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IMPROVEMENT IN PRODUCTIVITY AND PROFITABILITY OF BARLEY THROUGH FRONT LINE DEMONSTRATION

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SUMMARY

KVK, Chandgothi, Churu (Rajasthan) conducted total 128 Front Line Demonstrations on barley at farmers field in Churu District of Rajasthan during five consecutive years from 2013-14 to 2017-18 in *rabi* season. The farming situation was irrigated and soil was sandy loam low in nitrogen, medium in phosphorus and medium to high in potash. Assessment of gap was done and on basis of gap assessment, improved recommended technologies of barley cultivation were demonstrated. On overall average basis, 4593 kg/ha grain yield of barley was recorded under demonstration plot while 3735 kg/ha in farmer's practices. On the basis of five year average, 22.94 per cent higher grain yield was recorded under demonstrations than the farmer's practices (Local check). The extension gap, technology gap and technology index were 858 kg/ha, -113 kg/ha and -2.49 per cent, respectively. An additional investments of Rs 940 per ha consist with scientific monitoring of demonstration and non–monetary factors resulted in additional return of Rs. 9705 per ha. On five year average basis, incremental benefit : cost ratio was found 10.62.

Key words : Barley, grain yield, economics, technology gap, extension gap

Barley is scientifically known as *Hordium vulgare*, L. and it is an important cereal crop in *rabi* season in India as well as in Rajasthan. Area, production and productivity of barley in Rajasthan is 2.74 lakh ha, 909695 tonns and 3324 kg/ha, respectively (Anonymous 2017-18). The productivity of barley in Churu district, Rajasthan is 2302 kg/ha which is quite low as compared to state (3324 kg/ha) (Anonymous 2017-18) and national productivity (2679 kg/ha) (Anonymous 2018). Low productivity may be due to several biotic and abiotic stresses besides unavailability of quality seeds of improved varieties in time and poor crop management practices due to unawareness and non adoption of recommended production and plant protection technologies. There is a considerable scope for increasing the productivity of barley by using improved practices. There is a considerable scope for increasing the production of the crop. Large number of technologies for the barley crop improvement have been generated by the Research Institutes and Agricultural Universities, but only few of them have been accepted by the farmers (Singh *et al.* 2016). Therefore, Front Line Demonstration (FLD) on barley at farmer's field may be helpful to establish the technology at farming community. The basic objective of this programme is to demonstrate improve proven technologies of recently released, short duration, high yielding varieties in compact block with INM, IWM and IPM at farmer's field (Table 1) through Krishi Vigyan Kendra to enhanced adoption of modern technologies to generate yield data with farmers feedback. Keeping this in view, KVK, Chandgothi, Churu conducted 128 demonstrations on barley crop at farmer's field during *rabi* 2013-14 to *rabi* 2017-18. The objectives of this study were as follows :

- To find out the performance of recognized and recommended high yielding varieties of barley with full recommended package of practices.
- To compare the yield of FLD organized by KVK with farmer's practices (local check).
- To collect and consider the feedback information from farmers for further improvement in research.
- To motivate farmers by adoption of improved package on their fields

MATERIALS AND METHODS

KVK, Chandgothi, Churu conducted total 128 Front Line Demonstration on barley varieties i.e. RD

2035, RD 2552 and RD 2715 at 128 selected farmer's field in a compact block in Churu District (Rajasthan) during *rabi* 2013-14 to *rabi* 2017-18. The selection of villages was done on basis of non adoption of improved and recommended varieties (RD 2035, RD 2552 and RD 2715). After the selection of villages, most approachable side of farmer's field was selected, so that the performance of demonstrated technology can be seen by other farmers. The farming situation was irrigated and soil was sandy loam low in nitrogen, medium in phosphorus and medium to high in potash. The area for demonstration was 0.38 ha in 2013-14, 0.33 in 2014-15 to 2016-17 while in 2017-18 it was 0.4 ha each and were conducted by using recommended package of practices. The KVK provided high quality seed of barley verities *i.e.* RD 2035, RD 2552 and RD 2715 @ 100 kg/ha and other critical input like DAP, micro-nutrients, bio fertilizers, herbicide and pesticides were purchased by the farmers and used (Table 2) with the guidance of KVK during all the years. The sowing of crop was done in month of November and harvested during second fortnight of April. The scientist of KVK, Chandgothi, Churu regularly visited and monitored demonstrations on farmers fields from sowing to harvesting. The grain yield of demonstration and local check was recorded and analyzed. Other parameters as suggested by Verma *et al.* (2014) were used for calculating gap analysis, cost and returns. The details of different parameters are as follows:

