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YIELD GAP ANALYSIS OF WHEAT (*TRITICUM AESTIVUM*) THROUGH FRONT LINE DEMONSTRATION UNDER LIMITED IRRIGATION CONDITIONS

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Abstract

The present study was carried out at Krishi Vigyan Kendra, Umaria to know the yield gap between improved package and practices (IP) under Front Line Demonstration (FLD) and farmer's practice (FP) of wheat crop under limited irrigation conditions. The study found, the yield of wheat in IP under limited irrigated conditions ranges from 29.70 to 32.45 q/ha whereas in FP it ranges between 19.20 to 24.50 q/ha. The per cent increase in yield with IP over FP was recorded in the range of 32.40 to 35.90. The extension gap and technological index were ranging between 7.95-10.5 q/ha and 18.8-25.75 per cent, respectively. The trend of technology gap reflected the farmer's cooperation in carrying out demonstrations with encouraging results in subsequent years. The cost benefit ratio was 2.15 to 2.54 under demonstration, while it was 1.69 to 1.96 under FP plots. By conducting front line demonstration of proven technologies, yield potential of wheat crop could be enhanced to a great extent with increase in the income level of the farming community.

Key words : Front line demonstration, wheat, JW-30-20, yield, BC ratio.

Introduction

Wheat is the important winter season food crop of India and improvement in its productivity has played a key role in making the country self-sufficient in food grain. Crop occupies an area of about 28.5 million hectare with total production of 80.70 million tones and a productivity of 2.83 tones/ha and a shares 12.43% of total production of world. However, in the past decade a general slowdown in increase in the productivity of wheat has been noticed, particularly under environments relatively unfavorable for growth and development of wheat (Nagarajan, 2005). The main reason of low productivity is low availability of irrigation water for the proper growth and development, especially on critical stages of growth. Current estimate indicates that in India around 13.5 million hectare of wheat is heat stressed (Joshi *et al*., 2007). During past few years, more than 50% sowing of wheat after gets delayed till December or early January causing substantial loss in grain yield due to late harvesting of preceding *kharif* crop like rice, which ultimate results in poor seed yield due to unavailability of sufficient irrigation water. 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 causes supra-optimal thermal stress at reproductive phase, which results enforced maturity. Moreover, poor agronomic practice such as seed rate, selection of suitable variety, nutrient management, weed management and irrigation management etc. are responsible for low productivity of wheat in India.

Yield potential of wheat in Umaria district of M.P. is not being exploited fully due to many factors, among which delayed sowing, low yielding varieties (not suitable for limited irrigation), poor nutrient and insufficient supply of irrigation water are the most important ones. The productivity of wheat in the district is only 1.68 t/ha, as compared to the national average of 2.7 t/ha (Mukharjee, 2008). Around 50% of the wheat in the district is cultivated under rainfed condition, while irrigated area is only 25%. Comparatively cooler season and long crop duration in this region provides congenial condition to achieve fairly good yield. Hence, an effort made by the K.V.K. scientists by introducing the recommended technologies of wheat production with HYV JW30-20 under limited irrigation conditions through front line demonstration on farmers field during *rabi* season of 2009-10 and 2010-11.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Umaria (M.P.), India during *rabi* season of 2009-10 and 2010-11 (two consecutive years) in the farmer's field in three adopted villages *viz.*, Lorha, Chhoti Pali and Chandia of Umaria district of Madhya Pradesh, India. During these three years of study, an area of 4.8 ha was covered with plot size 0.40 ha (1 acre) under front line demonstration with active participation of 12 farmers in different villages were conducted. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation etc. were followed as suggested by Choudhary, (1999) and Venkattakumar *et al.* (2010). In general, soils of the area under study was sandy loam and lower in fertility status. In demonstration plots, use of quality seeds of improved variety JW 30-20, line sowing and timely weeding, use of balanced fertilizers (using micro nutrient sulphur) and applied irrigations (3 no) on critical growth stages of irrigation as suggested by Chattopadhyay *et al.* (2003) was used as technical interventions. For the control of termites, chloropyrifos dust was used in demonstrated plots given in package and practices for the Umaria region were emphasized and comparison has been made with the existing practices. Visit of farmers and the extension functionaries was organized at demonstration plots to disseminate the message at large scale. The demonstration farmers were facilitated by K.V.K. scientists in performing field operations like sowing, fertilizer application, herbicide application, harvesting etc. during the course of training and visits. The necessary steps for selection of site and farmers, layout of demonstration etc. were followed as suggested by Choudhary (1999). The traditional practices were maintained in case of local checks. The data output were collected from both FLD plots as well as farmer's practice plot and finally the extension gap, technology gap, technology index along with the benefit cost ratio were worked out (Samui *et al.*, 2000) as given below:

Technology gap = Potential yield – demonstration yield

Extension gap = demonstration yield – farmer's practice yield.

$$\text{Technology Index} = \frac{\text{Potential yield} - \text{demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

Results of 12 front line demonstrations conducted during 2009-10 to 2010-11 in 4.8 ha area on farmer's field on three villages of Umaria district indicated that

Table 1 : Productivity, yield parameters, harvest index, technology gap, extension gap and technology index of wheat (JW-3020) as affected by recommended practices as well as farmer's practice under semi-irrigated conditions:

