Plant Archives Vol. 15 No. 2, 2015 pp. 1079-1082 ***ISSN 0972-5210***

IMPACT OF FRONT LINE DEMONSTRATION OF MANAGEMENT PRACTICES ON WHEAT (*TRITICUM AESTIVUM*) UNDER IRRIGATED CONDITIONS

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Abstract

The front line demonstrations of wheat were conducted during the *rabi* season at 12 farmers fields to demonstrate production potential and economic benefit of improved technologies consisting suitable variety (GW-273), integrated nutrient management (100:60:40:25 kg NPKS/ha+ *Azotobacter* + PSB @ 5g/kg of seed), integrated pest management (deep ploughing + seed treatment with *Trichoderma viridae* @ 5 g/kg seed) at Umaria district of Madhya Pradesh under irrigated conditions during *rabi* season of 2008-09 and 2009-10. The improved technologies recorded mean yield of 35.16q/ha, which was 47 percent higher than that obtained with farmers practice of 24.01q/ha. Improved technologies gave higher mean net return of Rs. 24082/ha with a benefit cost ratio 2.32 as compared to farmers practice (Rs. 13966/ha, benefit cost ratio 1.93).

Key words : Front Line Demonstration, wheat, GW-273, yield, B C 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 (MOF, 2010). 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). 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. 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, poor nutrient and irrigation management are the most important ones. The productivity of wheat in the district is only1.68 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 KVK scientists by introducing the recommended technologies of wheat production with HYV GW-273 through front line demonstration on farmers field during *rabi* season of 2008-09 and 2009-10.

Materials and Methods

The present study is a part of the mandatory programme of Krishi Vigyan Kendra, Umaria, Madhya Pradesh. Participatory rural appraisal (PRA), group discussion and transect walk were followed to explore the detail information of study area. In between the technology intervention HRD components (Trainings/

Kisan sangosthi/ Kisan mela/ field day etc.) were also included to excel the farmers understanding and skill about the demonstrated technology on wheat. Field demonstrations were conducted under close supervision of krishi vigyan Kendra, Umaria. Total 12 front line demonstrations under real farming situations were conducted during *rabi* season of 2008-09 and 2009-10 at four different villages namely; Kacharwar, Chotipali, Lorha and Chandia, respectively under krishi vigyan Kendra operational area. The area under each demonstration was 0.4 ha. The soil was sandy clay-loam in texture with moderate water holding capacity, low in organic carbon (0.2-0.41%), low in available nitrogen (97.3-142.3 kg/ha), low to medium in available phosphorus (8.2-12.9 kg/ha), low in available potassium (169.7-229.6 kg/ha) and soil pH was slightly acidic to neutral in reaction (6.8-7.2). The treatment comprised of recommended practice (Improved variety GW-273, integrated nutrient management-@ 100:60:40:25 kg NPKS/ha + *Azotobacter* + PSB @ 5 g/kg seed, integrated pest management- deep ploughing + seed treatment with *Trichoderma viridae* @ 5 g/kg seed etc. *vs.* farmers practice. Deep ploughing was done during the April month. Crop was sown between 15 November to 30 November with a seed rate was 100 kg/ha. An entire dose of P_2O_5, K_2O and S through diammonium phosphate, K through muriate of potash and sulphur through $ZnSO_4$ and 25% nitrogen was applied as basal before sowing; remaining quantity of nitrogen applied in three equal splits at 25, 45 and 65 days after sowing. The seeds were treated with *Trichoderma viridae* @5 g/kg seeds then inoculated by *Azotobacter* and phospho-solubilizing bacteria biofertilizers each 5g/ kg of seeds. Application of sulfosulfuron + metsulfuron-methyle @32g a.i./ha at 25-30 DAS for effective weed management; used flat fan nozzle. Fields were irrigated at the critical stages of crop and the crop was harvested between 25th March to 10th April during both years of demonstration.

Farmer's practice constituted there were no deep ploughing was done during summer, old seed of variety WH-147 was used, crop was sown on the same time of demonstration, broadcasting method of sowing, higher seed rate (125 kg/ha) sown, imbalance dose of fertilizers applied (60:40:0 kg NPK/ha), no seed treatment, no biofertilizers, no plant protection measures and one hand weeding at 30-35 DAS were adopted. Crop was harvested on the same time of harvesting of demonstration plots. Harvesting and threshing operations done manually and thresher, respectively; 5m × 3m plot harvested in 3 locations in each demonstration and average grain weight taken. Similar procedure adopted on FP plots under each demonstration then grain weight converted into quintal per hectare (q/ha).

Before conduct the demonstration training to farmers of respective villages was imparted with respect to envisaged technological interventions. All other steps like site selection, farmers selection, layout of demonstration, farmers participation etc. were followed as suggested by Choudhary (1999). Visits of farmers and extension functionaries were organized at demonstration plots to disseminate the technology at large scale. Yield data was collected from farmers practice and demonstration plots. The grass returns, cost of cultivation, net returns and benefit cost ratio (B:C ratio) were calculated by using prevailing prices of inputs and outputs and finally the extension gap, technology gap and technology index were worked out. To estimate the technology gap, extension gap and technology index, following formulae given by Samui *et al.* (2000) have been used.

