भाकृअनुप
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Progress Report
2016-17

अखिल भारतीय समन्वित गेहूँ एवं जौ सुधार परियोजना

AICRP on Wheat and Barley Improvement

उत्पादन वृद्धि से किसान समृद्धि
Higher Productivity for Farmers' Prosperity

सामाजिक विज्ञान
Social Science

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2016-17

SOCIAL SCIENCES

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Front Line Demonstrations (2016-2017)

Globally, in the realm of food commodities, wheat and barley occupies respectively the first and fourth position in terms of acreage. In India, these *Rabi* cereals altogether cultivated in around 31 million hectares accounting for about 36 per cent of the total foodgrains produced during 2016-2017. Wheat has been under cultivation in 30.72 million hectares and barley covered 0.69 million hectares during 2016-2017 (Source: Third Advance Estimates, Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, India). The current year production has reached an all-time record of 97.44 million tonnes with an average producitivity of 3172 kg/ha. The incremental production of wheat over the previous season, *i.*e 2015-16, has been estimated at 5.15 million tonnes (6%). Similarly, barley registered 1.79 million tonnes during 2015-2016 with an average national yield of 2580 kg/ha.

Front Line Demonstrations (FLDs) conducted across regions also witnessed a similar kind of trend. The improved varieties and technologies demonstrated at farmers field through the FLD programme showed that yield registered in FLDs is significantly higher than check plots. However, there existed yield gaps across regions which should be bridged through need based interventions by identifying the locations specific constraints. The ICAR-IIWBR make continuous efforts to popularize the regions specific superior varieites as well as micro level strategies to enhance the wheat and barley productivity. Despite this outreach programme, there exists the need for increasing the productivity of wheat and barley through different scientist-farmer interface programmes with more emphasis on seed replacement, integrated nutrient management (INM), efficient water management, integrated crop management (ICM) integrated pest management (IPM), weed management, incorporation/ retention of crop residues and soil health management. The farm advisory services through WhatsApp group, MANAGE portal and rigorous training of field level extension functionaries or subject matter specialists by the institute has also played a key role in taking contingent management measures, particularly against blast and yellow rust. Several other programmes have been initiated as well at the institute level to transfer the efficient technologies to farmers' field.

Creation of awareness through mass and print media on seed treatment, seed replacement and disease management helped to increase the farmers' livelihood and welfare. Procurement by different authorized agencies has also motivated the farmers to retain the same or allot more area under the respective crop. However, developing storage facilities both at farm level and national level is the need of the hour and it warrants for some policy actions. The report highlights the outcome of wheat and barley FLDs, yield gain due to FLDs, costs and returns as well as constraints in wheat and barley production.

Wheat Front Line Demonstrations (2016-17)

During the wheat crop season 2016-17, 600 Wheat Front Line Demonstrations (WFLDs) of one hectare each were allotted to 83 cooperating centres across the country of which 543 were conducted through 79 cooperating centers. The technologies such as improved wheat (*T.aestivum, T.durum and T. dicoccum*) varieties with complete package of practices, rotavator, zero tillage/Happy Seeder, bio-fertilizer and drip/sprinkler irrigation were demonstrated in the selected farmers fields. These WFLDs covered 547.4 hectares area of 1238 farmers in 19 states. The maximum number of WFLDs were conducted in UP (77) followed by MP (57), Rajasthan (46), Assam (38), Bihar (35), Haryana (35), Maharashtra (35), HP (30), Punjab (28), Karnataka (25), Jharkhand (23), West Bengal (18), Chhattisgarh (17), Uttarakhand (15), Tamilnadu (15), Delhi (14), J&K (14), Gujarat (11), and Nagaland (10). The details of centre wise and state wise WFLDs are given in Tables 1 & 2.

Table 1: Centre wise distribution of wheat front line demonstrations during *rabi* 2016-17

S.No.	Name of Centre	WFLDs Allotted (1WFLD = 1ha)	WFLDs Conducted (1 ha basis)	Area Sown (ha)	No. of Farmers/ locations
NHZ					
1.	VPKAS, Almora (Uttarakhand)	8	8	8.19*	90
2.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	5	3	3.0	12
3.	CSKHPKV, RWRC, Malan, Kangra (HP)	5	5	5.0	20
4.	CSKHPKV,PCRS, Berthin, Bilaspur (HP)	5	Not conducted	-	-
5.	CSKHPKV, HAREC, Dhaulakuan, Sirmour (HP)	5	5	5.0	20
6.	IARI, RS, Amartara Cottage, Shimla (HP)	5	3	3.0	17
7.	ICAR-IIWBR, RS, Flowerdale, Shimla (HP)	5	Not conducted	-	-
8.	RR&RS, SKUAST-K, Khudwani, Anantnag (J&K)	5	4	4.0	8
9.	RARS, SKUAST-Jammu, Tandwal, Rajouri (J&K)	5	Not conducted	-	-
10.	KVK (CSKHPKV), Bara, Hamirpur (HP)	5	4	4.0	23
11.	AICW&BIP Sub-Centre, CAU, Imphal (Manipur)	2	Not conducted	-	-

NEPZ					
12.	NDUA&T, Faizabad (UP)	7	7	7.0	15
13.	CSAUA&T, Kanpur (UP)	10	10	10.0	6
14.	BHU, Varanasi (UP)	10	10	10.0	25
15.	KVK, Sohna, Sidharthnagar (UP)	10	10	10.0	25
16.	KVK, Sultanpur (UP)	5	5	5.2*	12
17.	BCKV, Kalyani, Nadia (West Bengal)	10	10	10.0	65
18.	UBKVV, Pundibari, Coochbehar (West Bengal)	10	8	8.0	20
19.	KVK-Dimapur, Jharnapani, MEDZIPHEMA (Nagaland)	10	10	10.0	20
20.	RARS, AAU, Shillongani, Nagaon (Assam)	10	10	10.0	10
21.	KVK (AAU)-Darrang , Mangaldai, Darrang (Assam)	5	5	5.0	12
22.	KVK (AAU), Chirakuta, (Revenue village Jamduar Pt.II) Dhubri (Assam)	5	5	5.0	16
23.	KVK (AAU), Citrus Research station, Gellapukhuri, Tinsukia (Assam)	7	7	7.0	18
24.	KVK (AAU), Napam, Tejpur, Sonitpur (Assam)	7	6	6.0	5
25.	KVK (AAU), Kajalgaon, Chirang (Assam)	5	5	5.0	14
26.	IARI, RS, Pusa, Samastipur (Bihar)	5	5	5.0	10
27.	KVK, Sokhodeora, Nawadah (Bihar)	5	5	5.0	5
28.	KVK, RAU, Hariharpur,Vaishali (Bihar)	5	5	5.0	6
29.	KVK, Adhaura, Kaimur, Bhabua (Bihar)	5	5	5.0	12
30.	KVK, Chanpura-Basaith, Madhubani (Bihar)	5	5	5.0	14
31.	KVK (RAU), Pipra Kothi, East Champaran (Bihar)	5	5	5.0	11
32.	KVK (RAU), Madhopur, West Champaran (Bihar)	5	5	5.0	11
33.	BAU, Kanke, Ranchi (Jharkhand)	7	7	7.0	16
34.	KVK, Morabadi, Ranchi (Jharkhand)	10	10	10.0	25
35.	KVK, BAU, West Singhbhum (Jharkhand)	7	6	6.0	15
NWPZ					
36.	KVK (CSKHPKV), Una (HP)	5	5	5.0	6
37.	KVK (SKUAST-Jammu), Rajhani, Kathua, Jammu (J&K)	10	10	10.0	25
38.	PAU, Ludhiana (Punjab)	10	10	10.0	10
39.	PAU, RRS, Gurdaspur (Punjab)	7	7	7.0	7
40.	KVK, Haveli Kalan, Rupnagar (Punjab)	6	6	6.0	15
41.	KVK, Usman, Amritsar (Punjab)	6	5	5.0	9
42.	RBS College, Bichpuri, Agra (UP)	6	6	6.0	6
43.	KVK, Baghara, Muzaffarnagar (UP)	6	6	6.0	14
44.	ZARS, Nagina, Bijnor (UP)	5	5	5.0	7
45.	KVK, Khajuri Bagh, New Gopal Nagar, Saharanpur,UP	5	5	5.0	12
46.	ICAR-IIFSR, Modipuram, Meerut (UP)	7	7	7.0	18
47.	Amity Centre for Extension Services, Noida (UP)	6	6	6.0	15
48.	GBPUA&T, Pantnagar, USNagar (Uttarakhand)	7	7	7.0	7
49.	CATAT, IARI, New Delhi	7	7	7.0	15
50.	KVK (NHRDF), Ujwa, New Delhi	7	7	7.0	17
51.	ICAR-IIWBR, Karnal (Haryana)	7	7	7.0	11
52.	ICAR-CSSRI, Karnal (Haryana)	7	7	7.2*	18
53.	CCSHAU, Hisar (Haryana)	6	6	6.0	6
54.	KVK, Bhiwani (Haryana)	5	5	5.0	10
55.	KVK, Tepla, Ambala (Haryana)	5	5	5.0	10
56.	KVK, Peoda Road, Kaithal (Haryana)	5	5	5.0	5
57.	RARI, SKNAU, Durgapura, Jaipur (Rajasthan)	5	5	5.0	12
58.	KVK, Ajmer (Rajasthan)	5	5	5.0	12
59.	KVK, Banasthali Vidyapeeth, District-Tonk (Rajasthan)	5	5	5.0	10
60.	ARS (RAU), Sriganganagar (Rajasthan)	5	5	5.0	5

CZ					
61.	RCOA (MPUA&T), Udaipur (Rajasthan)	7	7	7.0	15
62.	ARS, MPUA&T, Banswara (Rajasthan)	7	7	7.0	17
63.	ARS, MPUA&T, Kota (Rajasthan)	7	7	7.0	8
64.	KVK, Sawai Madhopur (Rajasthan)	5	5	5.0	12
65.	WRS, JAU, Junagarh (Gujarat)	10	4	4.0	10
66.	MWRS, SDAU, Vijapur, Mehsana (Gujarat)	10	7	7.0	16
67.	JNKVV, Jabalpur (MP)	10	5	5.0	3
68.	IARI, RWRS, Indore (MP)	10	10	13.50*	28
69.	KVK (JNKVV), Purushottampur, Panna (MP)	7	7	7.0	17
70.	KVK, Kalukhera Shiksha Samiti, Kalukhera, Ratlam (MP)	10	10	10.0	25
71.	KVK (RVSKVV), Pipersama, Neemuch(MP)	5	5	5.0	12
72.	KVK (RVSKVV),COH, Mandsour (MP)	5	5	5.0	12
73.	KVK (RVSKVV), MLNagar, Ujjain (MP)	10	10	10.0	25
74.	KVK (RVSKVV), Budhapura, Lahar, Bhind(MP)	5	5	5.0	12
75.	KVK, RRS, IGKVV, Jagdalpur, Bastar (CG)	7	7	7.0	14
76.	IGAU, RARS, Sarkanda, Bilaspur (CG)	10	10	10.0	10
PZ					
77.	PDKV, Akola (Maharashtra)	10	10	10.0	10
78.	ARS, Niphad, Nasik (Maharashtra)	10	10	10.0	10
79.	MAU, Parbhani (Maharashtra)	10	5	5.0	12
80.	ARI, MACS, Pune (Maharashtra)	10	10	10.0	11
81.	UAS, Dharwad (Karnataka)	20	20	20.0	20
82.	BIRDS KVK, Tukkanatti, Gokak, Belgaum (Karnataka)	10	5	5.0	8
SHZ					
83.	IARI, RS, Wellington (Tamil Nadu)	15	15	15.2*	45
Very High Altitude Areas of NHZ					
84.	ICAR-IIWBR, Karnal (FLDs conducted in HP)	10	5	5.1	26
Total		**600**	**543**	**547.4**	**1238**

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

The reasons for not achieving the target were non-availability of newly released wheat varieties (NRWVs) (3-5 years old) seed at local level and non-availability of NRWVs seed in time with the National Seeds Corporation (NSC) recommended for NHZ. The target could not be achieved in high altitude area because the private companies offered high rental value of land to the farmers to grow vegetable crops or produce seed during this season. Therefore, farmers were not ready to grow wheat, as economically it was less profitable venture for them. The wheat FLDs data received from the cooperating centers which were not reported properly as per FLDs guidelines were not included for analysis.

