat under FLDs

Year	No. of demo.	Area (ha)	Yield (kg/ha)		% yield Increase over FP	Extension gap (q/ha)	Technology gap (q/ha)	Techno logy Index (%)
			FLD	FP				
2009-10	10	4.0	52.30	42.20	23.93	10.10	10.10	16.19
2010-11	10	4.0	51.50	41.10	25.30	10.40	10.90	17.47
Mean	20	8.0	51.90	41.65	24.62	10.25	10.50	16.83

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

Year	Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		Additional Cost of cultivation (Rs./ha) in FLD	Additional Return (Rs./ha) in FLD	B C Ratio	
	FLD	FP	FLD	FP	FLD	FP			FLD	Farmers practice
2009-10	27644	25914	76191	61374	48547	35460	1730	13087	2.76	2.37
2010-11	27890	26250	75255	60087	47365	33837	1640	13528	2.70	2.29
Mean	27767	26082	75723	60730	47956	34648	1685	13308	2.73	2.33

Economic analysis

The higher cost of cultivation Rs 27767 involved in FLDs as compared to Rs. 26082 under Farmers practice (Table 4). The front line demonstrations plots fetched higher mean gross returns (Rs. 75723/ha) and net return (Rs. 47956/ha) with higher benefit: cost ratio (2.73) as compared to (Rs. 60730), (Rs. 34648) and (2.33) 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.1685/ha) under integrated crop management demonstrations and has yielded additional net returns of Rs. 13308 per hectare. 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 (49.2 %) to the medium (35.0 %) level of satisfaction regarding the performance of FLDs, whereas, very few (15.8 %) of respondents expressed lower level of satisfaction. The higher to medium level of satisfaction with respect to performance of demonstrated technology indicate stronger conviction, physical and mental involvement of in the frontline demonstrations which in turn would lead to higher adoption. The results are in close conformity with the results of Kumaran and Vijayaragavan (2005) and Dhaka *et al.* (2010).

TABLE 5: Extent of farmers satisfaction over performance of FLDs (n=120)

Satisfaction level	Number	Percent
High	59	49.2
Medium	42	35.0
Low	19	15.8

CONCLUSION

Thus, it may be concluded that yield the adoption of improved production technologies significantly increased the yield and returns in wheat crop. However, the yield level under FLD was better than the local 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 demonstrations. The farmers should be encouraged to adopt the recommended package of practices for the crop for higher returns. From the above research findings it can be

also concluded that the maximum number of the respondents had medium level of knowledge and extent of adoption regarding recommended wheat production technology.

ACKNOWLEDGEMENT

We sincerely thank to all the farmers on whose fields' frontline demonstration were conducted. The financial assistance provided by Indian Council for Agricultural Research, New Delhi and Zonal Project Directorate (ICAR) - Zone IV, Kanpur. The views expressed in this paper are those of individual scientists and do not necessarily reflect the views of the donor or the authors' institution.

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