Technology gap = Potential yield-demonstration yield

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

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

Results and Discussion

Yield attributing parameters

The yields attributing parameters like number of tillers/m^2 and harvest index (%) of wheat obtained over the years under recommended practice as well as farmers practice are presented in table 1. The Number of tillers/m^2 of wheat ranged from 288 to 323 with mean of 306 under recommended practice on farmers field as against a ranged from 215 to 226 with a mean of 221 recorded under farmers practice. Similarly, higher harvest index was recorded under recommended practice (41.2-42.8 % mean value of 42.0%) as compared to farmers practice (ranged between 39.5-39.6%, mean of 39.5%). The higher values of number of tillers/m^2 and harvest index following recommended practice as well as farmers practice was due to the use of latest high yielding variety, integrated nutrient management and integrated pest management on wheat during both the years of demonstration. Similar results have been reported earlier by Tyagi (1997) & Singh *et al.* (1995).

Seed yield

The yields of wheat obtained over the years under recommended practice as well as farmers practice are presented in table 1. The productivity of wheat ranged from 31.52 to 38.80 q/ha with mean yield of 35.16 q/ha under recommended practice on farmers field as against a yield ranged from 23.90 to 24.13 q/ha with a mean of 24.01 q/ha recorded under farmers practice. In comparison to farmers practice there was an increase of 31 and 62% higher productivity, respectively during 2008-09 and 2009-10 following recommended practices. The higher yield of wheat under recommended practices was due to the use of latest high yielding variety, integrated weed management, integrated nutrient management and integrated pest management. Similar results have been reported earlier by Singh *et al.* (1995).

Economics

The inputs and outputs prices of commodities prevailed during both the year of demonstrations were taken for calculating cost of cultivation, net returns and benefit cost ratio (table 2). The investment on production by adopting recommended practices ranged from Rs. 17675 to 18546/ha with a mean value of Rs. 18111/ha against farmers practice where the variation in cost of production was Rs. 14725- Rs. 14979/ha, mean of Rs. 14852/ha. Cultivation of wheat under recommended practices gave higher net return of Rs. 20149 and Rs.28014/ha compared to Rs. 14231 and Rs. 13701/ha under farmers practice during 2008-09 and 2009-10, respectively. The additional net income ranged from Rs. 5918 to Rs. 14313/ha with a mean value of Rs. 10116/ha over farmers practice. The average benefit cost ratio of recommended practices was 2.32, varying from 2.13 to 2.51 and that of farmers practice was 1.93, varying from 1.91 to 1.96. This may be due to higher yields obtained under recommended practices compared to farmers practice. Similar results have been reported earlier on wheat by Tyagi (1997).

Extension and technology gap

The extension gap ranging between 7.39-14.9 q/ha during the period of study emphasized the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide extension gap (table 1). The trend of technology gap ranging between 6.2 – 13.48 q/ha reflected the farmer's cooperation in carrying out such demonstration with encouraging results in both the years. The technology gap observed may be attributed to the dissimilarity in weather conditions. 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 the

Table 1 : Productivity, yield parameters, harvest index, technology gap, extension gap and technology index of wheat (GW-273) as affected by recommended practices as well as farmer's practice under 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			
2008-09	2.0	05	288	226	45	31.52	24.13	31	76.4	60.8	41.2	39.6	13.48	7.39	29.9
2009-10	2.8	07	323	215	45	38.80	23.90	62	90.5	60.5	42.8	39.5	6.2	14.9	13.7
Total/mean	**4.8**	**12**	**306**	**221**	**45**	**35.16**	**24.01**	**47**	**83.5**	**60.6**	**42.0**	**39.5**	**9.84**	**11.14**	**21.8**

Table 2 : Economics of Front Line Demonstration of wheat (GW-273) as affected by recommended practices as well as farmer's practices under 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
2008-09	05	31.52	24.13	31	17675	14725	37824	28956	20149	14231	5918	2.13	1.96
2009-10	07	38.80	23.90	62	18546	14979	46560	28680	28014	13701	14313	2.51	1.91
Total/mean	**12**	**35.16**	**24.01**	**47**	**18111**	**14852**	**42192**	**28818**	**24082**	**13966**	**10116**	**2.32**	**1.93**

Table 3 : HRD component: Cumulative data of 2008-09 & 2009-10.

S. no.	HRD components	Frequency	Beneficiaries
1.	Trainings on wheat production	26	1315
2.	Radio talk	2	Mass
3.	CD shows	5	Mass
4.	Kisan mela	6	11234
5.	Kisan sangosthi	4	40
6.	Field day	2	32
6.	News paper coverage	13	Mass
7.	Folders	2	4000

technology. As such, the reduction in technology index from 29.9% during 2008-09 to 13.7% during 2009-10 exhibited the feasibility of the demonstrated technology in this region.

HRD components

During the study period, Human Resources Development Components *i.e.* training, radio talk, field day, CD shows, popular articles, Kisan Mela and Kisan Sangosthi were also taken to increase the farmers understanding and skill about the recommended practice on wheat production (table 3).

Conclusion

The result of front line demonstration convincingly brought out that the yield of wheat could be increased higher with the intervention on varietal replacement *i.e.* GW-273, integrated weed management, integrated nutrient management and integrated pest management in wheat production in the Umaria district. To safeguard and sustain the food security in India, it is quite important to increase the productivity of wheat under limited resources. Favorable benefit cost ratio is self explanatory of economic viability of the demonstration and convinced the farmers for adoption of improved technology of wheat production. The technology suitable for enhancing the productivity of wheat and calls for conduct of such demonstration under the transfer of technology programme by KVKs.

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