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Front Line Demonstration as a bridge for enhancing the Area, Production and Productivity of barley in Azamgarh district

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Abstract

Barley is an important rabi crop of northern plains of India. Barley was produce in district of Azamgarh 2689 & 7944 m tons and in Uttar Pradesh got production 403155 & 454980 m tons during to 2017-18 & 2018-19, respectively. An area and productivity achieved at district level & state level were 1064 ha & 143911 ha and 25.27 & 28.01 qha^{-1} in 2017-18 and 2809 ha & 150880 and 28.28 & 30.16 q/ha in 2018-19, respectively. Maximum numbers of farmers fall in category of medium level knowledge with 31.9 per cent, while 24.2 per cent were with high knowledge level. The average yield under recommended practice (FLD) with variety DBWR - 137and PL 426 were obtained 36.5 & 34.4 q ha^{-1} as compared to farmers' practice 27.9 kg ha^{-1}, which were 30.82% and 23.30% higher, respectively. The two years average yield of FLD demonstrated varieties DWRB 137 and PL 426 technology index - I were found 3.77 & 5.07 per cent, respectively and locally used variety (Azad) technology index – I was 20.28 per cent. The technology index II of FLD barley varieties was found higher (18.89 – 23.56%) over the farmers' practice. The average yield of district every year increase (25.27 to 28.28 q ha^{-1}). Both demonstrated varieties average net returns 44.07% & 31.35 higher than that of farmers' practice. It showed that the adaption of demonstration technology by farmers would be higher economically and gainful proposition. Farmers show the first year technological impact and replacement of varieties with new cultivars i.e. DWRB – 137 and PL 426 highly adaptability increased in barley cultivation and drastically changed the seen in cultivated area, production and productivity of barley in district Azamgarh.

Key words: Barley, production, knowledge, farmers', FLD, net return, demonstration

Introduction

Agriculture plays a vital role in India's economy. 54.6% of the population is engaged in agriculture and allied activities (census 2011) and it contributes 17.4% to the country's Gross Value Added for the year 2016-17 (at current prices).

Barley (*Hordeum vulgare* L) is a very important grain in the world today. It ranks fourth in both quantity produced and in area of cultivation of cereal crops in the world. The annual world harvest of barley in the late century was approximately 140 million tons from about 55 million ha. It is very versatile in every way and has well adapted through its evolution. In fact, it is the most adaptable cereals. *Hordeum species* are found in most areas with Mediterranean climate. The genus is also represented in zones with an oceanic as well as a continental climate. Barley also has a very good resistance to dry heat compared to other small grains. This feature allows it to grow near desert areas such as North Africa.

Barley is an important *rabi* crop of northern plains of India. Barley was produce in district of Azamgarh 2689 & 7944 m tons and in Uttar Pradesh got production 403155 & 454980 m tons during to 2017-18 & 2018-19, respectively. The area and productivity achieved at district level & state level were 1064 ha & 143911 ha and 25.27 & 28.01 qha^{-1} in 2017-18 and 2809 ha & 150880 and 28.28 & 30.16 qha^{-1} in 2018-19, respectively. It is commonly grown in the states of UP, Rajasthan, MP, Bihar, Punjab, Haryana, HP and J&K. Barley thrives well in marginal, saline or alkaline

soils and in water scarce areas as rain fed crop. It is also cultivated for malting and brewing purposes in Haryana, Western U.P., Punjab and Rajasthan with relatively better management to get good grain quality. Barley occupied 0.46% of the total cropped area, 0.62% of the food grains and 0.76% of the cereals in the country. Similarly, it contributes 0.86% of the total production of cereals and 0.81% of the food grains in India.

Uttar Pradesh and Rajasthan are the two major producers in country. These two states together provide 64 per cent of the total area and 72 per cent of total production of barley in India. UP is leading barley producing state which sharing is 36.65% of total area and 40.11% of total production of barley in India. The important barley producing districts includes Vanarasi, Gazipur, Jaunpur, Pratapgarh, Gorakhpur, Ballia, Fatehpur, Allahbad, Mirzapur, Agra, Mathura and Bulandshahar (Singh *et.al* 2014).

Domestic consumption of barley for 2018-19 is forecast expected to 1.2 million tons, a marginal increase from the previous year. Demand by malting industries will be a little below 1.0 million tons, while seed use will be close to 100,000 tons. Barley feed use is expected to grow marginally at 125,000 tons by different livestock industries looking to substitute feed ingredients after the dry and hot summer which negatively impacted corn and pasture production.

Materials and Methods

The present study was carried out for purpose of enhancement of an area, production and productivity of barley in the district of Azamgarh due to nearby district cover good acreage and productivity. Front line demonstrations were conducted during 2017-18 and 2018-19 farmer's fields of this district by Krishi Vigyan Kendra, Azamgarh in 18 villages namely Jairampur, Keshavpur, Khanpur, Shadipur, Khemupur, Sameda, Parampur, Serra, Gehwara, Semrahan, Dhanchuwan, Goddipur, Farenda, Pahelwanpur, Kandhanapur, Allipur, Husainganj and Sirwan. The soil of the farmer's fields was sandy loam in texture low in organic carbon, nitrogen medium in phosphorus availability and slightly poor available for potash.