Table 2: State wise distribution of wheat FLDs during *rabi* 2016-17

State	Allotted	Conducted	Area sown (ha)	No. of farmers/ locations
Uttarakhand	15	15	15.19	97
HP	50	30	30.1	124
J&K	20	14	14.0	33
Nagaland	10	10	10.0	20
Manipur	2	-	-	-
UP	77	77	77.2	155
West Bengal	20	18	18.0	85
Assam	39	38	38.0	75
Bihar	35	35	35.0	69
Jharkhand	24	23	23.0	56
Punjab	29	28	28.0	41
Delhi	14	14	14.0	32
Haryana	35	35	35.2	60
Rajasthan	46	46	46.0	91
Gujarat	20	11	11.0	26
MP	62	57	60.5	134
Chhattisgarh	17	17	17.0	24
Maharashtra	40	35	35.0	43
Karnataka	30	25	25.0	28
Tamil Nadu	15	15	15.2	45
Total	**600**	**543**	**547.4**	**1238**

Table 3: Zonewise distribution of wheat FLDs during *rabi* 2016-17

S. N.	Zone	WFLDs allotted (1 WFLD = 1ha)	WFLDs conducted (1 ha basis)	Area sown (ha)	No. of farmers/ locations
1.	NHZ	65	37	37.29	216
2.	NEPZ	170	166	166.20	388
3.	NWPZ	155	154	154.20	282
4.	CZ	125	111	114.50	236
5.	PZ	70	60	60.00	71
6.	SHZ	15	15	15.20	45
Total		**600**	**543**	**547.40**	**1238**

Table 4: Centre wise performance of improved wheat varieties during *rabi* 2016-17

Zone & Centre	Improved varieties/FLD Mean yield (q/ha)	Check varieties Mean yield (q/ha)	% Gain
NHZ			
Almora	30.84	22.86	34.91***
Bajaura, Kullu	25.92	22.79	13.73***
Malan, Kangra	33.65	29.50	14.07**
Dhaulakuan, Sirmour	35.75	29.60	20.78***
Tutikandi, Shimla	30.00	27.00	11.11^{NS}
Khudwani, Anantnag	27.50	22.38	22.88***
Hamirpur	25.12	21.27	18.10***
NEPZ			
Faizabad	50.53	42.27	19.54***
Kanpur	62.74	53.76	16.70***
Varanasi	39.50	32.83	20.32***
Sohna, Sidharthnagar	44.73	41.34	08.20***
Sultanpur	40.77	35.28	15.56***
Kalyani, Nadia	39.80	27.53	44.57***
Pundibari, Coochbehar	35.69	34.12	04.60*

Dimapur	10.40	08.95	16.20*
Shillongani	23.62	20.87	13.18^{NS}
Darrang, Mangaldai	29.09	23.03	26.31***
Dhubri	25.19	19.94	26.33***
Tinsukia			
Sonitpur	19.86	11.92	66.61***
Chirang	22.00	17.00	29.41^{NS}
Pusa, Samastipur	46.20	30.39	52.02***
Nawada	42.50	37.70	12.73***
Vaishali	50.64	46.77	08.27***
Kaimur, Bhabua	39.23	35.41	10.79***
Madhubani	32.41	26.63	21.70***
East Champaran	45.65	36.16	26.24***
West Champaran	41.20	33.17	24.21^{NS}
Kanke, Ranchi	34.10	21.36	59.64***
Morabadi, Ranchi	37.56	31.34	19.85***
West Singhbhum	31.40	27.53	14.06***
NWPZ			
Una	32.43	29.67	09.30**
Kathua-Jammu	35.36	30.64	15.40***
Ludhiana	57.52	55.13	04.34***
Gurdaspur	50.64	44.93	12.71***
Ropar	55.87	54.42	02.66**
Amritsar	53.18	51.88	02.51**
Agra	56.92	53.50	06.39*
Muzaffarnagar	42.81	37.47	14.25***
Bijnor	48.86	44.49	09.82**
Saharanpur	57.34	43.65	31.36***
Meerut	50.75	47.19	07.54**
Noida	59.56	54.62	09.04***
Pantnagar	54.50	53.93	01.06^{NS}
IARI, New Delhi	52.16	48.66	07.19**
KVK, Ujwa, Delhi	42.99	39.70	08.29***
IIWBR, Karnal	57.23	55.43	03.25^{NS}
CSSRI, Karnal	49.97	47.93	04.26*
Hisar	58.33	57.08	02.19^{NS}
Bhiwani	58.70	53.13	10.48***
Ambala	50.40	47.10	07.01***
Kaithal	54.50	53.25	02.35^{NS}
Durgapura, Jaipur	53.25	48.13	10.64***
Ajmer	61.63	47.50	29.75***
Banasthali Tonk	48.10	45.20	06.42^{NS}
Sriganganagar	51.40	44.80	14.73**
CZ			
Udaipur	44.87	40.87	09.79***
Banswara	43.47	37.71	15.27***
Kota	53.69	46.25	16.09***
Sawai Madhopur	50.81	45.60	11.43***
Junagarh	53.25	49.75	07.04^{NS}
Vijapur, Mehsana	44.51	41.36	07.62^{NS}
Jabalpur	24.33	23.00	05.78^{NS}
Indore	63.54	43.08	47.49***
Panna	39.50	32.40	21.91***
Ratlam	35.21	26.53	32.72***
Neemuch	65.40	54.72	19.52***
Mandsaur	45.00	38.00	18.42***
Ujjain	53.56	51.72	03.56^{NS}
Lahar, Bhind	47.69	40.50	17.75***
Jagdalpur, Bastar	22.47	19.08	17.77***
Sarkanda, Bilaspur	34.80	30.50	14.10***

PZ			
Akola	25.39	22.09	14.94^{NS}
Niphad, Nashik	42.70	36.00	18.61***
Parbhani	41.88	31.42	33.29***
Pune	51.47	43.29	18.90***
Dharwad	40.25	34.40	17.01***
Belgaum	22.00	19.14	14.94***
SHZ			
Wellington	23.86	-	-

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

Centre wise yield gain over check at different centres in different wheat growing zones is given in Table 4. The significant yield gain in NHZ was 34.91 per cent at Almora centre followed by Khudwani Anantnag (22.88 %), Dhaulakuan Sirmour (20.78 %), Hamirpur (18.10 %), Malan Kangra (14.07 %) and Bajaura Kullu (13.73 %). In NEPZ, the yield gain varied from 4.60 per cent at Pundibari Coochbehar to 66.61 per cent at Sonitpur. The yield gain due to improved wheat varieties was 59.64 % at Kanke Ranchi, 52.02 % at Pusa Samastipur, 44.57 % at Kalyani Nadia, 26.33 % at Dhubri, 26.31 % at Darrang Mangaldai, 26.24 % at East Champaran, 21.70 % at Madhubani, 20.32 % at Varanasi and 19.85 % at Morabadi Ranchi. In NWPZ, the significant yield gain was highest at Saharanpur (31.36 %) followed by Ajmer (29.75 %), Kathua Jammu (15.40 %), Sriganganagar (14.73 %), Muzaffarnagar (14.25 %), Gurdaspur (12.71 %) and Durgapura Jaipur (10.64 %). In CZ, there was significant yield gain at Indore (47.49 %), followed by Ratlam (32.72 %), Panna (21.91 %), Neemuch (19.52 %), Mandsaur (18.42 %), Jagdalpur Bastar (17.77 %) and Lahar Bhind (17.25 %). In PZ, the significant yield gain of 33.29, 18.90, 18.61, 17.01 and 14.94 per cent was recorded at Parbhani, Pune, Niphad Nasik, Dharwad and Belgaum centers, respectively. In SHZ, the average yield of improved varieties under WFLDs was 23.86 q/ha at Wellington center.

Table 5: State wise performance of improved wheat varieties during *rabi* 2016-17

State	Mean yield (q/ha)		% Gain
	Improved	Check	
Uttarakhand	32.70	25.30	29.25***
HP	30.84	26.50	16.38***
J&K	33.45	28.64	16.79***
UP	50.98	44.81	13.77***
West Bengal	38.86	29.04	33.82***
Nagaland	10.40	8.95	16.20*
Assam	25.22	20.01	26.04***
Bihar	41.42	33.84	22.40***
Jharkhand	34.92	27.47	27.12***
Punjab	54.84	52.51	04.44***
Delhi	47.29	43.90	07.72**
Haryana	54.12	51.50	05.09***
Rajasthan	50.19	43.90	14.33***
Gujarat	47.87	44.58	07.38^{NS}
MP	47.79	39.81	20.05***
Chhattisgarh	27.61	23.84	15.81**
Maharashtra	40.69	33.35	22.01***
Karnataka	35.04	30.04	16.64**
Tamil Nadu	23.86	-	-

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

Statewise yield gain over check in different states is given in Table 5. All the improved varieties for different production conditions (timely sown, late sown, rainfed) have been included while calculating the yield gain over check/regional yield). The maximum yield gain was observed in West Bengal (33.82 %) followed by Uttarakhand (29.25 %), Jharkhand (27.12 %), Assam (26.04 %), Bihar (22.40 %), Maharashtra (22.01 %), MP (20.05 %), J&K (16.79 %), Karnataka (16.64 %), HP (16.38 %), Nagaland (16.20 %), Chhattisgarh (15.81 %), UP (13.77 %), Delhi (07.72 %), Gujarat (07.38 %), Haryana (05.09 %) and Punjab (04.44 %).

Table 6: Performance of improved timely sown aestivum wheat varieties during *rabi* 2016-17

Zone & Centre	Improved varieties	Mean yield (q/ha)	Check varieties	Mean yield (q/ha)	% Gain
NHZ					
Almora	VL 907	34.60	Local	25.12	37.74***
Almora	VL 953	33.59	Local	24.89	34.95***
Bajaura	HS 507	25.92	HPW 155	22.79	13.73***
Malan Kangra	HPW 349	28.67	HPW 155	25.11	14.18**
Malan Kangra	HS 507	37.73	HPW 155	33.09	14.02**
Dhaulakuan Sirmour (FLDs at Paonta valley)	HD 2967	35.75	HD 2380	29.60	20.78***
Shimla	HS 562	28.50	VL 892	26.00	09.62 NS
Shimla	HS 562	33.00	HS 507	29.00	13.79 NS
Khudwani Anantnag	SW 2 (SKW355)	27.50	SW 1	22.38	22.88***
Hamirpur	HPW 360	24.37	HPW 236	21.80	11.79***
Hamirpur	HPW 349	26.00	HPW 236	22.16	17.33***
Hamirpur	HS 507	24.52	HPW 236	19.18	27.84***
NEPZ					
Faizabad	HD 2967	47.80	PBW 343	40.20	18.91***
Kanpur	HD 2967	62.74	PBW 343	53.76	16.70***
Siddharthnagar	HD 2967	47.50	HD 2733	45.70	03.94 NS
Siddharthnagar	HD 2967	46.76	PBW 343	43.43	07.67*
Siddharthnagar	HD 2967	43.79	PBW 550	39.46	10.97*
Kalyani	HD 2967	39.80	UP 262	27.53	44.57***
Pundibari,Coochbehar	HD 2967	34.96	PBW 343	33.84	03.31 NS
Shillongani	HD 2967	22.58	Sonalika	19.50	15.79**
Shillongani	HD 2967	32.50	K 1006	30.50	06.56 NS
Darrang	HD 2967	29.09	Sonalika	23.03	26.31***
Dhubri	HD 2967	25.13	Mollah	20.13	24.84***
Dhubri	HD 2967	25.25	Sonalika	19.75	27.85***
Sonitpur	HD 2967	19.86	Local	11.92	66.61***
Chirang	HD 2967	22.00	Sonalika	17.00	29.41 NS
Pusa, Samastipur	HD 2967	46.06	PBW 343	30.36	51.71***
Pusa, Samastipur	HD 2967	46.75	UP 262	30.50	53.28*
Nawada	HD 2967	42.50	PBW 154	37.70	12.73***
Vaishali	HD 2967	50.64	HD 2733	46.77	08.27***
Kaimur, Bhabua	HD 2967	38.30	HUW 234	35.40	08.19 NS
Kaimur, Bhabua	HD 2967	40.00	PBW 502	35.42	12.93***
Madhubani	HD 2967	32.40	PBW 343	26.58	21.90***
Madhubani	HD 2967	32.41	UP 262	26.66	21.57***
East Champaran	HD 2967	41.25	HD 2733	37.00	11.49 NS
East Champaran	HD 2967	46.13	PBW 343	36.06	27.93***
West Champaran	HD 2967	41.20	HD 2733	33.17	24.21 NS
Kanke, Ranchi	HD 2967	34.10	Sonalika	21.36	59.64***
Marabadi, Ranchi	HD 2967	37.56	UP 262	31.34	19.85***
West Singhbhum	HD 2967	31.40	K 9107	27.53	14.06***

Zone & Centre	Improved varieties	Mean yield (q/ha)	Check varieties	Mean yield (q/ha)	% Gain
NWPZ					
Una	HD 3086	33.70	HD 2967	30.28	11.29 NS
Una	WH 1105	31.17	HD 2967	29.05	07.30**
Kathua	HD 3086	35.36	HD 2967	30.64	15.40***
Ludhiana	HD 3086	57.63	WH 1105	55.50	03.84 NS
Gurdaspur	DBW 88	47.25	HD 2967	45.00	05.00 NS
Gurdaspur	HD 3086	52.00	HD 2967	44.90	15.81***
Rupnagar	HD 3086	55.87	WH 1105	54.42	02.66**
Amritsar	HD 3086	53.18	HD 2967	51.88	02.51**
Agra	HD 3086	57.00	PBW 550	50.00	14.00 NS
Muzaffarnagar	HD 3086	46.37	PBW 502	38.85	19.36***
Saharanpur	HD 3086	57.34	PBW 226	43.65	31.36***
Noida	HD 3086	60.00	HD 2967	58.00	03.45 NS
Noida	HD 3086	59.40	PBW 343	54.78	08.43 NS
Noida	HD 3086	59.50	PBW 502	53.98	10.23***
IARI, New Delhi	HD 3086	51.86	PBW 343	47.00	10.34 NS
IARI, New Delhi	HD 3086	50.70	PBW 550	44.83	13.09***
Ujwa, New Delhi	HD 3086	42.99	HD 2851	39.70	08.29***
Hisar	HD 3086	58.33	HD 2967	57.08	02.19 NS
Ambala	HD 3086	50.40	HD 2967	47.10	07.01***
Kaithal	HD 3086	53.00	HD 2967	52.00	01.92 NS
Durgapura	HD 3086	52.83	Raj 3077	48.08	09.88***
Durgapura	HD 3086	53.67	Raj 4037	48.17	11.42***
Ajmer	HD 3086	61.59	Raj 3077	47.77	28.93***
Ajmer	HD 3086	62.00	Raj 4037	44.50	39.33 NS
Tonk	HD 3086	47.00	Raj 1482	44.50	05.62 NS
Tonk	HD 3086	48.38	Raj 3077	45.38	06.61 NS
Sriganganagar	HD 3086	51.40	HD 2967	44.80	14.73**
CZ					
Banswara	DBW 110	43.47	Raj 4037	37.71	15.27***
Kota	DBW 110	55.50	GW 322	48.00	15.63*
Kota	DBW 110	53.08	Raj 4037	45.67	16.23***
Sawai Madhopur	DBW 110	50.81	Raj 1482	45.60	11.43***
Junagarh	GW 451	46.25	Lok 1	44.65	03.58 NS
Junagarh	GJW 463	60.25	Lok 1	54.85	09.85 NS
Vijapur	GW 451	46.61	GW 496	42.34	10.09 NS
Jabalpur	DBW 110	24.33	Raj 4238	23.00	05.78 NS
Indore	HI 1605	51.00	Lok 1	31.67	61.04**
Panna	DBW 110	40.33	J W 3211	34.47	17.00**
Panna	DBW 110	39.35	Lok 1	32.20	22.20***
Panna	DBW 110	39.25	Sujata	31.35	25.20***
Ratlam	DBW 110	35.33	HI 1531	26.08	35.47***
Ratlam	DBW 110	35.04	Lok 1	26.34	33.03***
Ratlam	DBW 110	38.10	MP 3288	32.00	19.06 NS
Neemuch	DBW 110	65.40	GW 366	54.72	19.52***
Mandsour	DBW 110	45.00	Lok 1	38.00	18.42***
Ujjain	DBW 110	52.50	GW 322	52.00	00.96 NS
Ujjain	DBW 110	53.27	HI 1544	53.65	-00.71 NS
Ujjain	DBW 110	54.43	Lok 1	47.00	15.81***
Lahar Bhind	DBW 110	47.69	Lok 1	40.50	17.75***
Jagdalpur Bastar	DBW 110	22.61	Sujata	18.52	22.08***
Bilaspur	DBW 110	35.13	GW 273	30.63	14.69***
PZ					
Akola	HD 3090	28.48	Ajit 102	25.31	12.52 NS
Akola	HD 3090	20.74	Lok 1	17.27	20.09***
Niphad	NIAW 1994	42.70	Ajay 72	36.00	18.61***
Pune	MACS 6478	54.83	MACS 6222	47.67	15.02 NS
Dharwad	UAS 304	41.50	DWR 162	35.42	17.17**

