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IMPROVEMENT IN WHEAT PRODUCTIVITY THROUGH FRONT LINE DEMONSTRATIONS

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ABSTRACT

Wheat (*Triticum aestivum* L.) is a major cereal crop of Rabi season in Ajmer district of Rajasthan. However, its productivity is very low as compared to other districts. The Krishi Vigyan Kendra Ajmer has carried out front line demonstrations on wheat covering an area of 80 ha of farmer's field from 2003-2004 to 2011-12 to exhibit latest production technologies and compared it with farmer's practice. An attempt has also been made to know the productivity and economics of front line demonstrations & the adoption of latest production technologies by the 50 FLD farmers and 50 non-FLD farmers. FLD farmers and non FLD farmers were randomly selected from FLD villages. The results revealed that improved technologies of wheat enhanced yield from 42.09 qt/ha to 49.22 qt/ha in front line demonstrations. The percentage of increase in yield ranges from 27.46 to 39.65. The economic analysis of yield performance showed that front line demonstrations recorded higher average gross return (Rs. 65077/ha), higher average net return (Rs. 44500/ha) with higher cost benefit ratio of 3.16 as compared to local check. Full extent of adoption of improved technologies of wheat cultivation was in the range of 24 to 94 percent in FLD farmers while it was in the range of 4 to 56 percent among non- FLD farmers. This might be due to the fact that FLD was effective in changing attitude, knowledge, adoption of improved technologies of wheat and ultimately in obtaining sustained income.

INTRODUCTION

Wheat is one of the important cereals Rabi crop grown in all over the Rajasthan. Area, production and productivity of wheat crop during 2011-12 in Ajmer district is 46550 ha., 146725 metric ton and 3152 kg per ha, respectively. The productivity of wheat (2011-12) is comparatively low in Rajasthan (3112 kg per ha.) than other wheat cultivated states such as Haryana (5030 kg per ha) and Punjab (4898 kg per ha).The low productivity of this crop is due to poor adoption of improved technologies of wheat by the farmers. Hence, the Krishi Vigyan Kendra (KVK) Ajmer has organized frontline demonstrations (FLD's) with improved variety along with recommended package of practices. The main purpose of these demonstrations was to enhance the productivity levels of wheat which in turn will increase the income levels of farmers and to transfer the latest production technology to farmers in the district. Realising the importance of FLD in transfer of technology, it was thought appropriate to undertake the study with a view to evaluate the FLD on wheat with the following specific objectives.

1. To assess the recommended technology and farmers practice of wheat production.
2. To study the extent of adoption of improved technologies of wheat by the farmers.
3. To study the productivity and economics of frontline demonstrations on farmers field.
4. To identify the agro-economical and technical constraints limiting wheat yield in the district.

RESEARCH METHODOLOGY

All the farmers who have organized FLD of wheat were purposively selected for the study. The farmers who were involved in demonstrations were given the improved variety along with recommended package of practices to grow along with local check in the adjacent field with farmers practice. The FLDs were conducted by KVK Ajmer from Rabi 2003-04 to 2011-2012 in an area of 80 ha. on 195 locations (farmers). Thus, a total of 195 full package FLDs were selected. The data collected from the reports of FLDs conducted by the KVK on the production technology of wheat crop were used. These were compared with prevailing production technologies of wheat

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crop (which were taken in check plots). The performances of improved varieties with improved technologies were evaluated closely by the organising seasonal trainings, method of demonstrations, field days and by taking crop-cut experiments. Regular diagnostic visit by the scientists helped in proper execution of demonstration as well as collection of farmers opinion about the demonstration field. Production and economic data for FLDs and local practice were collected and analyzed. An endeavour was also made to identify the constraints which are limiting the wheat yield in the area. The constraints were ascertained by recording the responses in three categories namely most significant, significant and non-significant.

The impact of FLD on adoption of recommended production technology was also made. Out of 195 participating farmers, 50 FLD farmers were randomly selected. Similarly, a sample of 50 non-FLD farmers was randomly selected from the wheat growing farmers of the same area. Thus a total of 100 farmers were selected as respondents. An interview schedule was prepared regarding improved technologies of wheat. The data were recorded on a 3 point continuum scale i.e. fully, partial and no adoption. The result and discussion of both groups of FLD and non-FLD farmers have been summarized separately keeping in view these existing practices.