Year	Area (ha)	No. of farmers	No. of tillers/m²		Grain yield (q/ha)			% increase over FP	Biological yield (q/ha)		Harvest Index (%)		Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			RP	FP	Potential	RP	FP		RP	FP	RP	FP			
2009-10	2.4	06	292	205	40	29.70	19.20	35.90	73.5	49.5	40.4	38.7	10.3	10.5	25.75
2010-11	2.4	06	288	231	40	32.45	24.50	32.40	79.5	62.0	40.8	39.5	7.55	7.95	18.8
Total/Mean	**4.8**	**12**	**290**	**218**	**40**	**31.07**	**21.85**	**34.20**	**76.5**	**55.7**	**40.6**	**39.1**	**8.92**	**9.22**	**22.27**

Table 2 : Economics of front line demonstration of wheat (JW-3020) as affected by recommended practices as well as farmer's practices under semi-irrigated conditions.

Year	No. of demonstration	Yield (q/ha)		% increase over FP	Gross expenditure (Rs/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		Additional net return (Rs/ha)	B:C ratio	
		RP	FP		RP	FP	RP	FP	RP	FP		RP	FP
2009-10	06	29.70	19.20		16535	13624	35640	23040	19105	9416	9689	2.15	1.69
2010-11	06	32.45	24.50	32.4	16546	14979	42185	29400	25639	14421	11218	2.54	1.96
Total/ Mean	**12**	**31.07**	**21.85**		**16541**	**14302**	**38913**	**26220**	**22372**	**11919**	**10454**	**2.34**	**1.82**

the cultivation practices comprised under FLD *viz.*, used of improved variety recommended under semi irrigated conditions *i.e.* JW 30-20, line sowing, balanced application of fertilizers (80:40:30 kg NPK/ha) and management of termite at economic threshold level, produced on an average 34.2% more yield of wheat as compared to farmers practices (21.85 q/ha). The data of table 1 revealed that the yield of wheat fluctuated successively over the year in demonstration plots. The maximum yield was recorded (32.45 q/ha) during 2010-11 and minimum yield was recorded in year 2009-10 (29.7 q/ha) and the average yield of two years study period was recorded 31.07 q/ha over farmer's practices (21.85 q/ha). The increase in per cent of yield was ranging between 32.40 to 35.90 during two years of study. The similar results of yield enhancement in wheat crop in front line demonstrations has been documented by Tyagi (1997). The results are also in conformity with the findings of Singh *et al*. (1995). The results indicated that the front line demonstrations has given a good impact on the farming community of this district as they were motivated by the improved agricultural technologies used in the front line demonstrations. The results clearly indicates the positive effects of FLDs over the existing practices toward in enhancing the yield of wheat in Umaria area, with its positive effect on yield attribute (table 1). The benefit cost ratio was recorded higher under demonstration against FP in both the years of study. The findings revealed that a gap exists between the actual farmer's yield and realizable yield potential of the variety. Use of improve variety carry potential to enhance the present level of wheat productivity, which is not percolating down at desired pace due to lack of confidence among the farmers. Hence, to exploit the potential of improved production and protection technologies efforts through FLDs ought to be increased awareness among the farmers (Tyagi, 1997 and Singh *et al*., 1995).

The extension gap showed in decreasing trend. The extension gap ranging between 7.95-10.5 q/ha during the study period emphasizes the need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend. The trend of technology gap (ranging between 7.55-10.3 q/ha) reflects the farmers cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed might be attributing to the dissimilarity in soil fertility status and weather conditions. Mukharjee (2003) have also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing system productivity. Similar findings were also recorded by Mitra *et al*. (2010) and Katare *et al*. (2011). The technology index showed the feasibility of the evolved technology at the farmer's field. The lower the value of technology index, the more is the feasibility of technology. The wider gap in technology index (ranging between 18.8-25.75%) during the study period in certain region, may be attributed to the difference in soil fertility status, weather conditions, non availability of irrigation water and insect-pests attack in the crop (Tyagi, 1997 and Singh *et al*., 1995).

The benefit cost ratio of front line demonstrations have been presented in table 2 clearly showed higher BC ratio of recommended practices was greater than FP plots in both the year of study. The benefit cost ratio of demonstrated and FP plots were 2.15 and 1.69, 2.54 and 1.96 during 2009-10 and 2010-11, respectively. Hence, favorable benefit cost ratios proved the economic viability of the interventions and convinced the farmers on the utility of interventions. Similar findings were reported by Sharma (2003) in moth bean and Gurumukhi and Mishra (2003) in sorghum.

Conclusion

The results of front line demonstration convincingly brought out that the yield of wheat in semi irrigated conditions could be increased by 32-35% with the intervention on balanced nutrition coupled with the improved seed, weed management, irrigation management and pest management in the Umaria district of Madhya Pradesh. From the above findings, it can also be concluded that use of scientific method of wheat cultivation can reduce the technology gap to a considerable extent thus leading to increased productivity in the district. Moreover, extension agencies in the district need to provide proper technical support to the farmer's through different educational and extension methods to reduce the extension gap for higher wheat production in the district.

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