Zone & Centre	Improved varieties	Mean yield (q/ha)	Check varieties	Mean yield (q/ha)	% Gain
Dharwad	UAS 347	32.00	Local	28.00	14.29 NS
Dharwad	UAS 415 (d)	38.00	DWR 1006	34.00	11.76 NS
Dharwad	UAS 446 (d)	34.00	B.Yellow	28.00	21.43 NS
SHZ					
Wellington	HW 5207	26.81	-	-	-
Wellington	HW 5216	23.75	-	-	-

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

The variety wise mean yield data has revealed that variety HS 507 gave significantly higher yield (37.73 q/ha) at Malan Kangra followed by HD 2967 (35.75 q/ha) at Dhaulakuan and VL 907 (34.60 q/ha) at Shimla center NHZ (Table 6). In NEPZ, the highest significant average yield was recorded by HD 2967 at Kanpur (62.74 q/ha) followed by the same variety HD 2967 at Vaishali (50.64 q/ha) and Faizabad (47.80 q/ha). In NWPZ, the highest significant average yield was recorded by HD 3086 at Ajmer (62.00 q/ha) followed by the same variety HD 3086 (60.00 q/ha) at Noida and 57.00 q/ha at Agra. In CZ, DBW 110 gave highest significant average yield of 65.40 q/ha at Neemuch centre followed by the same variety DBW 110 (55.50 q/ha) at Kota and DBW 110 (54.43 q/ha) at Ujjain center. In PZ, NIAW 1994 gave highest and significant yield (42.70 q/ha) at Niphad Nashik followed by UAS 304 (41.50 q/ha) at Dharwad centre. At Wellington centre of SHZ, HW 5207 variety recorded the average yield of 26.81 q/ha followed by HW 5216 (23.75 q/ha).

Table 7: Performance of improved late sown wheat varieties during *rabi* 2016-17

Zone & Centre	Improved varieties	Mean yield (q/ha)	Check varieties	Mean yield (q/ha)	% Gain
NEPZ					
Varanasi	HD 3118	39.50	HUW 234	32.83	20.32***
Siddharthnagar	DBW 107	42.90	HUW 234	39.13	09.63*
Siddharthnagar	DBW 107	44.15	PBW 154	40.55	08.88 NS
Siddharthnagar	DBW 107	39.80	PBW 550	39.35	01.14 NS
Sultanpur	DBW 107	40.77	PBW 373	35.28	15.56***
NWPZ					
Muzaffarnagar	DBW 71	39.24	PBW 590	36.09	08.73***
Meerut	DBW 71	50.68	PBW 226	47.38	06.96**
CZ					
Udaipur	Raj 4238	43.67	Lok 1	39.50	10.56***
Udaipur	Raj 4238	43.75	Raj 4037	43.00	01.74 NS
PZ					
Parbhani	HD 3090	43.21	HD 2189	33.14	30.39***
Parbhani	HD 3090	40.00	Lok 1	29.00	37.93***
Pune	HD 3090	51.43	NIAW 34	41.75	23.19***
Dharwad	HD 3090	41.75	DWR 195	35.75	16.78**
Dharwad	HD 3090	36.00	DWR 162	30.00	20.00 NS
Belgaum	HD 3090	22.00	DWR 162	19.14	14.94***

The late sown varieties mean yield data revealed that variety DBW 107 gave significantly higher yield (42.90 q/ha) at Siddharthnagar followed by the same variety DBW 107 (40.77 q/ha) at Sultanpur center in NEPZ (Table 7). In NWPZ, the significant average yield was recorded by DBW 71 at Meerut (50.61 q/ha) center. followed by the same variety DBW 71 (39.24 q/ha) at Muzaffarnagar center. In CZ, the significant average yield was recorded by Raj 4238 (43.67 q/ha) at Udaipur center. In PZ, HD 3090 gave significant higher yield (51.43 q/ha) at Pune center.

Table 8a: Zone wise productivity under FLDs over regional during *rabi* 2016-17

Zone	Mean yield (q/ha)		% Gain
	WFLDs	Regional	
NHZ	30.62	23.48	30.41***
NEPZ	39.15	29.35	33.39***
NWPZ	50.99	42.94	18.75***
CZ	45.49	39.11	16.31***
PZ	38.46	28.02	37.26***
SHZ	23.86	-	-

*** Significant at 1 percent level

The yield gain due to improved varieties over regional mean yield was highest in PZ (37.26 %) followed by NEPZ (33.39 %), NHZ (30.41 %), NWPZ (18.75 %) and CZ (16.31 %) (Table 8a).

Table 8b: Zone wise productivity under FLDs over check during *rabi* 2016-17

Zone	Mean yield(q/ha)		% Gain
	WFLDs	Check	
NHZ	30.62	24.34	25.80***
NEPZ	39.15	31.69	23.54***
NWPZ	50.99	46.70	09.19***
CZ	45.49	39.12	16.28***
PZ	38.46	32.05	20.00***
SHZ	23.86	-	-

*** Significant at 1 percent level

The yield gain due to improved varieties over check was highest in NHZ (25.80 %) followed by NEPZ (23.54 %), PZ (20.00 %), CZ (16.28 %) and NWPZ (09.19 %) (Table 8b). Yield gap in the NEPZ and CZ need to be bridged if India has to meet its ever increasing food requirements. The concerted efforts made by the developmental agencies in NEPZ will help in bridging the yield gap and increasing wheat productivity to meet the ever increasing requirement. The location specific highest varietal yield (Table 9) attained in a zone were; HI 8737 (d) (74.00 q/ha) at Indore centre in CZ, HD 3086 (66.50 q/ha) at Ajmer in NWPZ, HD 2967 (64.00 q/ha) at Kanpur in NEPZ, MACS 6478 (62.50 q/ha) at Pune in PZ, HW 1098 (*dic.*) (50.60 q/ha) in SHZ and HS 507 (46.00 q/ha) at Malan Kangra in NHZ (Table 9).

Table 9: Highest wheat variety yield attained in various zones during *rabi* 2016-17

Zone	Centre	Variety	Yield (q/ha)
NHZ	Malan Kangra	HS 507	46.00
NEPZ	Kanpur	HD 2967	64.00
NWPZ	Ajmer	HD 3086	66.50
CZ	Indore	HI 8737 (d)	74.00
PZ	Pune	MACS 6478	62.50
SHZ	Wellington	HW 1098 (*dic.*)	50.60

Table 10: Yield gain through bio-fertilizer during *rabi* 2016-17

Zone & Centre	100 % Inorganic + Bio-fertilizer (Azotobactor+PSB)		100 % Inorganic fertilizer		% Gain
	Variety	Mean yield (q/ha)	Variety	Mean yield (q/ha)	
NEPZ					
Faizabad	HD 2967	53.50	HD 2967	44.13	21.23***
Dimapur	DBW 107	10.40	DBW 107	08.95	16.20*
Shillongani	HD 2967	21.38	HD 2967	18.93	12.94 NS
NWPZ					
Agra	HD 3086	57.50	HD 3086	55.50	03.60 NS
Bijnor	DBW 71	49.40	DBW 71	43.99	12.30**
Pantnagar	HD 3086	57.25	HD 3086	55.00	04.09*
IARI, New Delhi	HD 3086	52.85	HD 3086	50.92	03.79 NS
IIWBR, Karnal	DBW 88	58.75	DBW 88	57.00	03.07 NS
IIWBR, Karnal	HD 3086	57.00	HD 3086	55.10	03.45 NS
IIWBR, Karnal	WH 1105	58.33	WH 1105	56.50	03.24 NS
Bhiwani	HD 3086	60.40	HD 3086	56.06	07.74**
CZ					
Jagdalpur	DBW 110	22.33	DBW 110	19.64	13.70***

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

FLDs on bio-fertilizer (Azotobactor & PSB) along with 100 % inorganic fertilizer as compared to check (100% recommended dose of inorganic fertilizer) showed that the significant yield gain was 21.23% at Faizabad followed by 16.20% at Dimapur in NEPZ, 12.30 % at Bijnor followed by 7.74 % at Bhiwani and 4.09% at Pantnagar in NWPZ and 13.70 % at Jagdalpur in CZ (Table 10).

Table 11: Performance of improved durum/dicoccum varieties during *rabi* 2016-17

Zone & Center	Improved variety	Mean yield (q/ha)	Check variety	Mean yield (q/ha)	% Gain
CZ					
Udaipur	HI 8737 (d)	47.20	Lok 1	40.80	15.69***
Vijapur	GDW 1255 (d)	40.67	GW 496	38.83	04.74 NS
Indore	HI 8713 (d)	71.50	HI 8498 (d)	49.50	44.44*
Indore	HI 8759 (d)	66.33	HI 8498 (d)	49.33	34.46*
Indore	HI 8737 (d)	70.75	HI 8498 (d)	47.50	48.95***
Bilaspur	HI 8737 (d)	34.30	GW 273	30.30	13.20***
PZ					
Pune	MACS 3949 (d)	42.50	MACS 3125 (d)	38.00	11.84 NS
Pune	HW 1098 (*dic.*)	50.60	MACS 2971 (*dic.*)	44.70	13.20 NS
SHZ					
Wellington	HW 1098 (*dic.*)	22.83	MACS 2971 (*dic.*)	-	-

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

In case of improved durum varieties, the variety HD 8713 (d) gave a significant average yield of 71.50 q/ha followed by HI 8737 (d) (70.75 q/ha) at Indore centre in CZ. In PZ, the variety HW 1098 (*dic.*) gave an average yield of 50.60 q/ha at Pune center, though it was non-significant (Table 11).

Table 12: Performance of improved varieties under rainfed/restricted irrigation conditions

Zone & Center	Improved variety	Mean yield (q/ha)	Check variety	Mean yield (q/ha)	% Gain
NHZ					
Almora	VL 953	14.00	Local	11.54	21.32***
Bajaura	HS 507	25.92	HPW 155	22.79	13.73***
Malan	HPW 349	28.67	HPW 155	25.11	14.18**
Malan	HS 507	37.73	HPW 155	33.09	14.02**
Shimla	HS 562	28.50	VL 892	26.00	09.62 NS
Shimla	HS 562	33.00	HS 507	29.00	13.79 NS
Khudwani	SW 2 (SKW355)	27.50	SW 1	22.38	22.88***
Hamirpur	HPW 360	24.37	HPW 236	21.80	11.79***
Hamirpur	HPW 349	26.00	HPW 236	22.16	17.33***
Hamirpur	HS 507	24.52	HPW 236	19.18	27.84***
CZ					
Banswara	DBW 110	43.47	Raj 4037	37.71	15.27***
Kota	DBW 110	55.50	GW 322	48.00	15.63*
Kota	DBW 110	53.08	Raj 4037	45.67	16.23***
Sawai Madhopur	DBW 110	50.81	Raj 1482	45.60	11.43***
Jabalpur	DBW 110	24.33	Raj 4238	23.00	05.78 NS
Indore	HI 1605	51.00	Lok 1	31.67	61.04**
Panna	DBW 110	40.33	J W 3211	34.47	17.00**
Panna	DBW 110	39.35	Lok 1	32.20	22.20***
Panna	DBW 110	39.25	Sujata	31.35	25.20***
Ratlam	DBW 110	35.33	HI 1531	26.08	35.47***
Ratlam	DBW 110	35.04	Lok 1	26.34	33.03***
Ratlam	DBW 110	38.10	MP 3288	32.00	19.06 NS
Neemuch	DBW 110	65.40	GW 366	54.72	19.52***
Mandsour	DBW 110	45.00	Lok 1	38.00	18.42***
Ujjain	DBW 110	52.50	GW 322	52.00	00.96 NS
Ujjain	DBW 110	53.27	HI 1544	53.65	-00.71 NS
Ujjain	DBW 110	54.43	Lok 1	47.00	15.81***
Lahar Bhind	DBW 110	47.69	Lok 1	40.50	17.75***
Jagdalpur	DBW 110	22.61	Sujata	18.52	22.08***
Bilaspur	DBW 110	35.13	GW 273	30.63	14.69***
SHZ					
Wellington	HW 5207	26.81	-	-	-
Wellington	HW 5216	23.75	-	-	-

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

In NHZ, at Tutikandi Shimla center, improved rainfed variety HS 507 yielded 37.73 q/ha which was significantly higher than the check varieties, followed by HPW 349 (28.67 q/ha) at Malan Kangra, SKW 355 (27.50 q/ha) at Khudwani Anantnag and HPW 360 (24.37 q/ha) at Hamirpur center. In CZ, DBW 110 gave significantly higher yield of 65.40 q/ha at Neemuch center which was significantly higher than the check variety followed by the same variety DBW 110 (55.50 q/ha) at Kota center. In SHZ, HW 5207 yielded 26.81q/ha at Wellington center (Table 12).