RESULTS AND DISCUSSION

Assessment of production technology in FLD plots and local check plots

The records of recommended production technology of wheat in frontline demonstration plots were compared with the farmers practices adopted in local check plots. The table 1 indicated that under FLDs only recommended high yielding varieties like Raj-3765 and Raj-4037 @ 100-125 kg per ha. were sown after seed treatment with Carbendazim 2 gm , vitavax 1.25 gm and Chlorpyrifos 20EC 4.5 ml per kg seed followed by seed treatment with azotobactor and PSB culture. The line sowing (22.5 cm) was practiced under demonstration plots. 45 kg nitrogen and 35 kg P_2O_5 per ha. were applied as basal application. Top dressing was done with 45 kg nitrogen per ha at first and second irrigations. Whereas under farmers practice, they used their own seed of variety Raj-3077 and Raj-1482 and applied higher seed rate @ 125 to 150 kg per ha without seed treatment. Mostly broadcasting method was adopted in sowing with low quantity of fertilizer at the time of basal and top dressing application by the farmers in farmer practice

Adoption of improved technologies of wheat crop by the FLD farmers and non-FLD farmers

The data presented in Table 2 indicated that 98 percent FLD farmers and only 8 percent non-FLD farmers fully adopted the optimum seed rate in wheat

Table 1: Comparison between adoption of demonstration package and farmers practice of wheat

S.No.	Particular practice	Demonstration package	Farmers practice
1.	Improved variety	Raj-3765 and Raj-4037	Own seed of Raj-3077 and Raj-1482
2.	Optimum seed rate	100-125 kg	125-150 kg
3.	Seed treatment	Carbendazim 2 gm + vitavax 1.25 gm, Chlorpyrifos 20EC 4.5 ml per kg seed & azotobactor + PSB culture	Not used
4.	Sowing method	Line sowing (drill)	Broadcasting and line sowing
5.	Sowing distance	22.5 cm	-do-
6.	Basal application of fertilizer	45 kg N + 35 kg P_2O_5	Less quantity applied without knowledge of right method
7.	Top dressing of urea	45 kg N in two split doses at first and second irrigation	Less quantity at first irrigation
8.	PP measures	Need based spray of pesticides	No use of pesticides

cultivation. FLD farmers learned the use of optimum seed rate while conducting demonstration on their own fields. While 92 percent non-FLD farmers did not adopt the optimum seed rate in wheat cultivation. These non-FLD farmers were of the view that there may be low germination of seed or plant mortality at the time of germination so they used higher seed rate in comparison to recommended seed rate. The reason explained for higher seed rate adoption by non-FLD farmers at the time of interview was that in order to maintain optimum plant population they generally used higher seed rate.

An examination of the data in Table 2 explained that 94 percent FLD farmers and only 56 percent non-FLD farmers fully adopted the right sowing method and sowing distance in wheat cultivation. 84 percent FLD farmers and 46 percent non-FLD farmers fully adopted the use of high yielding variety seed in wheat cultivation.

The data depicted in Table 2 revealed that 82 percent FLD and only 22 percent non-FLD farmers adopted the top dressing of urea while 6 percent FLD and 60 percent non-FLD farmers partially adopted the practice of top dressing of urea. The reason behind this was that FLD farmers have gained knowledge about the actual quantity of urea applied during the top dressing through trainings and demonstrations conducted by KVK. While majority of non-FLD farmers were not aware about these things and partially adopted this technology and did not apply the right quantity of urea in top dressing. The low adoption of seed treatment practice and use of plant protection measures might be attributed to unawareness, high cost of fungicide, insecticide and lack of knowledge about proper method of seed treatment, plant protection measures and diagnosis of disease and pests. Likewise, Sharma (2000) reported that seed treatment practice and use of plant protection measures were least adopted practices in wheat cultivation by both categories of farmers under Kisan Mandal and Kisan Seva Kendra.

