

Barley Front Line Demonstrations (BFLDs) 2015-16

During the rabi crop season 2015-16, 130 Barley Front Line Demonstrations (BFLDs) were allotted to 25 different cooperating centers all over India in six states namely, HP, UP, Punjab, Haryana, Rajasthan and MP of which 125 were conducted by 24 centers, covering 130.6 hectares area of 265 farmers (Table 1). Improved barley varieties with complete package of practices (irrigation management, fertilizer dose and method of application, weed control, seed treatment etc.) were demonstrated.

Table 1: Centrewise distribution of Barley FLDs during rabi 2015-16

S. No.	Zone and Centre	Allotted (BFLD=1 ha)	Conducted (1 ha basis)	Area sown (ha)	No. of farmers/ locations
NHZ					
1.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	5	5	5	21
2.	IARI, RS, Amartara Cottage, Shimla (HP)	5	5	5	13
NEPZ					
3.	NDUA&T, Faizabad (UP)	5	5	5	9
4.	KVK (IAS-BHU), Barkachha, Mirzapur (UP)	5	5	6*	6
5.	CSAUA&T, Kanpur (UP)	5	5	6.8*	16
6.	BHU, Varanasi (UP)	5	5	5	6
7.	KVK, Morabadi, Ranchi (Jharkhand)	5	Not conducted	-	-
NWPZ					
8.	PAU, Ludhiana (Punjab)	5	5	5	10
9.	ICAR-IIWBR, Karnal (Haryana)	5	5	5	11
10.	CCSHAU, Hisar (Haryana) – 125004	5	5	5	7
11.	KVK (CCSHAU), Fatehabad (Haryana)	5	5	5.4*	8
12.	KVK (CCSHAU), Jhajjar (Haryana)	5	5	5	17
13.	KVK, Shri BB Ashram, Rewari (Haryana)	5	5	5	7
14.	KVK (CCSHAU), Bhiwani (Haryana)	10	10	11.2*	22
15.	KVK (CCSHAU), Rohtak (Haryana)	5	5	5	12
16.	KVK (CCSHAU), Faridabad (Haryana)	5	5	5	5
17.	RARI, Durgapura, Jaipur (Rajasthan)	5	5	5	6
18.	KVK, Tankarda, Chomu, Jaipur (Rajasthan)	5	5	5	10
19.	KVK, Khedla Khurd, Dausa (Rajasthan)	5	5	5	10
CZ					
20.	RCOA, MPUA&T, Udaipur (Rajasthan)	5	5	5	7
21.	KVK (MPUA&T), Dhoinda, Rajasmand (Raj.)	5	5	4.8	12
22.	ZARS, COA, JNKVV, Kuthulia Farm, Rewa (MP)	5	5	5	5
23.	KVK (JNKVV), Purushottampur, Panna (MP)	5	5	5	17
24.	KVK (RVSKVV), Juara Khurd, Morena (MP)	5	5	6.4*	16
25.	KVK (RVSKVV), Budhapura, Lahar, Bhind, MP	5	5	5	12
Total		130	125	130.6	265

* Area covered more than allotted.

Table 2: Statewise distribution of BFLDs during rabi 2015-16

State	Allotted	Conducted	Area sown (ha)	No. of farmers/locations
HP	10	10	10.0	34
UP	20	20	22.8	37
Punjab	5	5	5.0	10
Haryana	45	45	46.6	89
Rajasthan	25	25	24.8	45
MP	20	20	21.4	50
Jharkhand	5	-	-	-
Total	130	125	130.6	265

Table 3: Zone wise distribution of BFLDs conducted during rabi 2015-16

Zone	Allotted	Conducted	Area sown (ha)	No. of Farmers/ locations
NHZ	10	10	10.00	34
NEPZ	25	20	22.80	37
NWPZ	65	65	66.60	125
CZ	30	30	31.20	69
Total	130	125	130.60	265

* Area covered more than allotted which is restricted to area equal to allotted FLDs.

Table 4 : State wise yield gain under BFLDs during 2015-16

State	BFLDs yield (q/ha)	Check yield (q/ha)	% increase
HP	25.63	19.34	32.52***
UP	35.03	27.64	26.74***
Punjab	49.60	46.40	06.90 ^{NS}
Haryana	47.26	42.63	10.86***
Rajasthan	47.73	39.98	19.38***
MP	41.79	34.67	20.54***

*** Significant at 1 percent level, ** - Significant at 5 percent level.

The highest increase in barley yield was recorded in HP (32.52 %) followed by UP (26.74 %), Madhya Pradesh (20.54 %), Rajasthan (19.38 %) and Haryana (10.86 %). The lowest increase in yield was reported in Punjab (06.90 %) (Table 4).