Table 13: Performance of zero tillage/happy seeder in NWPZ during *rabi* 2016-17

Zone & Centre	Improved varieties	Zero tillage mean yield (q/ha)	Conventional tillage mean yield (q/ha)	% Gain
NEPZ				
Faizabad	HD 2967	45.50	44.00	03.41 NS
Pundibari, Coochbehar	HD 2967	36.23	34.32	05.57 NS
Shillongani	HD 2967	24.65	21.70	13.59 NS
NWPZ				
Ludhiana	WH 1105	57.50	56.00	02.68 NS
Agra	HD 3086	56.25	55.00	02.27 NS
Pantnagar	HD 3086	51.25	53.13	-03.54 NS
Kaithal (Happy Seeder)	HD 3086	58.00	56.00	03.57 NS

NS– Non-significant

The zero tillage technology under wheat FLDs has shown positive and non significant impact at all the centers except Pantnagar.

Table 14: Performance of rotavator during *rabi* 2016-17

Zone & Centre	Improved varieties	Rotavator mean yield (q/ha)	Conventional tillage mean yield (q/ha)	% Gain
NWPZ				
Ludhiana	WH 1105	57.33	55.50	03.30 NS
Ludhiana	HD 3086	57.80	57.00	01.40 NS
Bijnor	DBW 71	48.15	45.17	06.60 NS
Meerut	DBW 71	52.00	44.00	18.18 NS
Pantnagar	HD 3086	54.83	53.75	02.01 NS
Kaithal	HD 3086	54.00	53.00	01.89 NS

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

The performance of rotavator technology under WFLDs has shown positive and non-significant impact at all the centers.

Chemical control of yellow rust

To test the alternate fungicides such as Bayleton and Triadimefon, wheat FLDs were organized at Karnal center. The yellow rust did not appear in the demonstrated field.

Performance of salt tolerant varieties

The performance of salt tolerant variety KRL 210 under wheat FLDs have shown positive and significant impact at CSSRI Karnal center (Table 15).

Table 15: Performance of salt tolerant varieties in NWPZ during *rabi* 2016-17

Zone & Center	Improved variety	Mean yield (q/ha)	Check variety	Mean yield (q/ha)	% Gain
CSSRI- Karnal (FLDs in Kaithal district)	KRL 210	49.97	HD 2967	47.93	04.26*

For effective and efficient use of water, demonstration on sprinkler/drip irrigation were organized at Bhiwani and Vijapur centers. There was significant yield gain due to sprinkler irrigation at Bhiwani center. There was yield gain due to drip irrigation at Vijapur center but non significant. It is visible that we can produce similar yield with less use of water. Therefore, such technologies have great future in view of the declining water table across the country.

The aim of 'Per drop more crop' can be realised by demonstrating the micro irrigation technologies at farmers' fields. The main limitation with this technology is that many centers does not possess the required infrastructure to demonstrate micro irrigation technologies.

Table 16a: Performance under sprinkler/drip irrigation during *rabi* 2016-17

Zone & Center	Improved varieties	Drip irrigation mean yield (q/ha)	Flood irrigation mean yield (q/ha)	% Gain
Bhiwani (sprinkler)	HD 3086	57.00	50.20	13.55**
Vijapur, Mehsana (drip)	GDW 1255 (d)	42.00	40.00	05.00 NS
Vijapur, Mehsana (drip)	GW 451	53.30	50.00	06.60 NS

Performance of herbal hydrogel

The performance of herbal hydrogel under wheat FLD has shown positive but non-significant impact at Karnal center. With this technology, two irrigations were saved at farmer's field under demonstration.

Table 16b: Performance of Herbal Hydrogel in wheat crop at Karnal center during *rabi* 2016-17

Center	Improved variety	With hydrogel use mean yield (q/ha)	Without hydrogel use mean yield (q/ha)	% Gain
ICAR-IIWBR, Karnal	DBW 71	55.00	53.50	02.80 NS

Suggestions by the cooperating centers of different zones for the smooth conduct of wheat FLDs

Suggestions	Zone					
	NHZ	NEPZ	NWPZ	CZ	PZ	SHZ
Budget of FLDs should be increased	√	√				
Timely/ early release of funds should be ensured	√	√	√	√		√
Timely supply of inputs to the farmers	√	√	√			
Supply of quality seed of newly released variety should be continued		√				
Budget pertaining to POL/hiring of vehicle for monitoring of FLDs, organizing field day should be increased		√	√			
Timely supply of seeds to ensure timely conduct of demonstrations		√	√	√		
Late sown variety with low water requirement/limited irrigation should be promoted through FLDs		√				
Short duration, less water requiring and heat tolerant variety is required.			√			
Centers should be allowed to conduct FLDs to individual farmers not in cluster approach			√			
Number of demonstrations should be increased			√	√	√	
Training on latest technologies should be organised before start of FLDs programme		√			√	
The Budget for complete package i.e. seed, fertilizer and plant protection chemicals should be provided		√		√		
More than one variety should be provided to a centre under FLD				√		
FLD Programme should be continued				√		
Release the high yielding variety of wheat for semi-irrigated conditions				√		

Suggestions by the cooperating centers of different zones for the smooth conduct of barley FLDs

Suggestions	Zone		
	NEPZ	NWPZ	CZ
Timely/ early release of funds should be ensured			√
Additional fund for organizing field day and POL under FLDs		√	
Increase budget for POL/hiring of vehicle for monitoring of FLD sites and organizing field day	√	√	
Centers should be allowed to conduct FLDs to individual farmers in different villages/multilocational, not in cluster approach	√	√	
Number of demonstrations should be increased			√
More than one variety should be provided to a centre under FLD			√
Plot size for barley FLDs should be reduced to 0.20 ha		√	
Release the high yielding variety of barley suitable for semi-irrigated conditions			√

Farmers' perception about FLDs

- The farmers appreciated the new wheat production technologies demonstrated under FLDs. Improved varieties performed better, gave more yields than the check varieties. New varieties have good grain /seed quality, disease resistance, uniform and good crop growth and crop stand, lodging resistance, long compact ear head, high grain and straw yield which provided good returns to the farmers. There was negligible weed infestation and no serious disease was observed.
- The zero tillage technology in wheat saves time, labour, money and energy.
- Bio-fertilizers (Azotobactor and Phosphorus Solubilizing Bacteria) are free living organisms which fix atmospheric nitrogen and improve the solubility of phosphorus in soil by saving fertilizer.
- Neighboring farmers responded positively about FLDs and would like to grow the improved variety and they have asked for improved varieties seed from the FLD farmer.
- More financial support is to be provided under the FLD programme.
- FLD is an effective method of transfer of technology. Regular availability of improved varieties will certainly enhance wheat productivity along with farmers' income.

Monitoring of Front Line Demonstrations (FLDs)

The ICAR-IIWBR team accompanied by the experts from the Ministry of Agriculture & Farmers Welfare and the concerned centres, monitored the following FLDs centers during the crop season 2016-17.

Monitoring Team Leader	Centers Monitored	Dates of Monitoring
Dr. Satyavir Singh	Belgaum and Dharwad	21-22 February, 2017
Dr. Sendhil R	Indore, Ujjain, Jabalpur	2-5 March, 2017
Dr. Anita Meena	Ajmer, Tonk, Chomu-Jaipur, and Durgapura-Jaipur	6-9 March, 2017

Front Line Demonstrations (FLDs) Monitoring Report of KVK-Belgaum and UAS-Dharwad centers during wheat crop season 2016-17.

Monitoring Center : KVK-Belgaum and UAS-Dharwad in Karnataka state.
Monitoring Date : 21.02.2017
Monitoring Team
1.Dr. Satyavir Singh, PS & PI (Social Sciences), ICAR-IIWBR, Karnal
2.Dr. M.Y. Kamatar, Pr. Scientist (Breeding) & Head WIP, UAS, Dharwad (Karnataka)
3.Shri S. Srikanth, STA, MOA&FW, DOAC&FW, DOD, Hyderabad.
4.Shri Shiva Kumar K Kumbar, BTM, ATMA, O/O ADA, Raibag, Belgaum (Karnataka)
5.Mr. Rahul, Field Staff, KVK, Belgaum (Karnataka).

The team visited the wheat FLDs on 21st February, 2017 at village Harugeri (variety HD 3090), taluka Raibag, district Belgaum conducted by KVK-Belgaum. The team also visited wheat FLDs at villages Dharmatti (variety HW 1098) and Singlapur (varieties HD 3090 and HW 1098) in district Belgaum; and village Hanagandi (variety UAS 304) in district Bagalkot conducted by UAS-Dharwad. The technology i.e. improved or newly released wheat variety (NRWV) with complete package of practices was demonstrated at farmers' fields.

Monitoring Center : UAS, Dharwad (Karnataka)
Monitoring Date : 22.02.2017
Monitoring Team
1.Dr. Satyavir Singh, PS & PI (Social Sciences), ICAR-IIWBR, Karnal
2.Dr. M.Y. Kamatar, P. Scientist (Breeding) & Head WIP, UAS, Dharwad (Karnataka)
3.Shri S. Srikanth, STA, MOA&FW, DOAC&FW, DOD, Hyderabad.

The team visited the wheat FLDs on 22nd February, 2017 conducted by UAS-Dharwad at villages Kamlapur (variety UAS 304) and Maradagi (variety UAS 304) in district Dharwad; villages Arkeri (variety HD 3090) and Haganur (variety HW 1098) in district Bagalkot. The technology i.e. improved or newly released wheat variety (NRWV) with complete package of practices was demonstrated at farmers' fields.

The following observations were made during visit of the wheat FLDs farmers' fields at KVK-Belgaum and UAS-Dharwad centers.

- The weeds infestation in FLDs was negligible.
- The wheat FLDs crop was free from diseases.
- New wheat varieties have good tillering good crop stand, long earhead, more number of grains per earhead and bold grains.
- Wheat straw is good for domestic animals.
- The improved wheat varieties being popularized were HD 3090, UAS 304 and HW 1098. The check varieties being used were DWR 162 and DWR 195.
- The neighbour farmers of the FLDs were impressed by the performance of new varieties.
- There is no lodging/less lodging in new varieties.
- Farmers expected more yield from the new varieties than the old varieties.
- FLD is good source of transfer of technology.
- The farmers appreciated the conduct and supervision of FLDs by cooperators.

Front Line Demonstrations (FLDs) Monitoring Report of IARI-RS-Indore, KVK-Ujjain, JNKVV-Jabalpur during wheat crop season 2016-17.

Monitoring Center : IARI, Regional Station, Indore, MP
Monitoring Date : 02.03.2017
Monitoring Team

1. Dr. R. Sendhil, Scientist, Social Sciences, ICAR-IIWBR, Karnal, Haryana
2. Dr. A.K. Singh, Principal Scientist and FLD Incharge, IARI, RS, Indore, MP.
3. Sh. Vipin Kumar, Assistant Director, DPD, Bhopal, MP.
4. Sh. Abdul Waseem, Field/Farm Technician, IARI, RS, Indore, MP.

Improved or newly released wheat varieties (11 varieties) *viz.,* HI 1605, HI 1531, HI 8663, HI 8737, HI 1544, HI 8759, HI 8713, HD 2932, HI 8627, HD 2987 and HI 1500 were demonstrated in 13.50 ha of land at farmers' field against four popular check varieties (Lok 1, HI 8498, Sujata and C 306) across four villages namely Makodia, Machhukhedi, Puwalda Happa and Puwalda Dai of Sanwer block, Indore district (Madhya Pradesh). Five types of technologies were demonstrated at farmer's field by the Indore Center. The demonstrated technologies were: Limited irrigation (aestivum), Limited irrigation (durum), Assured irrigation (aestivum), Assured irrigation (durum), and Late sown (aestivum).

The following observations were made during the overall monitoring and discussion with the FLD beneficiaries' *viz.,* Sh.Amjad Patel, Sh.Wahid Patel, Sh.Kadir Patel, Sh.Islam Patel, Sh.Mahendra Maheswari and Sh.Shair Mohmmad, Sh.Shubhash Rathore, Sh.Sharafat Patel, Sh.Sultan Patel, Sh.Asif Patel, Sh.Yunus Patel, Sh.Yusuf Patel, Sh.Sikander Patel, Sh.Islam Patel, Sh.Naushad Patel, Sh.Daulat Patel and Sh.Dilawar Patel.