It was also observed that there was a significant difference in the extent of adoption of optimum seed rate, sowing method, sowing distance, use of high yielding variety seed, top dressing of urea, basal application of fertilizer, seed treatment and plant protection measures in wheat crop between FLD farmers and non-FLD farmers. The results arrived so because of the fact that the FLD farmers attended the on-campus and off-campus trainings organized by KVK before conducting the frontline demonstrations and field day was also organized at the time of maturity of crop. FLD farmers have a regular contact with KVK scientists during the conduction of demonstration. This might have created the gap in the adoption level between FLD and non-FLD farmers. Thus, it shows that there is definitely a positive impact of frontline demonstration in acquainting the

Table 2: Extent of adoption of improved technologies of wheat crop by the FLD farmers and non-FLD farmers

n=100

S.No.	Improved practices	FLD farmers			Non-FLD farmers		
		Extent of adoption in %			Extent of adoption in %		
		Fully	Partial	No	Fully	partial	No
1.	Use of HYV seeds	84.0	4.00	12.00	46.00	16.00	38.00
2.	Optimum seed rate	98.00	-	2.00	8.00	-	92.00
3.	Seed treatment	60.00	20.00	20.00	26.00	18.00	56.00
4.	Sowing method	94.00	-	6.00	56.00	-	44.00
5.	Sowing distance	94.00	-	6.00	56.00	-	44.00
6.	Basal application of fertilizer	74.00	12.00	14.00	16.00	58.00	26.00
7.	Top dressing of urea	82.00	6.00	12.00	22.00	60.00	18.00
8.	PP measures	24.00	-	76.00	4.00	22.00	74.00

farmers about improved practices of wheat cultivation. Gogoi et al (2000) and Dangi and Jain (2007) also observed that the trained farmers had significantly higher level of adoption of overall recommended practices than the untrained farmers.

Performance of economics of FLD wheat

The grain yield data (Table 3) indicated that variety Raj-3765 and Raj—4037 with improved technologies of wheat in frontline demonstration were superior to local check. In case of FLD plots the yield improvement ranges from 27.46 percent to 39.65 percent with an average improvement of 32.72 percent as compared to local variety. The finding is in line with Rao et al (2011) who found that the variety TCGS-320 with improved package of practices in groundnut gave 22.80 percent to 44.39 percent increase in yield over local variety with an average improvement of 35.03 percent. Similar results were also reported by Pradhan et al (2011).

The cost of improved technologies was estimated by the yield economic calculation (Table 4). The improved practices of cultivation in wheat frontline demonstration exhibited higher value of returns. Regarding economic returns, the gross return of improved technologies was higher in FLD plots than the farmer's practices in each year demonstration.

Table 3: Performance of wheat variety under frontline demonstration

Year	Variety	Area (ha.)	No. of demo.	Avg. Yield (kg/ha)		% increase in yield over control
				Demo	Control	
2004-05	Raj-3765	10	20	47.74	37.31	27.95
2005-06	Raj-3765	20	60	45.73	35.63	28.34
2007-08	Raj-3765	10	20	47.86	34.27	39.65
2008-09	Raj.-3765	10	20	49.22	35.42	38.96
2009-2010	Raj. 4037	10	25	42.47	31.56	34.53
2010-2011	Raj.-4037	10	25	42.93	33.68	27.46
2011-2012	Raj.-4037	10	25	42.09	32.90	27.93
Overall		90	195	45.43	34.39	36.10

Table 4: Economics of frontline demonstration on wheat

Year	Variety	Cost of critical input (Rs./ha)		Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		BCR	
		Demo	Local	Demo	Local	Demo	Local	Demo	Local	Demo	local
2004-05	Raj-3765	2902	1919	16500	14431	47766	37379	31266	22948	2.89	2.59
2005-06	Raj-3765	3377	2155	16802	15105	45757	35667	28955	20562	2.72	2.36
2007-08	Raj-3765	4288	2461	20846	18619	62246	44697	41400	26078	2.98	2.40
2008-09	Raj.-3765	4296	2461	23514	21279	78908	62344	55394	41065	3.35	2.92
2009-10	Raj.-4037	4585	2708	22363	20146	84955	63120	62592	42974	3.79	3.13
2010-11	Raj.-4037	4970	2790	23445	21690	70835	55572	47390	33882	3.02	2.56
2011-12	Raj.-4037	5104	3500	25159	23510	73658	57575	48499	34065	2.92	2.44
Avg. Of overall		4217.4	2570.5	21232.7	19254.2	66303.5	50907.7	45070.8	41653.4	3.12	2.64