Table 5 : Zone wise productivity under BFLDs over regional check during 2015-16

Zone	BFLDs yield (q/ha)	Regional mean yield (q/ha)	% Increase
NHZ	25.63	22.06	16.18***
NEPZ	35.03	27.43	27.71***
NWPZ	48.48	41.58	16.59***
CZ	41.74	29.57	41.16***

*** Significant at 1 per cent level .

The yield gain due to improved varieties over regional mean yield was highest in Central Zone (41.16 %) followed by north eastern plains zone (27.71 %), north western plains zone (16.59 %) and northern hills zone (16.18 %) (Table 5).

Table 6 : Zone wise productivity under BFLDs over National check during 2015-16

Zone	BFLDs yield (q/ha)	Check mean yield (q/ha)	% Increase
NHZ	25.63	19.34	32.52***
NEPZ	35.03	27.64	26.74***
NWPZ	48.48	43.46	11.55***
CZ	41.74	34.17	22.15***

*** Significant at 1 per cent level .

The yield gain due to improved varieties over check mean yield was highest in northern hills zone (32.52 %) followed by north eastern plains zone (26.74 %), central zone (22.15 %) and north western plains zone (11.55 %) (Table 6). Therefore, efforts should be made to increase barley yield in the north eastern plains zone and central zone in collaboration with the state department of agriculture.

The yield gain at Mirzapur (67.57 %) centre was highest followed by Shimla (44.08 %), Panna (42.75 %), Varanasi (34.07 %), Durgapura-Jaipur (33.60 %), Rajsamand (30.20 %) and Faizabad (29.59 %) centers across the zones. The increase in improved variety's yield at Rohtak over check variety was the lowest (03.68 %) but significant (Table 7).

Table 7: Centre wise performance of improved barley varieties during 2015-16

Zone	Centre	BFLDs yield (q/ha)	Check yield (q/ha)	% increase
NHZ	Bajaura	26.55	20.69	28.32***
	Shimla	23.60	16.38	44.08***
NEPZ	Faizabad	27.94	21.56	29.59***
	Mirzapur	37.20	22.20	67.57***
	Kanpur	36.27	32.00	13.34***
	Varanasi	40.77	30.41	34.07***
NWPZ	Ludhiana	49.60	46.40	06.90 ^{NS}
	IWBR, Karnal	49.31	42.26	16.68***
	Hisar	46.00	42.29	08.77*
	Fatehabad	35.93	33.21	08.19***
	Jhajjar	51.47	41.44	24.20***
	Rewari	45.54	43.00	05.91***
	Bhiwani	51.73	48.72	06.18***
	Rohtak	42.25	40.75	03.68**
	Faridabad	41.20	38.26	07.68 ^{NS}
	Durgapura-Jaipur	55.67	41.67	33.60***
	Chomu-Jaipur	51.56	48.35	06.64 ^{NS}
	Dausa	50.80	44.10	15.19***
	CZ	Udaipur	43.43	35.86
Rajsamand		40.53	31.13	30.20***
Rewa		40.64	37.46	08.49**
Panna		37.40	26.20	42.75***
Morena		46.04	39.91	15.36***
Bhind		42.83	38.50	11.25***

*** Significant at 1 percent level, ** - Significant at 5 percent level, * Significant at 10 percent level, NS- Non-significant