- As per the discussion and site visit of the above farmers' field, all the farmers opted for line sowing using seed drill. Around 40kg of seeds per acre was used for sowing.
- Around 2-3 irrigation were given under limited irrigation condition
- Around 5 irrigations were given under assured irrigation facility
- HI 1544 performance was good in comparison to the other demonstrated varieties. On an average it has around 25 tillers per plant.
- Under assured irrigation facility, farmers expect yield even close to 70 quintals per hectare.
- A majority of the monitored fields were infested with weeds like *Phalaris minor* and wild oats.
- Fertilizers were applied based on the recommended dose by the Indore Centre for both limited irrigation and assured irrigation conditions.
- The monitored plots were not infested with any insect-pests and diseases.
- The crop growth was normal in the region and harvesting by employing manual labour is expected to be done in a couple of weeks in the monitored plots.
- Farmers valued the demonstrations of new wheat production technologies via FLDs as the improved wheat varieties perform better and expected to give more yield than the local check varieties. They appreciated the technical assistance and advisory offered by the ICAR-IARI RS Indore centre. They are interested to continue wheat cultivation even if the assistance under FLD programme is stopped.

Monitoring Center : KVK-Ujjain, MP
Monitoring Date : 03.03.2017 and 04.03.2017
Monitoring Team
1. Dr. R. Sendhil, Scientist, Social Sciences, ICAR-IIWBR, Karnal, Haryana
2. Dr. S.K. Kaushik, Scientist (Plant Breeding) and FLD Incharge, KVK Ujjain, MP.
3. Sh. Vipin Kumar, Assistant Director, DPD, Bhopal, MP.

Newly released wheat variety *viz.,* DBW 110 has been demonstrated in 10 hectares of farmers' field by the KVK Ujjain centre against two popular checks namely HI 1544 and Lok 1. Out of 25 demonstration sites spread at different villages, 10 plots were monitored. The following observations were made during the overall monitoring and discussion with the following FLD beneficiaries' *viz.,* Sh.Bharat Das, Sh.Jagdish Prajapat, Sh.Mangal Patel, Smt.Ramkanya, Sh.Hakim Singh, Sh.Sewa Ram, Sh.Bala Ram, Smt.Champa Bai, Sh.Hakim Singh and Sh.Bharat Singh.

- All farmers have used seed drill for sowing (seed rate @ 40kg/ac) and some of them have used the drill criss-cross with the ambition of getting more yield. Hence, it was recommended to follow the standard practice.
- It was informed that the seeds were treated with Azotobacter @5ml/kg before sowing. However in this case, the demonstrated and the check variety should be same with and without application of Azotobacter in order to avoid the varietal influence on yield.

- The beneficiaries reported that around four irrigations were given and they expect yield around 40-60 Quintals/ha.
- In a few of the plots, *Phalaris minor* was found to be more in number. Most of the farmers have used 2,4 D to manage weeds which is for controlling broad leaved weeds only.
- In the plot of Sh.Hakim Singh S/o Sh.Sajjan Singh, several plants were found with stunted spikes (refer picture furnished in the Annexure).
- In Sh.Bharat Singh's plot, termite attack was found in a few pockets.
  Technical assistance and advisory offered by the KVK-Ujjain centre was much appreciated by the beneficiaries and they are interested to continue wheat cultivation in the coming years even if the assistance from FLD programme is discontinued.

Monitoring Center : JNKVV, Jabalpur, MP
Monitoring Date : 05.03.2017
Monitoring Team
1. Dr. R. Sendhil, Scientist, Social Sciences, ICAR-IIWBR, Karnal, Haryana
2. Dr. S.K. Singh, Senior Scientist, JNKVV, Jabalpur
3. Sh. Vipin Kumar, Assistant Director, DPD, Bhopal, MP.

Improved or newly released wheat variety DBW 110 has been demonstrated in 5 hectares of land at farmers' field in Chatarpur village of Pnagar block, Jabalpur district (Madhya Pradesh). It is recommended to allot at the maximum of 1 hectare per beneficiary for demonstration following the FLD guidelines. The variety DBW 110 was demonstrated at three farmers' field against HD 2967 (not recommended to this region) and Raj 4238 with respect to restricted irrigation. The following observations were made during the overall monitoring and discussion with the FLD beneficiaries' *viz.,* Sh.Pankaj Saxena and Sh.Deepak Yadav and all the demonstrated plots were monitored.

- As per the discussion and site visit, it was informed that the demonstrations were done jointly by the beneficiaries in a pooled area.
- Seeds were sown at the rate of 40kg/acre using seed drill.
- The monitored fields were infested with a few weeds.
- Harvesting is expected to commence in a couple of weeks in the monitored plots and around 40 quintals/ha was their yield expectation.
- Few plants in the check plot (Raj 4238) were infested with loose smut in Sh.Trilok Yadav's field.
- Sprinkler method of irrigation has been followed in the monitored fields owing to the undulated topography.
- Farmers valued the demonstrations of new wheat production technologies via FLDs as the improved wheat varieties perform better and expected to give more yield than the check varieties. They appreciated the technical assistance and advisory offered by the JNKVV, Jabalpur centre. They are interested to continue wheat cultivation even if the assistance from FLD programme is stopped.

Suggestions for betterment of the FLD programme

- The FLD centres should strictly follow the guidelines as recommended by the MoA&FW.
- The demonstration site selection should be near to the road and each FLD plot should have a banner/board with the details of demonstrated and check varieties for creating awareness among the public.
- There should be a clear-cut boundary distinction between the demonstrated and check plot.
- It is suggested for soil test based fertilizer and micro nutrient application.
- To strictly follow the scientific package of practices as recommended by the FLD coordinating centres particularly for weed control as weeds were found to be more in number in a majority of the fields.
- Early allotment of FLDs for better conduct following the sowing window period.
- Further, funds and/or seeds of demonstrated varieties should reach the concerned FLD center before the start of the crop season so that FLDs can be planned and organised in time and efficient way.
- Seeds of the newly released varieties shall be purchased from the State Seed Corporation or nearby Government authorized seed production farm or research centres for timely delivery to the FLD beneficiaries.

Front Line Demonstrations (FLDs) Monitoring Report of KVK-Tonk, KVK-Ajmer, RARI-Durgapura Jaipur and KVK-Chomu Jaipur centers during wheat crop season 2016-17.

Monitoring Center : KVK, Tonk, Rajasthan
Monitoring Date : 06.03.2017
Monitoring Team
1. Dr. Anita Meena, Scientist (Soil Science), ICAR-IIWBR, Karnal.
2. Dr. Bansidhar Choudhary, Agronomist, KVK, Banasthali, Tonk (Rajasthan).
3. Mr. Ram Narayan Ahirwar, Sr. Tech. Assistant, DMD, Jaipur (Rajasthan).

The team visited villages Jujharpura, Bhanvati and Bahakwa of Niwai block in Tonk district on 6th March, 2017 for monitoring of FLDs on Wheat conducted by KVK, Banasthali Vidhyapith during *Rabi* 2016-17 under NFSM. Total 10 FLDs on wheat were conducted over 5 ha area. The improved wheat variety HD-3086 (notified in the year 2014) was distributed among the beneficiary farmers. The technologies i.e., improved Wheat variety HD-3086 with complete package of practices was demonstrated at farmers fields. The check variety used was Raj 1482. The condition of crop was good. Display board was not found in demonstrated fields.

Monitoring Center : KVK, Tabiji farm, Ajmer, Rajasthan
Monitoring Date : 07.03.2017
Monitoring Team
1. Dr. Anita Meena, Scientist (Soil Science), ICAR-IIWBR, Karnal.
2. Dr. Ramakant Sharma & Dr. D.S. Bhati, Scientist (Extension), KVK, Ajmer (Raj).
3. Mr. Ram Narayan Ahirwar, Sr. Tech. Assistant, DMD, Jaipur (Rajasthan).

The team visited village Dang Saradhana of Pisangan block in Ajmer district on 7th March, 2017 for monitoring of FLDs on wheat conducted by KVK, Tabiji Farm Ajmer during *Rabi* 2017. Total 12 FLDs on wheat were conducted over 4.8 ha area. The improved wheat variety HD-3086 was distributed among the beneficiary farmers. The technologies i.e., improved Wheat variety HD-3086, seed inoculation with azotobactor and PSB with row to row spacing (20-25 cm) and irrigation at critical stages was demonstrated at farmer's field. The check variety of wheat was Raj-3077. The crop condition was good and found at milking stage in demonstrated field. Display board was found at FLDs sites.

Monitoring Center : RARI (SKNAU), Durgapura, Jaipur, Rajasthan
Monitoring Date : 08.03.2017
Monitoring Team
1. Dr. Anita Meena, Scientist (Soil Science), ICAR-IIWBR, Karnal.
2. Dr. S.K. Goyal, STA, RARI (SKNAU), Durgapura, Jaipur (Rajasthan)
3. Mr. Ram Narayan Ahirwar, Sr. Tech. Assistant, DMD, Jaipur (Rajasthan).

The team visited village in Idan ka bass of Jobner block in Jaipur district on 8th March, 2017 for monitoring of Wheat and Barley FLDs conducted by RARI-Durgapura, Jaipur during *Rabi* 2016-17 under NFSM. RARI-Durgapura conducted 12 FLDs of wheat over 6 ha area and 10 FLDs of Barley over 5 ha area. The seed of improved wheat variety HD-3086 and improved barley variety BH-946 (notified in the year 2013) were distributed among the beneficiary farmers. The technologies i.e., improved wheat variety HD-3086 and barley variety BH-946 with complete package of practices was demonstrated at farmer's field. The check variety of wheat was Raj-3077. Both crop conditions were good. Wheat crop was found at dough stage and barley crop was found at maturity stage in demonstrated field. Display board was not found at FLDs sites.

Monitoring Center : KVK, Tankarda, Chomu, Jaipur, Rajasthan
Monitoring Date : 09.03.2017
Monitoring Team
1. Dr. Anita Meena, Scientist (Soil Science), ICAR-IIWBR, Karnal.
2. Dr. Babu Lal Yadav, Agronomist, KVK, Chomu, Jaipur (Rajasthan)
3. Mr. Ram Narayan Ahirwar, Sr. Tech. Assistant, DMD, Jaipur (Rajasthan).

The team visited village in Devthala of Pachayat Samiti Govindgarh in Jaipur district on 9th March, 2017 for monitoring of Barley FLDs conducted by KVK, Chomu, Jaipur during *Rabi* 2016-17 under NFSM. KVK, Chomu conducted 08 FLDs of barley over 5 ha area. The improved barley variety BH-946 was

distributed among the beneficiary farmers. The technologies i.e., improved barley variety BH-946 with integrated crop management was demonstrated at farmer's field. The check variety of barley was RD2794/RD2052. The sowing of barley crop was done in first week of November, 2016. The crop condition was good and found at maturity stage in demonstrated field. Display board was found at FLDs sites.

Observations / Farmers Feedback during FLDs field visit

- The sowing of wheat and barley crops was done in-between 1st week to 3rd week of November, 2016 in the visited centres. Line sowing was adopted by all beneficiary farmers in demonstrated plots.
- Display board was found at Ajmer and Chomu FLDs sites whereas no display board was found at Tonk and RARI-Durgapura FLDs sites.
- No incidence of insect-pest and disease was observed in the fields of visited centres. Weed infestation was negligible in the FLDs fields.
- The condition of both wheat and barley crop was very good. Wheat crop was found at milking to maturity stage while barley crop was found at maturity stage.
- In demonstrated fields of visited centres, better crop stand was observed due to no lodging, compact, long ear head, more tillers and more number of grains per ear head.
- The farmers appreciated the performance of variety of wheat (HD-3086) and barley (BH-946) in comparison to local varieties of the crop grown by them. Further, they informed that they will continue to grow these varieties.
- The farmers expected more yield from the improved varieties of wheat and barley than the check varieties.

Table 17: Improved and check wheat varieties at farmers' field in various zones during *rabi* 2016-17

Zone	Improved Varieties	Check Varieties
NHZ	VL 953, VL 907, HS 507, HPW 349, HD 2967, HS 562, SW 2 (SKW 355), HPW 360	HPW 155, HD 2380, HPW 236, VL 892, HS 507, SW 1 (SKW 196), Local
NEPZ	HD 2967, HD 3118, DBW 107	HD 2967, PBW 343, HUW 234, HD 2733, PBW 550, PBW 154, PBW 373, UP 262, DBW 107, Sonalika, K 1006, Mollah, Local, PBW 502, K 9107
NWPZ	HD 3086, WH 1105, DBW 88, DBW 71, KRL 210	HD 2967, WH 1105, HD 3086, PBW 550, PBW 502, PBW 590, DBW 71, PBW 226, HD 2851, DBW 88, Raj 4037, Raj 3077, Raj 1482
CZ	HI 8737 (d), Raj 4238, DBW 110, GJW 463, GW 451, GDW 1255 (d), HI 1605, HI 8759 (d), HI 8713 (d)	Lok 1, Raj 4037, GW 322, Raj 1482, GW 366, GW 496, GW 451, GDW 1255 (d), Raj 4238, HI 8498 (d), Sujata, JW 3211, HI 1531, MP 3288, HI 1544, DBW 110, GW 273
PZ	HD 3090, NIAW 1994, MACS 6478, MACS 3949 (d), HW 1098 (dic.), UAS 304, UAS 446 (d), UAS 347, UAS 415 (d)	Ajit 102, Ajay 72, HD 2189, MACS 6222, MACS 3125 (d), MACS 2971 (dic.), NIAW 34, DWR 162, DWR 195, B.Yellow, Local, DWR 1006 (d), Lok 1
SHZ	HW 1098 (dic.), HW 5207, HW 5216	-

Table 18: Zone wise distribution of popular wheat varieties during *rabi* 2016-17

Zone	Popular Wheat Varieties
NHZ	Local, VL 616, VL 829, HPW 155, HPW 349, DPW 621-50, HD 2967, HS 507, HPW 368, HPW 236, VL 907, Raj 3765, Sonalika, PBW 343, WH 1080, HD 2380, VL 892, SW 1 (SKW 196)
NEPZ	PBW 343, K 0307, DBW 17, Raj 3765, K 9107 (Dewa), Halna, PBW 373, K 0402, HUW 234, HD 2733, PBW 550, UP 262, HD 2967, Local, Sonalika, K 1006, Mollah, PBW 154, HD 2985, PBW 502
NWPZ	HD 2967, PBW 621, DBW 17, DPW 621-50, DBW 88, Raj 3077, Raj 3765, PBW 725, PBW 677, PBW 550, HD 3086, WH 1105, PBW 343, PBW 373, PBW 502, DBW 16, PBW 590, PBW 226, UP 2628, WH 711, Raj 4037, Raj 4079, VL 907, HPW 349
CZ	Raj 4037, Raj 3765, HI 1544, GW 366, HI 8498 (d), GW 322, Raj 3077, GW 273, Raj 1482, GW 496, Raj 4238, WH 147, Sujata, JW 3211, GW 173, Ratan, Lok 1
PZ	Lok 1, Ajit 102, Ajay 72, Kedar Ankur, NIAW 34, GW 496, HD 2189, NIAW 301, MACS 2971 (dic.), Golden, DWR 162, DWR 185 (d)
SHZ	HW 1098 (dic.), MACS 2971 (dic.), HW 5207, HW 5216

Conducting wheat FLDs at ICAR-IIWBR, Karnal centre during *rabi* 2016-17

During *rabi* 2016-17, seven hectares WFLDs were conducted at eleven farmers' fields in the villages namely Kalesar in Yamunanagar district and villages Jadoli Khurd, Jadoli Kalan, Mahmoodpur, Kharajpur and Mugal Majra in Karnal district of Haryana state using vareties HD 3086, WH 1105 and DBW 88. The demonstrations were conducted with complete package of practices and farmers were provided with the critical inputs as per provision under the programme.