The participating farmers were provided with all advance technical know how about advanced cultivation of barley crop. KVK scientists also visited regularly to the demonstrations fields and continuously guide the farmers. The varieties of barley DWRB 137; PL 426 and local variety Azad (K 219) were also utilized for collection of feedback information for more improvement in technology transfer programmes. Field days and group meeting were also organized at demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies.

The data on barley yield contributing character (effective tillers/m^2) and productivity (q/ha) were collected from the demonstration and control plots (Farmers Practice) for further analysis. The critical inputs were duly supplied to the farmers by KVK. Data were collected from the field of FLDs farmers and analyzed to compare the yield of farmers' field and FLDs field. The Technology gap, extension gap and technology index I and technology index II were estimated by formulae provided by Samui *et.al.* 2000.

Technology gap = Potential yield – Demonstration yield

Extension gap

= Demonstration yield – Farmers practice yield (control)

$$\text{Technology index-I (\%)} = \frac{\text{Potential yield} - \text{Demo yield}}{\text{Potential yield}} \times 100$$

$$\text{Technology index -II (\%)} = \frac{\text{Demo yield} - \text{Check yield}}{\text{Demo yield}} \times 100$$

Data on District and State on production, productivity and area were taken from Agriculture Department. Data were interpreted on three years average bases.

Economics of the Treatment

Recommendation and adoption of any practice by cultivators depends upon its economics. Therefore, it becomes essential to work out economics of the treatments tested for judging the best treatment under study for getting higher net profit per hectare.

Cost of Cultivation (Rs/ha)

For different treatments total cost of cultivation was calculated on the basis of prevailing market rates of fertilizers, seeds, field preparation, sowing of seeds, labour charges, cultural and intercultural operations as well as expenditure on harvesting, threshing and other activities.

Gross return (Rs/ha)

For different treatments gross returns were calculated on the basis of prevailing market rate of produce.

Net return (Rs/ha)

It was calculated treatment wise. Cost of cultivation per ha was subtracted from the gross income for computing net return of each treatment.

Net Return = Gross Return (Rs/ha) – Cost of Cultivation (Rs/ha)

Cost Benefit Ratio (BCR)

The BCR was calculated as given below formula

$$BCR = \frac{\text{Gross Return}}{\text{Gross Cost}}$$

Results and discussion

1. Knowledge level of advanced agronomic practices of Barley

To know the need of the technological intervention the knowledge level of the farmers in 18 villages were estimated from 360 farmers and 20 farmers from each village. Over all maximum number of farmers fall in category of medium level knowledge with 31.9 per cent, while 24.2 per cent were with high knowledge level (Table 1). Thus need was felt to introduce latest varieties and nutrients management in CFLDs programme in the eighteen villages. FLDs are good extension tool to demonstrate the impact of new agro techniques to the farmers.

Table 1: Overall knowledge level of farmers in respect of cultivation of Barley N= 360

Category of knowledge level	Score range	No. of farmers	%tage of respondents
Low	30-35	115	31.9
Medium	36-54	158	43.9
High	55-75	87	24.2

2. Yield and Technological index I & II

Implementation of improved varieties and production technologies remarkably increased the yield 36.5 & 34.4 q/ha over farmers' practice (27.9 q/ha) during the two years of FLDs.

The average yield under recommended practice (FLD) with variety DBWR – 137and PL 426 were obtained 36.5 & 34.4 q ha^{-1} as compared to farmers' practice 27.9 kg ha^{-1}, which were 30.82% and 23.30% higher, respectively (table 2). Although, varieties yield obtained under FLD demonstrations at par potential yield of varieties. Similarly, yield contributing characters also performed in same trend of yield. It may be due to cumulative effect of several biotic and abiotic factors in micro climatic conditions that varying year to year (Tiwari *et al.* 2003).

Yield enhancement under recommended practice might be due to balance nutrition as per soil test value, integrated approach, involving fertilizers and bio-fertilizers which play a vital role in making availability of plant nutrient. Similar results were observed by Tomar *et al.* (2003), Tiwari and Saxena (2001) and Tiwari *et al.* (2003).

Table 3 showed that by adopting advance production technology under FLD demonstrations produced at par yield than the potential yield of varieties and it reflected technology index I (3.77-5.07) and farmer's practice far away from potential yield of locally adopted variety. The two years average yield of FLD demonstrated varieties DWRB 137 and PL 426 technology index - I were found 3.77 & 5.07 per cent, respectively and locally used variety (Azad) technology index – I was 20.28 per cent. The technology index II of FLD barley varieties was found higher (18.89 – 23.56%) over the farmers' practice. The average yield of district every year increase (25.27 to 28.28 q ha^{-1}) (Ram *et al.* 2010 & 2012).