Extension gap = Demonstration yield (D_1)- Farmers practices yield (F_1)

Technology gap = Potential yield (P_1)- Demonstration yield (D_1)

$$\text{Technology index} = \frac{\text{Potential yield } (P_1) - \text{Demonstration yield } (D_1)}{\text{Potential yield } (P_1)} \times 100$$

Additional return = Demonstration return (D_r)- Farmers practices return (F_r)

Effective gain = Additional return (A_r)– Additional cost (D_c)

$$\text{Incremental B : C ratio} = \frac{\text{Additional return } (A_r)}{\text{Additional cost } (D_c)}$$

RESULTS AND DISCUSSION

Grain Yield : The grain yield of barley under demonstration plot was ranged from 4252 kg/ha to 5148 kg/ha with an average (Year 2013-14 to 2017-18) of 4593 kg/ha, while, in farmer's local practices plot it ranged from 3402 kg/ha to 4172 kg/ha with an average of 3735 kg/ha (Table 3 & Fig. 1). The grain yield was increased from 20.34 to 27.13 per cent over farmer's practices (local check) during all the years. On average basis, 22.94 per cent increase in yield was recorded under demonstrations plot as compared to farmer's local cultivation practices of barley.

Gap analysis : An extension gap between

TABLE 1
Particulars showing the details of barley growing under front line demonstration and existing farmer's practices

S. No.	Particulars	Technological Intervention (Demonstration Practices)	Farmers Practices (Local Check)	Technological Gap
1	Farming Situation	Irrigated	Irrigated	No Gap
2	Variety	Improved varieties *i.e.* RD 2035, RD 2552 and RD 2715	Locally available	Full Gap (100%)
3	Seed Rate	120 kg/ha	120 kg/ha	No Gap
4	Seed inoculation	PSB	No Seed Inoculation	Full Gap (100%)
5	Sowing Method	Line Sowing (22.5×10 cm)	Line sowing (30×10 cm)	Full Gap (100%)
6	Fertilizer	40 kg N, 20 kg P_2O_5 and 25 kg $ZnSO_4$	31 kg N and 23 kg P_2O_5 and 25 kg $ZnSO_4$	N 9 kg < recommended and P_2O_5 3 kg >recommended
7	Micro-nutrients	Use of micro nutrients for balance fertilizer	No use of Micronutrients	Full Gap (100%)
8	Weed Control	Herbicide application	Hand weeding	No herbicide use Full Gap (100%)
9	Plant protection	Need based spray of Insecticides and fungicides	No spray	Full Gap (100%)

TABLE 2
Critical Inputs used to demonstrate the technologies in demonstration plot

S. No.	Input	Quantity	
		Demonstrated by the KVK	Used by the farmer
1.	Seed	120 kg/ha	-
2.	Urea	-	87 kg/ha
3.	SSP	-	125 kg/ha
4.	Micro nutrients	-	5 g/L water
5.	Biofertilizer	-	PSB @ 600 g/ha
6.	Herbicide	-	2,4-D @ 500 gm *a.i.*/ha Isoproturon @ 750 gm *a.i.*/ha
7.	Pesticides	-	Termite : Chloropyriphos 20 EC @ 4 L/ha

TABLE 3
Grain yield and gap analysis and technology index of Front Line Demonstration on barley at farmer's field

Year of demonstration	No. of demonstration	Variety	Potential yield (kg/ha)	Demonstration yield (kg/ha)	Farmers practices yield (kg/ha)	Increased over farmers practices (%)	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
2013-14	13	RD 2035	4800	5148	4172	23.39	976	-348	-7.25
2014-15	30	RD 2552	5000	4983	4060	22.73	923	17	0.34
2015-16	30	RD 2715	4200	4325	3402	27.13	923	-125	-2.98
2016-17	30	RD 2715	4200	4252	3525	20.34	727	-52	-1.24
2017-18	25	RD 2715	4200	4256	3514	21.11	742	-56	-1.33
Average	-	-	4480	4593	3735	22.94	858	-113	-2.49

