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Promotion of improved production technology of wheat through Front Line Demonstrations in Faizabad District of Uttar Pradesh

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Abstract
Front line demonstrations of improved wheat production technology on wheat variety HD 2967 were conducted on the farmers' fields of the Faizabad district of eastern Uttar Pradesh during Rabi 2013 and 2014. Prevailing farmers' practices were treated as control for comparison with recommended cultivation practices. About 33.04 % higher grain yield was recorded under demonstrations over the farmers' practices (Farmer Practice-FP). The average extension gap, technology gap and technology index (%) were observed to be 4.48 q ha^{-1}, 9.93 q ha^{-1} and 10.08, respectively. The technology index (%) was varied from 6.87 – 13.29 % with an average of 10.08 %. Technology index was recorded to be decreased over the successive years of study the successive decreased value of technology index reflected the feasibility of the demonstrated technology in agro - climatic condition of eastern Uttar Pradesh.

Keywords: Economics, Extension gap, FLD, Technology gap, Technology index

1. Introduction
Wheat is the world's most widely cultivated cereal crop and in India is the second most important staple cereal food after rice. It is not only the staple food for wheat consuming population of India but also the major source of their dietary energy. Wheat is grown globally in about 217 m ha area with a total production of 632 million tonnes. The area under wheat cultivation remained constant at about 220 m ha in the past 3 decades, however, the production has increased many folds from 355 million tonnes (1975) to the present level owing to enhanced wheat productivity. In India, wheat was cultivated in about 29.6 m ha of the total cultivated area with an annual production of 93.5 m tones. The average wheat productivity of India is 31.5 q/ha (FAO, 2013) [5]. Wheat is one of the major crops, which has benefitted tremendously from the 1st green revolution. Over the last 50 years, area under wheat cultivation was increased from 10 mha to 26 mha in India. During the same period, cultivated area under assured irrigation facilities was also increased from 30% to 85% of the total area. Wheat productivity has been showing a similar pattern of improvement from 7.0 tha^{-1} in 1950 to 28 tha^{-1} today. This increase in wheat productivity may be attributed to the increase increased irrigation facilities, application of inorganic fertilizers, improved varieties and socio-economic support provided to the farmers. The major wheat growing states of India are Uttar Pradesh, Punjab, Hariyana, Rajasthan, Madhya Pradesh and Bihar. Uttar Pradesh is largest wheat growing state of the country with an annual production of 30.30 m tones from an area of 9.73 m ha. The average productivity of the Uttar Pradesh is 31.14 q/ ha (Anonymous, 2013) [1]. The major wheat production constraints in Uttar Pradesh are declining soil health due to multi-nutrient deficiencies, soil salinity/alkalinity and low input use efficiency. Due to the late harvesting of preceding crop like rice and sugarcane sowing of the wheat was delayed till December or early January in the majority of the districts of eastern Uttar Pradesh resulted in substantial loss in grain yield. Late sown suffers due to sub-optimal temperature at sowing, which causes delayed germination, slow growth, lesser development and ultimately low yield. The delayed sowing further cause's supra-optimal thermal stress at reproductive phase which results enforced maturity. Poor agronomic practices such as higher seed rate, unsuitable variety, use of imbalance fertilizer, improper use of weed control measures and unavailability of irrigation facilities etc. were also affecting negatively on wheat productivity in the state. As per an estimate about 109 million tonnes of wheat is required by 2020 for feeding the growing Indian population. There is no scope for area expansion, additional production has to come by increasing the per hectare productivity (Nagarajan, 1997) [14]. Development of new high yielding varieties/ production technologies and dissemination of improved wheat production technologies among farming community are the few options available to increase the wheat

productivity of country. In view of the above observations frontline demonstrations of improved production technology on wheat were conducted on the farmers field of the Faizabad district of eastern Uttar Pradesh to enhance the wheat productivity and economic returns during Rabi 2013 and 2014.