Data presented in table 3 revealed that demonstrated technology had impact over farmers' practices. It might be due to cumulative effect on average yield of district, technology index I and

Table 2: Performance of varieties & technological intervention (FLD) on yield (qha^{-1})

Technology	Yield Potential (qha^{-1})	Effective Tillers/m^2			Yield obtained (qha^{-1})			Yield increase (%)
		2017-18	2018-19	Av.	2017-18	2018-19	Av.	
T_1- FP Azad(K-125)	35.00	303	313	308	27.5	28.3	27.9	-
T_2- DWRB -137 + RDF	37.93	379	381	380	36.3	36.7	36.5	30.82
T_3- PL -426 + RDF	36.25	360	366	363	33.8	35.0	34.4	23.30

Table 3: Performance of technological intervention (FLD) on technology index I & II on two years' average basis

Technology	Area (ha)	Demos (No.)	Variety		State average yield (q/ha)	District average yield (q/ha)	Potential yield of the demo variety (q/ha)	Average Yield Technology demonstration	Technology index -I (%)	Technology index -II (%)
			Check	Demo						
T_1- FP Azad(K-125)	40	100	Azad	-	29.09	26.78	35.00	27.9	20.28	-
T_2- DWRB -137+ RDF	40	100	Azad	DWRB-137	29.09	26.78	37.93	36.5	3.77	23.56
T_3- PL-426 + RDF	40	100	Azad	PL-426	29.09	26.78	36.25	34.4	5.07	18.89

Table 4: Economical comparison between FLD demo and farmers' practice

Technology	Sale Price (Rs/q)	Expenditure and returns (Rs./ha)								Av Net returns increase (%)
		2017-18				2018-19				
		Gross Cost ($Rsha^{-1}$)	Gross return ($Rsha^{-1}$)	Net Return ($Rsha^{-1}$)	B:C ratio	Gross Cost ($Rsha^{-1}$)	Gross return ($Rsha^{-1}$)	Net Return ($Rsha^{-1}$)	B:C ratio	
T_1- FP Azad(K-125)	1900	20550	52250	31700	2.54	21350	53770	32420	2.51	-
T_2- DWRB -137 + RDF	1900	22720	68970	46250	3.03	23600	69730	46130	2.95	44.07
T_3- PL -426 + RDF	1900	22520	64220	41700	2.85	23520	66500	42520	2.82	31.35

technology index II due to good management of FLD and technological spread among the farmers of the district. The average yield increased in FLD demo field due to technological intervention may happen in other similar situation. The results are in agreement with the finding as reported by Tomar *et al.* (2003) & Kaur *et al.* (2009).

3. Economical Assessment

The cost of cultivation in FLD demonstration comparatively higher (Rs 22520 - 23600) as compared to farmers' practice (Rs 20550 – 21350) because of additional input applied in FLD demonstrated Variety DWRB – 137 achieved highest gross return Rs 68970 & 69730 and net return Rs 46250 & 46130 in 2017-18 & 2018-19, respectively (Table 4). FLD demos were found higher than the farmers practice gross return (Rs 52250 & 53770) and net return Rs 31700 & 32420 in both the years. Both demonstrated varieties average net returns 44.07% & 31.35 higher than that of farmers' practice. It showed that the adaption of demonstrated technology by farmers would be higher economically and gainful proposition. It was also advocated by Pathak (2017) and Tiwari & Saxena (2001).

The B:C ratio showed the same trend as in gross and net return which was found 3.03 & 2.85 in 2017-18 and 2.95 & 2.82 in 2018-19 of variety DWRB 137 and PL 426 demonstration and 2.54 and 2.51 farmers' practice during 2017-18 and 2018-19, respectively (table 4). Results showed economics viability and agronomic feasibility of technology for barley cultivars cultivation (Deshmukh *et al.* 2005) and (Tiwari & Saxena. 2001)

4. Impact of FLD on technology dissemination in the district

Data presented in table 5 revealed the impact of FLD on barley in the district. During first year decreased trend was found in cultivated area and production but increased in productivity from 2601 to 1064 ha, 6395 to 2689 mt and 24.59 to 25.27 q ha^{-1}, respectively but during second year (2018-19) increase trend was found in cultivated area, production and productivity from 1064 to 2809 ha, 2689 to 7944 and 25.27 mt to 28.28 q/ha, respectively. Technology dissemination on advance technology of barley through FLD on crop growth area, production and productivity founded (-) 59.09, (-) 57.95 & 4.18 per cent in 2017-18, and 164.00, 195.42 & 11.91 per cent in 2017-18, respectively. Farmers show the first year technological impact and replacement of varieties with new cultivars *i.e.* DWRB – 137 and PL 426 highly adaptability

Table 5: Growth on Area (ha), Production (Mt) and Productivity (qha^{-1}) of barley in district Azamgarh

Year	Area		Production		Productivity	
	(ha)	% over the last year	(mt)	% over the last year	qha^{-1}	% over the last year
2016-17	2601		6395		24.59	
2017-18	1064	-59.09	2689	- 57.95	25.27	4.18
2018-19	2809	164.00	7944	195.42	28.28	11.91

Source: JDA Statics, Krishi Bhawan, Lucknow

increased in barley cultivation and drastically change seen in cultivated area, production and productivity of barley in district Azamgarh.

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