Table 8: Variety wise performance of improved barley varieties during 2015-16

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	% Increase over check
NHZ					
Bajaura	BHS 400	26.55	Sonu	20.69	28.32***
Shimla	BHS 400	23.60	BHS 352	16.38	44.08***
NEPZ					
Faizabad	RD 2794	27.94	Faizabad Local	21.56	29.59***
Mirzapur	HUB 113	36.00	Jagriti	20.00	80.00 ^{NS}
	HUB 113	39.00	Manjula	25.50	52.94 ^{NS}
Kanpur	RD 2794	36.27	Azad	32.00	13.34***
Varanasi	HUB 113	40.77	Geetanjali	30.41	34.07***
NWPZ					
Ludhiana	BH 946	44.17	PL 807	40.67	08.61**
	DWRB 101	57.75	DWRUB 52	55.00	05.00 ^{NS}
IWBR, Karnal	BH 946	49.41	BH 393	42.68	15.77***
	DWRB 101	48.90	BH 393	40.60	20.44**
Hisar	BH 946	46.00	BH 393	42.29	08.77*
Fatehabad	BH 946	35.68	BH 393	33.08	07.86 ^{NS}
	DWRB 101	36.18	BH 393	33.35	08.49**
Jhajjar	BH 946	51.92	BH 393	41.75	24.36***
	DWRB 101	51.23	BH 393	41.27	24.13***
Rewari	BH 946	46.00	BH 393	43.00	06.98***
	DWRB 101	45.08	BH 393	43.00	04.84***
Bhiwani	BH 946	51.73	BH 393	48.72	06.18***

Rohtak	BH 946	42.25	BH 902	40.75	03.68**
Faridabad	BH 946	41.20	BH 393	38.26	07.68 ^{NS}
Durgapura-Jaipur	BH 946	55.67	Raj 4079	41.67	33.60***
Chomu-Jaipur	BH 946	47.46	RD 2035	43.88	08.16 ^{NS}
	BH 946	51.96	RD 2052	48.96	06.13 ^{NS}
	BH 946	54.46	RD 2503	50.99	06.81 ^{NS}
Dausa	BH 946	50.80	RD 2052	44.10	15.19***
CZ					
Udaipur	BH 959	43.00	RD 2035	35.25	21.99**
	BH 959	44.00	RD 2552	36.67	19.99*
Rajsamand	BH 959	40.53	Local	31.13	30.20***
Rewa	BH 959	39.17	JB 1	37.77	03.71 ^{NS}
	BH 959	42.85	JB 58	37.00	15.81 ^{NS}
Panna	BH 959	37.40	Munda Jawa	26.20	42.75***
Morena	BH 959	46.04	K 560	39.91	15.36***
Bhind	BH 959	42.83	Local	38.50	11.25***

*** Significant at 1 percent level, ** - Significant at 5 percent level, * Significant at 10 percent level, NS- Non-significant

In NHZ, BHS 400 was the highest average yielding (26.55 q/ha) variety at Varanasi centre. In NEPZ, HUB 113 at Varanasi (40.77 q/ha), DWRB 101 at Ludhiana (57.75 q/ha) in NWPZ and BH 959 at Morena (46.04 q/ha) in central zone were the highest average yielding varieties (Table 8).

Table 9: Yield potential of barley varieties in different zones during 2015-16

Zone	Centre	Variety	Yield(q/ha)
NHZ	Bajaura	BHS 400	32.80
NEPZ	Varanasi	HUB 113	44.00
NWPZ	Ludhiana	DWRB 101	60.00
CZ	Morena	BH 959	49.80

At particular farmers' field as well as on average basis BHS 400 (32.80 q/ha), HUB 113 (44.00 q/ha), DWRB 101 (60.00 q/ha) and BH 959 (49.80 q/ha) performed better than other varieties at Bajaura, Varanasi, Ludhiana and Morena centres in the NHZ, NEPZ, NWPZ and CZ, respectively (Table 9).

Table 10: Barley varieties grown in different zones during 2015-16

Zone	Improved varieties	Check varieties	Popular varieties in the region
NHZ	BHS 400	BHS 352, Sonu	Sonu, Dolma, HBL 276, Local, HBL 316, BHS 352
NEPZ	RD 2794, HUB 113	Faizabad Local, Jagriti, Manjula, Azad, Geetanjali	Faizabad Local, Jagriti, Manjula, JB 58, Azad, Jyoti, Geetanjali, Local
NWPZ	BH 946, DWRB 101	PL 807, DWRUB 52, BH 393, RD 2035, RD 2052, RD 2503	PL 807, BH 393, Local, BH 902, RD 2035, RD 2660, RD 2052, RD 2503, RD 2552
CZ	BH 959	RD 2035, RD 2552, Local, JB 1, JB 58, Munda Jawa, K 560	RD 2035, RD 2552, RD 2715, RD 2660, JB 1, JB 58, Munda Jawa, K 560, Local

Conducting barley FLDs at ICAR-IIWBR, Karnal centre during 2015-16

During *Rabi* 2015-16, five hectares barley Front Line Demonstrations (FLDs) were conducted at ten farmers' fields in the villages Ganjogarhi (Karnal), Rasina (Kaithal) and Makhand (Jind) of Haryana state using varieties DWRB 101 and BH 946. The demonstrations were conducted with complete package of practices. Farmers were provided the critical inputs as per provision under the programme.