2. Materials & Methods

Front Line Demonstrations on improved production technique of wheat *i.e.* HYV, seed treatment, nutrient management, disease management, weed management and sowing by seed drill were conducted on the farmer's field of the Faizabad district of eastern Uttar Pradesh during Rabi 2013 and 2014. The major objectives of these demonstrations are the promotion/demonstration of improved crop production and protection technologies and its management practices at farmers' fields under real farming situations. In between the technology intervention HRD components (trainings / kisan mela/ gosthies/field day etc.) were also included to excel the farmers understanding and skill about the demonstrated technology on wheat. The Field demonstrations were conducted under close supervision of the scientists of KVK, Masodha, Faizabad. Socio economic study of the demonstration area was also conducted. Majority of the farmers were found resource poor having small land holding. The constraints in wheat production were identified through participatory approach, farmers' meeting, training programmes and field diagnostic visits during crop growth period. 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. Low productivity of the wheat was conceived due to lack of suitable variety, delayed sowing, imbalance use of fertilizer, high weed infestation, indiscriminate use of pesticides etc. Based on the problems faced by the wheat farmers of the study area, altogether 60 numbers of front line demonstrations were conducted during the Rabi season of 2013 and 2014, at farmers' field covering an area of 24 ha in Shivdaspur, Gopalpur, Gangauli, Madhupur and Murchipur villages of Masodha Block of Faizabad district. The improved technologies selected for FLDs given in table 1.Soil samples were collected and analysed for major nutrients. The soils of the study area are generally silty loam to sandy loam in texture. The pH of the soils ranged from 7.2-8.1, and organic carbon (%) ranged from 0.32-0.45. The status of soil organic carbon was low in all the soil samples. The available N, P and K contents of the soil varied from 160-230 kg/ha, 20-32 kg/ha and 180-248 kg/ha. Since the balanced use of these nutrients was essential for realizing the full potential of the variety, recommended dose of fertilizer 120:60:40 NPK kg/ha was applied in all the demonstrations. The area under each demonstration was 0.4 ha. To manage the assessed problems seeds of wheat variety HD 2967, fertilizer and plant protection chemicals were provided to the farmers as critical inputs and scientific recommended technologies were followed as intervention during the course of front line demonstration programme. 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. Technology gap, extension gap and technology index were calculated as per the formula given by Samui *et al*. (2000).

$$Technology\ gap\ \left(\frac{q}{ha}\right) = Potential\ yield\ \left(\frac{q}{ha}\right) - Demonstration\ yield\ \left(\frac{q}{ha}\right)$$

$$\text{Extension gap}\ \left(\frac{\text{q}}{\text{ha}}\right) = Demonstration\ yied\ \left(\frac{q}{ha}\right) - Farmers\ yield\ \left(\frac{q}{ha}\right)$$

$$Technology\ Index\ (\%) = \frac{(Potential\ yield - Demonstration\ yield)}{Potential\ yield} \text{x} 100$$

The satisfaction level of participating as well as neighboring farmers' for the performance of improve demonstrated technology was also assessed. In all, 60 participating farmers' were selected to measure satisfaction level of farmers' for the performance of improve technology.

3. Results and Discussion

Major Constraints in wheat production

Socio economic survey of the adopted villages for the demonstration showed that majority of the wheat farmers were resource poor having small land holdings. Major constraints in wheat production were identified and documented. On perusal of data presented table -2 it was found that major constraints in wheat production were non-availability of the quality seed of high yielding varieties (77%) was given the top most rank followed by low technical knowledge (70%), high seed rate (65%), low fertility status (55%), weed infestation (50%) and damage of wheat crop by the wild animals (40%).

Wheat Grain Yield

Mean wheat grain yield under demonstration was found 39.93 q/ha which was 33.04% higher than the farmer's practice (30.00 q/ha). Results are in close conformity with the Sharma *et al*. (2016) [16]. Increase in grain yield during 2nd year of testing showed adoption of improved production technology by participating farmers.