Special wheat FLDs in high altitude area of HP during summer-2016

During summer-2016, 5.1 hectares special wheat FLDs were conducted at twenty six farmers' fields in the villages of district Lahaul & Spiti (HP) using HS 375 variety. Varietal demonstrations were conducted.

Constraints analysis in different wheat producing zones of India (2016-17)

India witnessed a continuous increase in wheat production in the recent years. The current year production has reached an all-time record of 97.44 million tonnes with an average producitivity of 3172 kg/ha. Variation in yield levels exists among different states, farmers and farms leading to yield gap in different states and different zones. Several reasons shall be attributed to this yield gap which needs to be addressed for sustainable wheat production. Through constraint analysis, an effort has been made to identify constraints impeding wheat production in different parts of the country.

Methodology

An inventory of constraints impeding wheat production in the country has been 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 wheat FLDs. The responses were collected on a three point continuum *viz;* most serious, serious and not serious. The scores were assigned as 3, 2, 1 for the most serious, serious and not serious constraints, respectively. Based on the total score for each constraint, the rank was calculated to ascertain the level of seriousness in the wheat and barley production zone.

Northern Hills Zone (NHZ)

In NHZ (Table 19), non-availability of seed of newly released wheat variety, rodents, high cost of inputs, non-availability of farm machinery and small land holding were perceived as top five major constraints.

Table 19: Constraints in NHZ **(n=162)**

Constraints	Score	Rank
Non-availability of seed of newely released variety	287	I
Rodents	252	II
High cost of inputs	247	III
Non-availability of farm machinery	235	IV
Small land holding	230	V
Untimely rain	224	VI
Lack of training facility	221	VII
Lack of extension literature	218	VIII
Non-availability of labour	213	IX
Poor Quality herbicides/pesticides	210	X

North Eastern Plains Zone (NEPZ)

Realizing the potential of north eastern plains zone, all categories of constraints need to be addressed immediately for achieving the targets of second green revolution. Among major constraints of this zone, non-availability of seeds of newly released variety, followed by small holding size, high cost of inputs, lack of knowledge among the farmers about recent technologies, and non-availability of labour took the top slot (Table 20). Farmers need to be educated and trained on recent wheat production technologies to harvest potential yield in their fields.

Table 20: Constraints in NEPZ **(n=324)**

Constraints	Score	Rank
Non-availability of seed of newely released variety	484	I
Small land holding	441	II
High cost of inputs	430	III
Lack of knowledge among farmers about recent technologies	428	IV
Non-availability of labour	423	V
Low organic matter	405	VI
Lack of irrigation facilities	389	VII
Chenopodium album (Bathua)	387	VIII
Poor quality seeds	385	IX
Poor information delivery by state extension machinery	379	X

North Western Plains Zone (NWPZ)

Phalaris minor followed by low price of wheat, high cost of inputs, small land holding and declining water table were perceived as major constraints in this mega zone (Table 21).

Table 21: Constraints in NWPZ **(n= 287)**

Constraints	Score	Rank
Phalaris minor	343	I
Low price of wheat	312	II
High cost of inputs	305	III
Small land holding	269	IV
Declining water table	267	V
Non availability of seed of newely released variety	261	VI
Chenopodium album (Bathua)	232	VII
Low organic matter	228	VIII
Erratic power supply	224	IX
Higher custom hiring rate of land leveling, field preparation, sowing & harvesting	223	X

Central Zone (CZ)

In central zone, declining water table, imbalanced use of fertilizers, low organic matter, high cost of inputs, and non-availability of seed of newely released wheat variety were identified as the major constraints as perceived by the farmers (Table 22).

Table 22: Constraints in CZ **(n=225)**

Constraints	Score	Rank
Declining water table	241	I
Imbalanced use of fertilizers	227	II
Low organic matter	208	III
High cost of inputs	205	IV
Non-availability of seed of newely released variety	199	IV
Lack of facility of canal irrigation water	198	V
Small land holding	194	VI
Non-availability of labour	193	VII
Lack of irrigation facilities	193	VII
Temperature fluctuation during crop growth	183	VIII

Peninsular Zone (PZ)

In peninsular zone, low price of wheat, erratic power supply, non-availability of seeds of newly released variety, non-availability of labour, and non-availability of electricity were perceived as the major constraints faced by the wheat growers (Table 23).

Table 23: Constraints in PZ **(n= 82)**

Constraints	Score	Rank
Low price of wheat	117	I
Erratic power supply	114	I
Non-availability of seed of newely released variety	102	II
Non-availability of labour	76	III
Non-availability of electricity	72	IV
Problem in marketing of wheat	71	V
Lack of knowledge among farmers about recent technologies	67	VI
Lack of training facility	67	VII
Poor participation in kisan melas/field days/kisan gosthi/training	63	VIII
Non-availability of crop loan	63	IX

Overall Constraints

The overall analysis across zones revealed that non-availability of seed of newely released variety, high cost of inputs, small land holding, non-availability of labour, low price of wheat, lack of knowledge among farmers about recent technologies, lack of irrigation facilities, declining water table, *Chenopodium album* (Bathua), and untimely rain were perceived as major constraints hampering wheat production (Table 24).

Farmers need to be educated and trained on recent wheat production technologies, complete package of practices and soil health management. There is a need of government intervention to ensure quality seeds as well as quality inputs. Farmers need to be updated on impact of climate change on wheat cultivation and what are the coping strategies they can adopt to mitigate it. The concept of conservation agriculture and adoption of resource conservation technologies at farmers' field can be propagated at a larger scale. To ensure better price, farmers have to go for quality wheat production. All the constraints need immediate attention in order to increase wheat production in all major wheat producing zones of the country.

Table 24: Overall constraints impeding wheat production in the country (n=1080)

Constraints	Score	Rank
Non-availability of seed of newely released variety	1353	I
High cost of inputs	1276	II
Small land holding	1205	III
Non-availability of labour	1160	IV
Low price of wheat	1141	V
Lack of knowledge among farmers about recent technologies	1029	VI
Lack of irrigation facilities	1014	VII
Declining water table	968	VIII
Chenopodium album (Bathua)	953	IX
Untimely rain	933	X

Barley Front Line Demonstrations (BFLDs) during 2016-17

During the *rabi* crop season 2016-17, 100 Barley Front Line Demonstrations (BFLDs) were allotted to 20 different cooperating centers all over India in six states namely, HP, UP, Punjab, Haryana, Rajasthan and MP of which 85 were conducted by 18 centers, covering 93.7 hectares area of 206 farmers (Table 25). Improved barley varieties with complete package of practices (irrigation management, fertilizer dose and method of application, weed control, seed treatment etc.) were demonstrated.

Table 25: Centre wise distribution of Barley FLDs during *rabi* 2016-17

S.No.	Zone and Centre	Allotted (1 BFLD=1 ha)	Conducted (1 ha basis)	Area sown (ha)	No. of farmers/ locations
NHZ					
1.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	5	2	2.0	12
2.	IARI, RS, Amartara Cottage, Shimla (HP)	5	Not conducted	-	-
NEPZ					
3.	NDUA&T, Narendranagar, Kumarganj, Faizabad (UP)	5	5	5.4*	9
4.	KVK (IAS-BHU), Barkachha, Mirzapur (UP)	5	Not conducted	-	-
5.	CSAUA&T, Kanpur (UP)	5	5	6.4*	16
6.	BHU, Varanasi (UP)	5	3	2.5	3
NWPZ					
7.	ICAR-IIFSR, Modipuram, Meerut (UP)	5	5	6.6	18
8.	PAU, Ludhiana (Punjab)	5	5	5.0	9
9.	CCSHAU, Hisar (Haryana)	5	5	5.0	10
10.	KVK (CCSHAU), Fatehabad (Haryana)	5	5	6.4	16
11.	KVK, Rampura, Rewari (Haryana)	5	5	5.0	11
12.	KVK (CCSHAU), Bhiwani (Haryana)	5	5	6.6*	11
13.	RARI (SKNAU), Durgapura, Jaipur (Rajasthan)	5	5	5.0	9
14.	KVK, Tankarda, Chomu, Jaipur (Rajasthan)	5	5	5.0	8
CZ					
15.	RCOA, MPUA&T, Udaipur (Rajasthan)	5	5	5.0	10
16.	KVK (MPUA&T), Dhoinda, Rajasmand (Rajasthan)	5	5	5.0	12
17.	ZARP, COA, JNKVV, Kuthulia Farm, Rewa (MP)	5	5	5.0	5
18.	KVK (JNKVV), Purushottampur, Panna (MP)	5	5	5.0	15
19.	KVK (RVSKVV), Juara Khurd, AB Road, Morena (MP)	5	5	6.4*	16
20.	KVK (RVSKVV), Lahar, Bhind (MP)	5	5	6.4*	16
Total		**100**	**85**	**93.7**	**206**

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

Table 26: Statewise distribution of BFLDs during *rabi* 2016-17

State	Allotted	Conducted	Area sown (ha)	No. of farmers/locations
HP	10	2	2.0	12
UP	25	18	20.9	46
Punjab	5	5	5.0	9
Haryana	20.	20	23.0	48
Rajasthan	20	20	20.0	39
MP	20	20	22.8	52
Total	**100**	**85**	**93.7**	**206**

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

Table 27: Zone wise distribution of BFLDs conducted during *rabi* 2016-17

Zone	Allotted	Conducted	Area sown (ha)	No. of Farmers/ locations
NHZ	10	2	2.0	12
NEPZ	20	13	14.3	28
NWPZ	40	40	44.6	92
CZ	30	30	32.8	74
Total	**100**	**85**	**93.7**	**206**

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

Table 28: State wise yield gain during *rabi* 2016-17

State	BFLDs yield (q/ha)	Check yield (q/ha)	% increase
HP	24.06	19.48	23.51***
UP	43.25	34.51	25.33***
Punjab	46.44	44.00	05.55*
Haryana	46.02	42.25	08.92***
Rajasthan	48.75	41.25	18.18***
MP	46.34	38.79	19.46***

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

The highest increase in barley yield was recorded in UP (25.33 %) followed by HP (23.51 %), MP (19.46 %), Rajasthan (18.18 %) and Haryana (08.92%). The lowest increase in yield was reported in Punjab (05.55 %) (Table 28).

Table 29: Zone wise productivity over regional during *rabi* 2016-17

Zone	BFLDs yield (q/ha)	Regional mean yield (q/ha)	% Increase
NHZ	24.06	16.80	43.21***
NEPZ	41.87	30.68	36.47***
NWPZ	48.00	41.68	15.16***
CZ	45.02	32.29	39.42***

*** Significant at 1 per cent level.

The yield gain due to improved varieties over regional mean yield was highest in northern hills zone (43.21 %) followed by central zone (39.42 %), north eastern plains zone (36.47 %) and north western plains zone (15.16 %) (Table 29).

Table 30: Zone wise productivity over check during *rabi* 2016-17

Zone	BFLDs yield (q/ha)	Check mean yield (q/ha)	% Increase
NHZ	24.06	19.48	23.51***
NEPZ	41.87	32.17	30.15***
NWPZ	48.00	43.07	11.45***
CZ	45.02	37.40	20.37***

*** Significant at 1 per cent level.

The yield gain due to improved varieties over check mean yield was highest in north eastern plains zone (30.15 %) followed by northern hills zone (23.51 %) central zone (20.37 %) and north western plains zone (11.45 %) (Table 30). Therefore, efforts should be made to increase barley yield in the NEPZ and CZ in collaboration with the state department of agriculture.