Constraints analysis in different barley producing zones during 2015-16

There is a variation in yield levels among different states, farmers and farms leading to yield gap in different states and different zones. There are many reasons of this yield gap which need to be addressed for sustainable wheat production. Through constraint analysis effort has been made to identify constraints impeding barley production in different parts of the country.

Methodology

An inventory of constraints impeding barley production in the country was developed after thorough review of literature and taking experts' opinion. Data were collected on a well designed pre-structured questionnaire mailed to all the cooperating centres conducting barley Front Line Demonstrations (FLDs). The responses were collected on a three point continuum viz; Most Serious, Serious and Not Serious constraints. The scores were assigned as 3, 2, 1 for the most serious, serious and not serious constraints, respectively. Based on total score the average score for each constraint was calculated to ascertain seriousness of each constraint and finally ranking was done.

NHZ

In northern hills zone, yellow rust, lack of knowledge among farmers about recent technologies, small land holdings, high cost of inputs, late sowing, low organic matter in the soil, imbalanced use of fertilizers, lack of facility of canal irrigation, untimely rain, water stress, lack of knowledge of appropriate dose and method of herbicide application, etc. were some of the constraints which need immediate intervention.

Table 11 : Constraints of NHZ

(n=16)

Constraints	Score	Rank
Yellow rust	32	I
Lack of knowledge among farmers about recent technologies	32	I
Small land holdings	27	II
Non availability of seeds of newly released varieties	27	II
High cost of inputs	22	III
Late sowing	22	III
Low organic matter in the soil	22	III
Imbalanced use of fertilizers	22	III
Lack of facility of canal irrigation	22	III
Untimely rain	21	IV
Water stress	21	IV
Lack of knowledge of optimum dose and method of herbicide application	21	IV

NEPZ

In north eastern plains zone, untimely rain was ranked first. The other major constraints were late sowing, *Phalaris minor*, non availability of labour, small land holdings, zinc deficiency, imbalanced use of fertilizer, non availability of farm machinery, temperature fluctuation during crop growth and erratic power supply.

Table 12: Constraints of NEPZ

(n=35)

Constraints	Score	Rank
Untimely rain	62	I
Late sowing	58	II
<i>Phalaris minor</i>	56	III
Non availability of labour	56	III
Small land holdings	53	IV
Zn deficiency	53	IV
Imbalanced use of fertilizer	53	IV
Non availability of farm machinery	53	IV
Temperature fluctuation during crop growth	51	V
Erratic power supply	44	VI

NWPZ

Being the most productive and potential zone for barley cultivation, the constraints which were most serious in nature need to be addressed. Among major constraints, erratic power supply, low price of barley, high temperature at maturity, high cost of inputs,

temperature fluctuation during crop growth, untimely rain, non availability of electricity, non availability of labour, small land holdings and low organic matter in the soil were perceived by majority of the FLD farmers of NWPZ.

Table 13: Constraints of NWPZ (n=125)

Constraints	Score	Rank
Erratic power supply	121	I
Low price of barley	119	II
High temperature at maturity	116	III
High cost of inputs	116	III
<i>Temperature fluctuations during crop growth</i>	114	IV
Untimely rain	114	IV
Non availability of electricity	113	V
Non availability of labour	112	VI
Small land holdings	110	VII
Low organic matter in the soil	110	VII

CZ

In central zone, high cost of inputs was perceived as the most serious constraint followed by non availability of farm machinery, lack of facility of canal irrigation, temperature fluctuations during crop growth, low organic matter in the soil, low micronutrients in soil, decline in water table, non availability of seeds of newly released varieties and lack of irrigation facility.