Extension gap, Technology gap and Technology index

The extension gaps ranged from 9.10 to 10.75 q/ha during the period of demonstration emphasized the need to educate the farmers through various extension tools viz. training programmes, kisan gosthies, distribution of literatures for the wider 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 adoption site specific wheat varieties. The technology gap observed may be attributed to the variability in edaphic and climatic factors. The technology index (%) was varied from 6.87 – 13.29% with an average of 10.08%. Technology index was recorded to be decreased over the successive years of study the successive decreased value of technology index reflected the feasibility of the demonstrated technology in agro - climatic condition of eastern Uttar Pradesh. The results are in corroborating with the findings of

Hiremath and Nagaraju (2009) [7], Kumaran and Vijayaragavan (2005) [12] and Dhaka *et al.* (2010) [3].

Economic analysis

Different input variables like seed, fertilizers, herbicides and pesticides were considered in economic analysis of FLD demonstrations as well as for farmers practice. It is observed that an additional investment of Rs. 1900/ ha was made under FLD demonstrations. Economic returns was analysed on basis of grain yield revealed that mean additional return of Rs. 12988/ha was obtained in the demonstrations due to higher grain yield. The higher additional returns under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The highest benefit cost ratio (2.23) was also found for the front line demonstrations. The higher B C ratio also encourages the farmers to adopt the improved wheat production technology. The results are in conformity with the findings of earlier work.

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

S. No.	Particulars	Front Line Demonstration	Farmers Practice
1	Wheat cultivar	HD 2967	HD 2967
2	Time of Sowing	2nd Week of November	Early December
3	Seed Rate (kg/ha)	100	125
4	Sowing method	Seed drill	Broadcasting
5	Fertilizer used (N:P:K in kg/ha)	120: 60:40	100: 50:0
6	Weed management	Sulfosulfuron @ 33 g + Carfentrazne @ 25 g/ ha	Isoproturon @ 1.0 kg/ha

Table 2: Ranks for different constraints (n=60) given by farmers

S.No.	Constraints	Percentage	Rank
1	Non availability of the seeds of high yielding varieties	77	I
2	Low technical knowledge	70	II
3	Use of higher seed rate	65	III
4	Low soil fertility	55	IV
5	Weed infestation	50	V
6	Damage by blue bull	40	VI

Table 3: Yield performance of wheat under FLDs

Year	No. of demonstrations	No. of farmers involved	Area (ha)	Potential Yield (q ha^{-1})	Demonstration Yield (q ha^{-1})	Farmers practice (q ha^{-1})	% Yield increase over farmers practice
2013	30	30	12	44.40	38.50	29.40	30.95
2014	30	30	12	44.40	41.35	30.60	35.13
Mean				44.40	39.93	30.00	**33.04**

Table 4: Yield Gap analysis under FLDs

Year	Technology gap (q ha^{-1})	Extension gap (q ha^{-1})	Technology index (%)
2013	5.90	9.10	13.29
2014	3.05	10.75	6.87
Mean	4.48	9.93	10.08

Table 5: 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	FP
2013	26500	24650	57750	44100	31250	19450	1850	11800	2.18	1.79
2014	27150	25200	62025	45900	34875	20700	1950	14175	2.28	1.82
Mean	26825	24925	59888	45000	33063	20075	1900	12988	2.23	1.81

4. Conclusion

Frontline demonstrations were carried out in a systematic and scientific manner on farmer's field to show the worth of improved production technology of wheat and convincing farmers for further adoption. Response receives from different farmer's revealed that farmer were satisfied with potentialities of demonstrated technology. Wheat FLDs were perceived by the farmers as effective method of transfer of technology. Front line demonstrations were also found effective in upgrading the knowledge base of farmers regarding improved production technology of wheat which will be helpful in enhancement of the wheat productivity of the area.

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