Table 31: Centre wise performance of improved barley varieties during *rabi* 2016-17

Zone	Centre	BFLDs yield (q/ha)	Check yield (q/ha)	% increase
NHZ	Bajaura	24.06	19.48	23.51***
NEPZ	Faizabad	36.22	27.11	33.60***
	Kanpur	45.00	34.80	29.31***
	Varanasi	42.50	35.52	19.65^{NS}
NWPZ	Ludhiana	46.44	44.00	05.55*
	Hisar	46.80	43.60	07.34*
	Fatehabad	41.38	38.75	06.79***
	Rewari	49.09	43.09	13.92***
	Bhiwani	48.99	45.27	08.22***
	Meerut	45.25	37.89	19.42***
	Durgapura-Jaipur	53.44	45.17	18.31***
	Chomu-Jaipur	61.66	56.25	09.62***
CZ	Udaipur	42.90	38.80	10.57***
	Rajsamand	41.48	30.68	35.20***
	Rewa	42.52	39.60	07.37***
	Panna	38.40	30.60	25.49***
	Morena	52.50	44.31	18.48***
	Bhind	49.67	41.33	20.18***

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

The yield gain at Rajsamand (35.20 %) centre was highest followed by Faizabad (33.60 %), Kanpur (29.31 %), Panna (25.49 %), Bajaura (23.51 %), Bhind (20.18 %) and Meerut (19.42 %) centers across the zones. The increase in improved variety's yield at Ludhiana over check variety was the lowest (05.55 %) but significant (Table 31).

Table 32: Variety wise performance of improved barley varieties during *rabi* 2016-17

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	% Increase over check
NHZ					
Bajaura	BHS 400	23.17	HBL 316	18.97	22.14***
	BHS 400	25.40	Sonu	20.25	25.43*
NEPZ					
Faizabad	RD 2794	36.22	Faizabad Local	27.11	33.60***
Kanpur	RD 2794	45.00	Azad	34.80	29.31***
Varanasi	HUB 113	42.50	Jyoti	35.52	19.65 ^{NS}
NWPZ					
Meerut	BH 946	45.25	Local	37.89	19.42***
Ludhiana	BH 946	45.20	PL 807	42.20	07.11*
	DWRB 101	48.00	DWRB 52	46.25	03.78 ^{NS}
Hisar	BH 946	46.80	BH 393	43.60	07.34*
Fatehabad	BH 946	41.00	Local	38.00	07.89 ^{NS}
	DWRB 101	42.00	Local	40.00	05.00 ^{NS}
Rewari	BH 946	48.17	BH 393	43.33	11.17**
	DWRB 101	50.20	BH 393	42.80	17.29*
Bhiwani	BH 946	48.99	BH 393	45.27	08.22***
Durgapura Jaipur	BH 946	53.44	Local	45.17	18.31***
Chomu Jaipur	BH 946	60.30	RD 2052	52.85	14.10***
	BH 946	63.02	RD 2794	59.64	05.67**

CZ					
Udaipur	BH 959	42.60	RD 2035	39.20	08.67*
	BH 959	43.20	RD 2552	38.40	12.50**
Rajsamand	BH 959	41.48	Local	30.68	35.20***
Rewa	BH 959	41.77	JB 1	39.93	04.61*
	BH 959	43.65	JB 58	39.10	11.64*
Panna	BH 959	38.40	Munda Jawa	30.60	25.49***
Morena	BH 959	52.50	Local	44.31	18.48***
Bhind	BH 959	49.67	Local	41.33	20.18***

*** 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 (25.40 q/ha) variety at Bajaura centre. In NEPZ, RD 2794 at Kanpur (45.00 q/ha), BH 946 at Chomu Jaipur (63.02 q/ha) in NWPZ and BH 959 at Morena (52.50 q/ha) in central zone were the highest average yielding varieties (Table 32).

Table 33: Yield potential of barley varieties in different zones during *rabi* 2016-17

Zone	Centre	Variety	Yield(q/ha)
NHZ	Bajaura	BHS 400	26.40
NEPZ	Kanpur	RD 2794	48.00
NWPZ	Chomu Jaipur	BH 946	65.10
CZ	Bhind	BH 959	55.00

At particular farmers' field as well as on average basis BHS 400 (26.40 q/ha), RD 2794 (48.00 q/ha), BH 946 (65.10 q/ha) and BH 959 (55.00 q/ha) performed better than other varieties at Bajaura, Kanpur, Chomu-Jaipur and Bhind centres in the NHZ, NEPZ, NWPZ and CZ, respectively (Table 33).

Table 34: Barley varieties grown in different zones during *rabi* 2016-17

Zone	Improved varieties	Check varieties	Popular varieties in the region
NHZ	BHS 400	HBL 316, Sonu	Sonu, Dolma, HBL 316, HBL 276, Local
NEPZ	RD 2794, HUB 113	Faizabad Local, Azad, Jyoti	Faizabad Local, Azad, Jyoti
NWPZ	BH 946, DWRB 101	PL 807, DWRUB 52, BH 393, RD 2052, RD 2794, Local	PL 807, DWRUB 52, BH 393, Local, RD 2035, RD 2052, RD 2715, RD 2794
CZ	BH 959	RD 2035, RD 2552, JB 1, JB 58, Munda Jawa, Local	RD 2035, RD 2552, RD 2715, RD 2660, RD 2786, JB 1, JB 58, Munda Jawa, Local

Constraints analysis in different barley producing zones during *rabi* 2016-17

Variation in yield levels among different states, farmers and farms leads to yield gap in different states and different zones. There are many reasons of this yield gap which need to be addressed for sustainable barley production. Through constraint analysis an effort has been made to identify the fators impeding barley production in different parts of the country. 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 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 the total score, the level of seriousness for each constraint has been calculated and finally ranking was done.

NHZ : In northern hills zone, yellow rust, small land holding, high cost of inputs, non-availability of seed of newely release variety, late sowing, low organic matter imbalanced use of fertilizers, lack of facility of canal irrigation water, lack of knowledge among farmers about recent technologies and powdery mildew were some of the constraints which need immediate intervention (Table 35).

Table 35: Constraints in NHZ

(n=5)

Constraints	Score	Rank
Yellow rust	10	I
Small land holding	10	I
High cost of inputs	10	I
Non-availability of seed of newely release variety	10	I
Late sowing	10	I
Low organic matter	10	I
Imbalanced use of fertilizers	10	I
Lack of facility of canal irrigation water	10	I
Lack of knowledge among farmers about recent technologies	10	I
Powdery mildew	5	II

NEPZ : In north eastern plains zone of barley production, small land holding followed by higher custom hiring rate for land leveling, field preparation, sowing & harvesting, high temperature at maturity, untimely rain and non-availability of labour were identified as the major constraints (Table 36).

Table 36: Constraints in NEPZ

(n=26)

Constraints	Score	Rank
Small land holding	50	I
Higher custom hiring rate for land leveling, field preparation, sowing & harvesting	50	I
High temperature at maturity	50	I
Untimely rain	49	II
Non-availability of labour	48	II
Phalaris minor	46	IV
Temperature fluctuation during crop growth	46	IV
Rodents	43	V
Non-availability of farm machinery	42	VI
High cost of inputs	32	VII

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, small land holding size followed by non-availability of labour, low price of barley, *Chenopodium album* (bathua) and declining water table were perceived as serious by a majority of the FLD farmers of NWPZ (Table 37).

Table 37: Constraints in NWPZ

(n=92)

Constraints	Score	Rank
Small land holding	77	I
Non-availability of labour	77	I
Low price of barley	71	II
Chenopodium album (Bathua)	68	III
Declining water table	66	IV
High temperature at maturity	63	V
Low organic matter	63	V
High cost of inputs	60	VI
Non-availability of electricity	59	VII
Erratic power supply	51	VIII

CZ : In central zone, high cost of inputs was perceived as the most serious constraint followed by declining water table, small land holding, temperature fluctuation during crop growth and low organic matter (Table 38).

Table 38: Constraints in CZ

(n=70)

Constraints	Score	Rank
High cost of inputs	99	I
Declining water table	87	II
Small land holding	77	III
Temperature fluctuation during crop growth	77	III
Low organic matter	75	IV
Lack of knowledge among farmers about recent technologies	73	V
Low micro nutrient	67	VI
Zn deficiency	67	VI
Imbalanced use of fertilizers	67	VI
Lack of irrigation facilities	65	VII

Most serious constraints impeding barley production in the country

Overall analysis of constraints in different zones clearly indicated that small land holding, followed by high cost of inputs, non-availability of labour, declining water table, low organic matter, higher custome hiring rate of land leveling, field preparation, sowing & harvesting, high temperature at maturity, temperature fluctuation during crop growth, lack of knowledge among farmers about recent technologies, untimely rain were identified as major constraints affecting barley production and productivity of the country (Table 39).

Table 39: Major constraints impeding barley production in the country

(n=193)

Constraints	Score	Rank
Small land holding	214	I
High cost of inputs	201	II
Non-availability of labour	191	III
Declining water table	190	IV
Low organic matter	179	V
Higher custome hiring rate of land leveling, field preparation, sowing & harvesting	166	VI
High temperature at maturity	163	VII
Temperature fluctuation during crop growth	161	VIII
Lack of knowledge among farmers about recent technologies	156	IX
Untimely rain	144	X

Costs and Returns for Wheat and Barley FLDs vis-à-vis Check Plots

Profitability on investment is one of major deciding criterions for adoption of any crop production technology. In this section, costs and returns analysis for wheat and barley FLDs have been attempted across regions for the improved production technologies that were tested in farmers' field during 2016-17.

Generally in any economic study, total costs are discussed under two categories *viz.,* variable costs and fixed costs, the widely adopted norm. Nevertheless, variable costs alone are reckoned to be the cost incurred by the farmers ignoring the fixed costs. The profit and loss are estimated accordingly. But in any economic analysis of farm business, the fixed costs should also be taken into consideration to arrive at total costs for computing the net income. However, in the present analysis only operational or variable costs were considered to know the profitability of technology adoption. Operational costs include expenses on labour employed to perform different cultural operations and expenses incurred on material inputs *viz.,* seeds, FYM, fertilizers, plant protection chemicals *etc*. The returns over variable costs give an idea of profitability accrued to the farmer after meeting all the working expenses. Profits were worked out for FLDs and check plots for a better comparison. Cost of production was also estimated to know the cost incurred in producing a unit quantity of wheat and barley output. Returns per rupee of investment were also worked out to know the comparative profitability between wheat and barley.

Data Collection

Primary data were collected by the cooperating centres from the selected farmers who were allotted with the FLDs. Personal interview and discussion method was adopted with the aid of pre-tested schedules designed exclusively for the purpose of evaluating the FLD technologies. The data collected pertained to the *Rabi* season 2016-2017. The communicated data were compiled and processed at the ICAR-Indian Institute of Wheat and Barley Research for further analysis and reporting. Every genuine effort was made by the FLD coordinators to collect realistic data from the sample farmers and inappropriate data reported from the cooperating centres were not included for the costs and returns analysis.

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

Perusal of Table 40 indicates that on an average, wheat varieties or technologies demonstrated in FLDs gave ₹2.83 per rupee of investment in comparison to the check varieties (₹2.48). A significant difference in returns per rupee of investment was noticed between the FLD and check plots across states, zones and technologies. The returns from FLDs ranged from ₹6.51 (Punjab) to ₹1.76 (Nagaland) across states, ₹3.77 (SHZ) to ₹2.32 (NHZ) across zones and ₹8.25 (Happy Seeder) to ₹2.10 (Sprinkler) across technologies. Punjab registered the highest returns per rupee of investment owing to the low operational costs, followed by Tamil Nadu (₹3.74) and Uttar Pradesh (₹3.41). In case of Tamil Nadu (SHZ), the costs and returns from check were not estimated as wheat was not grown in the selected farm where the FLDs were conducted.

The profit per hectare in FLDs was highest in Punjab (₹99779), followed by Uttar Pradesh (₹74309) and Gujarat (₹72024). The difference in profit between FLDs and check plots ranged from ₹21329 in Maharashtra to ₹2243 in Haryana. Interestingly, operational costs in Karnataka and Punjab were lower in FLDs than the check plots. The probable reason for Punjab might be demonstration of resource efficient zero tillage and rotavator techniques which reduces the operational costs. Estimates of cost of production indicated that the cost incurred in producing a unit quantity of output was least in Tamil Nadu (₹500 per quintal) owing to less operational costs and the likelihood of getting more yield being a progressive state. Among wheat growing zones, the returns per rupee of investment were highest in the SHZ due to less operational costs in raising the crop. NWPZ also realized a good return per rupee of investment (₹3.58) which is mainly due to the higher productivity.

Among the wheat production technologies demonstrated at farmers field, happy seeder gave the highest profit per hectare (₹89850) and the least profit was observed for the dicoccum varieties (₹37865). However, the results were not consistent across sites owing to testing of particular technology in different locations of diverse soil properties. Overall, on an average, an Indian farmer by adopting a new wheat variety or production technology will earn ₹55197 per hectare at his/her farm. Further, ₹777 have to be spent to produce a quintal of wheat through adoption of a new wheat variety or production technology against ₹917 (check varieties).