Table 14 : Constraints of CZ (n=69)

Constraints	Score	Rank
High cost of inputs	95	I
Non availability of farm machinery	85	II
Lack of facility of canal irrigation	85	II
Temperature fluctuation during crop growth	76	III
Low organic matter in the soil	69	IV
Low micro nutrient in the soil	69	IV
Imbalanced use of fertilizer	69	IV
Decline in water table	67	V
Non availability of seeds of newly released varieties	64	VI
Lack of irrigation facility	64	VI

Most serious constraints impeding barley production in the country

Over all analysis of constraints in different zones clearly indicated that erratic power supply, low price of barley, high temperature at maturity, high cost of inputs, temperature fluctuation during crop growth, untimely rain, non availability of electricity, non availability of labour, small land holdings, low organic matter in the soil, high cost of inputs, non availability of farm machinery and lack of facility of canal irrigation were identified as major constraints affecting barley production and productivity of the country.

Table 15. Major constraints impeding barley production in the country (N=245)

Constraints	Score	Rank
Erratic power supply	121	I
Low price of wheat	119	II
High temperature at maturity	116	III
High cost of inputs	116	III
Temperature fluctuations during crop growth	114	IV
Untimely rain	114	IV
Non availability of electricity	113	V
Non availability of labour	112	VI
Small land holdings	110	VII
Low organic matter in the soil	110	VII
High cost of inputs	95	VIII
Non availability of farm machinery	85	IX
Lack of facility of canal irrigation	85	IX

Costs and Returns for Barley (FLDs vis-à-vis Check Plot)

Perusal of Table 16 indicates that on an average, improved barley varieties demonstrated in FLDs gave around 16 per cent better returns in comparison to the check. A significant difference in returns per rupee of investment was noticed between the FLD and check plots across states and zones. Punjab registered the highest returns per rupee of investment (₹5.58) through demonstrations, followed by Haryana (₹3.42) and Uttar Pradesh (₹3.17). However, the difference in the returns per rupee of investment between FLDs and Checks was highest in Uttar Pradesh. The profit per hectare in FLDs was highest in Punjab (₹59990), followed by Haryana (₹57605) and Rajasthan (₹55076). The difference in profit between FLDs and check ranged from ₹16047 in Uttar Pradesh to ₹5120 in Punjab. Interestingly, operational costs in Madhya Pradesh and Uttar Pradesh were lower in FLDs than check plots. The valid reason might be reduction in the use of inputs as per the recommendation.

Table 16. Costs and Returns from Barley during 2015-16

Particulars	Cost of Cultivation (₹/ha)						Returns per ₹ invested		Cost of Production (₹/Qtl)	
	Operational Costs		Gross Returns		Profit		FLD	Check	FLD	Check
	FLD	Check	FLD	Check	FLD	Check				
State										
Haryana	23757	22655	81362	73297	57605	50642	3.42	3.24	516	539
Himachal Pradesh	24919	22788	51679	40275	26761	17488	2.07	1.77	983	1206
Madhya Pradesh	25046	25491	66084	55110	41038	29619	2.64	2.16	604	760
Punjab	13100	13100	73090	67970	59990	54870	5.58	5.19	269	289
Rajasthan	25771	25387	80846	65981	55076	40594	3.14	2.60	539	631
Uttar Pradesh	22728	24788	72070	58083	49342	33295	3.17	2.34	660	908
Zone										
CZ	24103	24197	68346	55095	44242	30898	2.84	2.28	579	720
NEPZ	22617	24694	72422	58258	49805	33564	3.20	2.36	658	905
NHZ	24919	22788	51679	40275	26761	17488	2.07	1.77	983	1206
NWPZ	23927	23130	81703	73133	57776	50003	3.41	3.16	504	539
Variety										
Improved Variety	23854	23631	74655	63782	50800	40151	3.13	2.70	578	686
All Categories										
India	23854	23631	74655	63782	50800	40151	3.13	2.70	578	686

The returns per rupee of investment across barley growing zones were highest in the NWPZ (₹3.41) followed by NEPZ (₹3.20) and CZ (₹2.84). Estimates of cost of production indicated that the cost incurred in producing a unit quantity of output was least in Punjab (NWPZ) owing to less operational costs and relatively higher yield. Overall, the costs and returns analysis on barley indicated that profit per hectare from FLDs was more than the check varieties by ₹10650 establishing the fact that FLDs carry the successful technologies from lab to land. In a few cases it was found that the operational costs under check varieties were more than FLDs. However, the present estimates are only the indicators for comparison within the current year and may not have a complete inter-year relevance as the demonstrations were conducted at different sites. Further, the difference in profit earned from barley cultivation is subject to farm-farmer-region specific conditions as it varies from one another.