The average gross return of demonstration was Rs. 66304 per ha. as against local check of Rs. 50908 per ha. The cost of cultivation was higher in FLD plots as compared to local check. The average cost of cultivation has been Rs. 21232 in the frontline demonstration as against Rs. 19254 for local check. The average net return of demonstration was Rs. 44500 while in local check it was Rs. 31653. Cost benefit ratio was 3.12 in demonstration whereas in local practice it was 2.64. The similar findings were also reported by Rao et al (2011) and Pradhan et al (2011).

Constraints limiting wheat yield

Data in Table 5 indicated that termite attack, *Chenopodium album* weed infestation, water stress

Table 5: Agro economical, technical constraints/problems limiting wheat yield in the area

Sl.No.	Constraint/problem	MS	S	NS	Sl.No.	Constraint/problem	MS	S	NS
1.	**Diseases**				iii.	Water logging			_/
i.	Leaf blight			_/	iv.	Untimely rain			_/
ii.	Rust			_/	v.	High temperature at maturity		_/	
iii.	False smut			_/		**5. input**			
iv.	Blast			_/	i.	Poor quality seed		_/	
v.	Loose smut			_/	ii.	Poor quality fertilizer			_/
vi.	Grain discoloration			_/	iii.	Poor quality chemicals			_/
2.	**Insect-pests**				iv.	Lack of irrigation facilities	_/		
i.	Aphids			_/	v.	Non-availability of inputs		_/	
ii.	Termite	_/			vi.	High cost of inputs		_/	
iii.	Stem borer			_/	vii.	Non-availability of diesel			_/
iv.	Leaf folder			_/		**6. others**			
3.	**weed infestation**			_/	i.	Late sowing			_/
i.	Phalaris minor			_/	ii.	Lodging			_/
ii.	Cyprus rotundus			_/	iii.	Low plant population			_/
iii.	Chenopodium album	_/			iv.	Rodents		_/	
iv.	Avena ludoviciana			_/	v.	Birds			_/
v.	Malva parviflora			_/	vi.	Zn deficiency		_/	
vi.	Convolvulus arvensis			_/	vii.	Small land holding		_/	
vii.	Rumex dentatus			_/	viii.	Higher custom rate of field preparation and sowing		_/	
viii.	Anagalis arvensis			_/	ix.	Non-availability of electricity		_/	
ix.	Argemone maxicana			_/	x.	Problem in marketing of wheat			_/
4.	**abiotic stress**				xi.	Low price of wheat			_/
i.	Water stress	_/							
ii.	Brackish water			_/					

and lack of irrigation facilities were most significant constraints which cause adverse effect on wheat yield in the area. While high temperature at maturity, poor quality of seed, non availability of inputs, high cost of inputs, rodents, zinc deficiency, small land holding and non- availability of electricity were significant constraints on wheat yield in the area.

CONCLUSION

It is concluded that FLD was an effective tool for increasing the productivity of wheat crop. Improved technologies in frontline demonstrations enhanced yield from 42.47 qt/ha. to 49.22 qt/ha. per ha with an average of 45.99 qt/ha. The percentage of increase in yield in FLD ranges from 27.46 to 39.65 percent with an average increase of 32.72 percent over the farmers practice in local check plots. This created greater curiosity and motivation among other farmers who do not adopt improved practices of wheat cultivation. These demonstrations also built the relationship and confidence between farmers and scientists of KVK. It was also concluded that besides other practices termite attack, *Chenopodium album* weed infestation, water stress and lack of irrigation facilities require to be given due attention to enhance wheat production in the area.

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