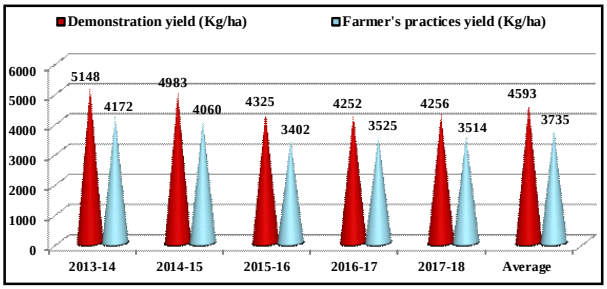

Fig. 1. Grain yield of barley in demonstration and farmer's practices plot.

demonstrated technology and farmer's practices of total 128 demonstration was observed 858 kg/ha (Table 3). Such big gap might be attributed to adoption of improved technology in demonstration which resulted in higher grain yield than the traditional farmer's practices. Wide technology gap of +17 to -348 kg/ha in yield was observed during the demonstration years. Average technology gap was found -113 kg/ha. This less technology gap during all the years indicated more feasibility of recommended technologies during study periods. Similarly, the technology index for all the demonstrations during the study period were in accordance with technology gap. Technology index were ranged from 0. 34 % to -7.25 % with an average of five years was -2.49 %. Lower technology index reflected the adequate proven technology for transferring to farmers and sufficient extension services for transfer of technology.

Economics analysis : Improved variety seed, fertilizers, bio fertilizers, herbicides and pesticides were considered as cash inputs for the demonstrations as well as farmers practices. On an average additional investment of Rs 940 per hectare was made under demonstration resulted in additional return of Rs. 9,705/ha. Economics returns as a function of grain yield and selling price varied during all the years. The average total return under demonstration plot was recorded Rs. 51,998/ha (Table 4). The higher effective gain of Rs. 8,765/ha was obtained under demonstration. The higher additional returns and effective gain under demonstration could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. Big difference of incremental B : C ratio (IBCR) was found during all five years which was 8.42 to 14.95. On the average of five year, IBCR was found 10.62. Higher IBCR could be due to higher additional return with low additional cost in demonstration and also correlated with selling price. The results confirm with the finding of Front Line

TABLE 4
Economics analysis of Front Line Demonstration on barley at farmer's field

Year of demonstr-ation	Cost of Cultivation (Rs/ha)		Additional cost in demo (Rs./ha)	Sale Price of grain (Rs./qt.)	Total return (Rs/ha)		Additional return in demo (Rs./ha)	Effective grain (Rs./ha)	Incremental B : C ratio (IBCR)
	Demo	Farmers practices			Demo	Farmers practices			
2013-14	15800	14750	1050	1000	51480	41720	9760	8710	9.30
2014-15	15800	14750	1050	1000	49830	40600	9230	8180	8.79
2015-16	16200	15250	950	1200	51900	40824	11076	10126	11.66
2016-17	16200	15250	950	1100	46772	38775	7997	7047	8.42
2017-18	16200	15500	700	1410	60009	49547	10462	9762	14.95
Average	16040	15100	940	1142	51998	42293	9705	8765	10.62

Demonstration on barley and wheat crops by Tiwari *et al.*, (2015), Singh *et al.* (2016), Kumari *et al.*, (2017), Singh (2017), Hussain *et al.*, (2018), Hussain *et al.*, (2019).

CONCLUSION

On the basis of five year data of front line demonstrations, it can be concluded that by adopting recommended package of practices can barley yield can be increased up to 22.94 per cent over farmer's practices. The increase was recorded with little extra spending of Rs. 940/ha. This amount is not big enough that even a small and marginal farmer can afford this. The adoption of improved technology not affected by the additional cost but the ignorance and unawareness is the primary reason and it is quite appropriate to call such yield gap as extension gap. Moreover, extension gap can be also be minimized by adopting such technology under FLD. The IBCR (10.62) is much high to motivate the farmers for adoption of technology. Therefore, FLDs on barley was found effective in changing not only the mindset of farmers but attitude, skill and knowledge about improved practices of barley cultivation including adoption. Farmers and scientists relationship also improved by this and built confidence between them. Technology Demonstration to farmers is a good primary source of knowledge or information on improved practices of barley cultivation and also source of good quality seed in locality and surrounding area for next season. FLDs helped in speedy and wider dissemination of the improved proven technology to the farming community.

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