Table 40: Costs and returns from wheat during 2016-17

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										
Assam	24897	23676	59771	49978	34874	26302	2.40	2.11	1013	1261
Bihar	34594	34535	85023	69789	50429	35253	2.46	2.02	838	1035
Chhattisgarh	28294	26458	68398	59302	40104	32844	2.42	2.24	1134	1277
Gujarat	36400	36104	108423	100949	72024	64846	2.98	2.80	796	843
Haryana	30864	28110	102879	97973	72015	69863	3.33	3.49	561	543
Himachal Pradesh	35342	33853	70714	61281	35372	27428	2.00	1.81	1164	1304
Jammu & Kashmir	23403	23403	70597	59812	47194	36409	3.02	2.56	701	822
Jharkhand	33820	32437	64551	50848	30731	18412	1.91	1.57	985	1230
Karnataka	33067	41531	75135	76431	42068	34900	2.27	1.84	1032	1431
Madhya Pradesh	28312	28142	87902	70969	59590	42826	3.10	2.52	633	755
Maharashtra	28141	26128	95681	72340	67541	46212	3.40	2.77	691	790
Nagaland	15800	15600	27792	24009	11992	8409	1.76	1.54	1520	1751
New Delhi	42411	41393	94804	87960	52393	46567	2.24	2.12	902	950
Punjab	18103	19939	117883	113060	99779	93121	6.51	5.67	532	581
Rajasthan	35578	35013	101305	88845	65727	53831	2.85	2.54	722	805
Tamil Nadu	11594	NE	43416	NE	31822	NE	3.74	NE	500	NE
Uttar Pradesh	30796	29145	105105	93300	74309	64155	3.41	3.20	606	652
Uttarakhand	25696	23643	72835	56066	47140	32423	2.83	2.37	868	1050
West Bengal	32726	32337	70730	50594	38004	18257	2.16	1.56	858	1140
Zone										
CZ	31203	30719	88355	74924	57152	44206	2.83	2.44	742	848
NEPZ	32269	31467	78448	63905	46179	32438	2.43	2.03	859	1063
NHZ	30102	28281	69979	55996	39878	27715	2.32	1.98	1022	1196
NWPZ	29036	27981	104026	95273	74990	67292	3.58	3.40	581	615
PZ	30725	32289	86564	73977	55839	41687	2.82	2.29	857	1047
SHZ	11496	NE	43373	NE	31876	NE	3.77	NE	496	NE
Technology										
Bio-fertilizer	37140	34826	98807	90447	61667	55621	2.66	2.60	891	947
Chemical Control of Yellow Rust	33075	32900	101250	101250	68175	68350	3.06	3.08	606	603
Dicoccum	13107	NE	50972	NE	37865	NE	3.89	NE	542	NE
Drip Irrigation	41232	41012	106520	100500	65288	59488	2.58	2.45	878	923
Durum	34620	35633	108801	83171	74181	47538	3.14	2.33	746	874
Happy Seeder	12400	16400	102250	98750	89850	82350	8.25	6.02	214	293
Hydrogel	31475	32075	101875	98688	70400	66613	3.24	3.08	572	600
Rotavator	28888	27612	105821	98407	76933	70795	3.66	3.56	555	573
Sprinkler	60403	42403	126625	112275	66222	69872	2.10	2.65	1063	853
Variety	31462	30541	88277	73935	56815	43395	2.81	2.42	785	943
Variety (late sown)	31290	28960	91567	80814	60277	51854	2.93	2.79	798	846
Variety (restricted irrigation)	27956	28076	73749	63955	45793	35879	2.64	2.28	812	957
Variety (salt tolerant)	18133	18392	82494	79313	64361	60921	4.55	4.31	365	386
Zero Tillage	28391	30528	74780	72466	46389	41938	2.63	2.37	721	805
All Categories										
India	**30175**	**29943**	**85372**	**74116**	**55197**	**44173**	**2.83**	**2.48**	**777**	**917**

Note: NE indicates that check varieties were not grown and hence costs and returns were not estimated.

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

Table 41 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 (₹6.54) through demonstrations, followed by Uttar Pradesh (₹4.30) and Rajasthan (₹4.02). However, the difference in the returns per rupee of investment between FLDs and Checks was highest in Uttar Pradesh.

Table 41: Costs and Returns from Barley during 2016-17

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	26463	26194	80174	73445	53711	47250	3.03	2.80	581	626
Himachal Pradesh	25700	22600	44372	35076	18672	12476	1.73	1.55	1072	1163
Madhya Pradesh	24992	25331	82692	69036	57700	43705	3.31	2.73	551	666
Punjab	13728	14028	89817	84644	76089	70617	6.54	6.03	297	320
Rajasthan	22450	20996	90258	77086	67809	56089	4.02	3.67	476	523
Uttar Pradesh	19391	20098	83431	65601	64040	45503	4.30	3.26	454	615
Zone										
CZ	24807	24833	79774	66305	54967	41472	3.22	2.67	560	665
NEPZ	25094	27215	95966	74026	70872	46811	3.82	2.72	595	858
NHZ	25700	22600	44372	35076	18672	12476	1.73	1.55	1072	1163
NWPZ	20983	20155	84225	75390	63243	55236	4.01	3.74	443	472
Technology										
Improved Variety	23347	23329	82657	70489	59310	47159	3.54	3.02	532	627
Sprinkler Irrigation	16894	13389	93452	78603	76558	65214	5.53	5.87	315	297
All Categories										
India	**23046**	**22866**	**83160**	**70867**	**60114**	**48001**	**3.61**	**3.10**	**522**	**612**

The profit per hectare in FLDs was highest in Punjab (₹76089), followed by Rajasthan (₹67809) and Uttar Pradesh (₹64040). The difference in profit between FLDs and check ranged from ₹18537 in Uttar Pradesh to ₹5472 in Punjab. Interestingly, operational costs in Madhya Pradesh, Punjab and Uttar Pradesh were lower in FLDs than check plots. The valid reason might be reduction in the use of inputs based on the recommendation. The returns per rupee of investment across barley growing zones were highest in the NWPZ (₹4.01) followed by NEPZ (₹3.82) and CZ (₹3.22). Estimates of cost of production indicated that the cost incurred in producing a unit quantity of output was least (₹297) in Punjab (NWPZ) owing to less operational costs and relatively higher yield.

Overall, the costs and returns analysis on wheat and barley indicated that profit per hectare from FLDs was more than the check varieties by ₹11029 and ₹12113 respectively establishing the fact that FLDs carry the successful technologies from lab to land. For some respondents it was found that the operational costs under check varieties were more than the 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 in different sites. Further, the difference in profit earned from wheat/barley cultivation is subject to farm-farmer-region specific conditions as it varies from case to case.

Technology Outreach Programme

'Mera Gaon Mera Gaurav' Scheme at ICAR-IIWBR, Karnal

The activities of the governments flagship programme towards doubling of farmer's income, 'Mera Gaon Mera Gaurav' scheme were carried out on a large scale during the current crop season and all the teams visited their adopted villages and created awareness among the farmers on advanced practices of crop cultivation and supplied mini kits on DBW 88 variety. Timely reports of monthly activities were compiled at IIWBR and submitted to the Zonal Nodal Officer & Director, ICAR- Agricultural Technology Application Research Institute (ATARI), Zone-I, Ludhiana (Punjab) regularly. All the fourteen teams have provided detailed information about their various activities in the villages and an extension bulletin was published on 'Mera Gaon Mera Gaurav' scheme. Farmers of many villages were invited on different occasions in the institute premises. One training programme on climate smart farming was organised for farmers during February 16-18, 2017.

Training programmes organised/conducted at ICAR – IIWBR, Karnal

S. N.	Date	Duration (days)	No. of Trainees	Subject	From
1	May 7, 2016	1	80 farmers	Anaaj ka surakshit bhandaaran	Village Bakana, Yamunanagar
2	June 30, 2016	1	70 farmers	Gehoon dhaan fasal chakra mein sabji faslon ka utpaadan	Village Chhota Baans, Yamunanagar
3	August 7, 2016	1	12 farmers	Punjab me gehoon ki unnat kheti	Kapurthala, Punjab
4	October 25, 2016	1	15 farmers	Increasing wheat production	Karnal
5	December 25, 2016	1	37 farmers	Entrepreneurship development in wheat	ICAR-IIWBR, Karnal
6	January 25, 2017	1	29 farmers	Improved wheat cultivation	Kisan club, Karnal
7	February 2-4, 2017	3	35 farmers	Uttarakhand me gehoon evum jau ki unnat kheti	Dehradun, Uttarakhand
8	February 16-18, 2017	3	30 farmers	जलवायु स्मार्ट कृषि द्वारा खाद्यान्न एवं पोषण सुरक्षा (Climate Smart Agriculture for Enhancing Food and Nutrition Security)	Karnal district
9	February 25, 2017	1	45 farmers	Gehoon mein antah sasya kriyayen	Saharanpur, UP.
10	March 6, 2017	1	40 farmers	Gurugram, Haryana mein gehoon ki vaigyanik kheti	Gurugram, Haryana
11	March 6-8, 2017	3	23 farmers	Uttarkashi mein fasal vividhikaran dwara kisano ki aay mein vriddhi	Uttarkashi, Uttarakhand
12	March 16-18, 2017	3	50 farmers	Bharatpur mein gehoon evum jau utpadan ki vaigyanik vidhi	Bharatpur, Rajasthan
13	March 22-24, 2017	3	40 students	Training cum workshop on data analysis tools and approaches (DATA) in agricultural sciences	ICAR-IIWBR, Karnal

Organization/Participation in Exhibition/Field Day/Agricultural Awareness Programmes

S.N.	Program	Date	Duration (days)	Organized by
1.	Agricultural Exhibition at Farah, Mathura (UP)	September 26-29, 2016	4	National Horticultural Board, Gurugram (Haryana)
2.	Krishi Kumbh at Muzaffarnagar (UP)	November 28-30, 2016	3	ICAR-IIFSR, Modipuram
3.	Exhibition during Rabi Kisan Mela at ICAR-CSSRI, Karnal.	March 8, 2017	1	ICAR-CSSRI, Karnal.
4.	Exhibition during Krishi Unnati Mela at ICAR-IARI, New Delhi.	March 15-17, 2017	3	ICAR-IARI, New Delhi.
5.	Exhibition during Rakhda Kisan Mela at Rakhda Farm, Patiala (Punjab).	March 19, 2017	1	Young Farmers Association, Rakhda, Patiala (Punjab)
6.	DD Kisan Prashan Manch on Wheat Production at village Mehmoodpur	March 23, 2017	1	ICAR-IIWBR, Karnal
7.	Exhibition at village Nalvi Khurd on the occasion of Field Day and Field School	March 26, 2017	1	ICAR-IIWBR, Karnal
8.	Field Day at FLD site in village Mughal Majra	March 31, 2017	1	ICAR-IIWBR, Karnal

Kisan Mela/ Farmers day/Field day

S.No.	Programme	Date	Organised by	Number of participants
1.	Farmers- Scientists Interactive Workshop and Seed Day	October 17, 2016	ICAR-IIWBR, Karnal	1200 farmers
2.	Workshop on doubling the farmers income by 2022	November 9, 2016	NABARD and ICAR-IIWBR, Karnal	100 farmers
3.	World Soil Day at village Ramba, district Karnal	December 5, 2016	ICAR-IIWBR, Karnal	100 farmers
4.	Foundation Day	February 9, 2017	ICAR-IIWBR, Karnal	200 members
5.	Field Day and Farm School at village Nalvi Khurd, district Karnal.	March 26, 2017	ICAR-IIWBR, Karnal	200 farmers
6.	Field Day at Wheat FLD site in village Mugal Majra, district Karnal.	March 31, 2017	ICAR-IIWBR, Karnal	100 farmers

Capacity building programmes for different stakeholders during 2016-17

For students

Dr. Sendhil R. is associated with the ICAR-National Dairy Research Institute, Karnal in teaching ‘Advanced Agricultural Marketing and Price Analysis (3+0)’ for Ph.D. Scholars and ‘Agricultural Marketing and Price Analysis (2+1)’, ‘Agricultural Finance and Project Management (2+1)’ and ‘Agricultural Development and Policy Analysis (2+0) for M.Sc. Scholars.

Lectures delivered by ICAR-IIWBR scientists

Date	Topic
December 24, 2016.	"Impact Assessment of Wheat Production Technologies - An Application of Economic Surplus Model" and "Relevance of futures market in the context of small scale production systems in India" at the CAFT program organised at the Division of Agricultural Economics, IARI.
March 22-23, 2017	'Big Data Analytics: Tools and Approaches' on March 22, 2017 and conducted 'Reflection Session' on March 23, 2017 in the Training-cum-Workshop on Data Analysis Tools and Approaches (DATA) in Agricultural Sciences organised at ICAR-IIWBR, Karnal during March 22-24, 2017.
March 25, 2017	'e-Learning: Process and Benefits' at PIMS, Panipat.
July 12, 2016	Rajbhasha Hindi me kaam kaj karna kitna aasaan at Jawahar Navodaya Vidyalaya, Sagga, Karnal
August 3, 2016	Hindi Bhasha Ka prachar evam prasar at NBAGR, Karnal.
August 18, 2016	Role of ICT in Transfer of technology at EEI, Nilokheri
September 19, 2016	Soft skills for effective and efficient policing at Madhuban police academy.
December 3, 2016	Agriculture Education: Scope and career opportunities at IIWBR to 10+2 students
January 11-13, 2017	"Krishi Vistaar Prabandhan Ki Chunautiyan" in skill development programme under Farmer FIRST Project on "Lavangrast Mridayon me Krishi Utpadan: Samasyayen avum samadhan at CSSRI, Karnal
	Role of extension in conservation of indigenous breeds of cattle and poultry in India, NBAGR, Karnal

Kisan Goshthi

Dr. Satyavir Singh participated in the Kisan Goshthi organised by ICAR-CSSRI, Karnal at village Mohri Jagir (district Karnal) under 'Mera Gaon Mera Gaurav' scheme. The queries raised by the farmers were replied on the spot.

TV programmes

Date	Topic
October 7, 2016	DD Kisan Prashna Manch was organized at ICAR-IIWBR, Karnal campus.
December 17, 2016	DD Kisan Prashna Manch was organized at village Jadauli Kalan, district Karnal on wheat production.
February 23, 2017	23.02.2017: DD National Krishi Darshan Live phone in programme on "Intercultural operations in wheat" at Mandi House, New Delhi.
March 30, 2017	30.03.2017: DD National Krishi Darshan Live phone in programme on "Harvesting and threshing of wheat crop" at Mandi House, New Delhi.

Farm advisory services

The farmers were advised on various aspects of wheat and barley cultivation. More than 600 farmers/entrepreneurs and other stakeholders were provided replies to their queries through letters, phone calls, emails and SMS.

Regular weekly advisories were issued on the ICAR-IIWBR web page for the farmers on weather and cultural practices during the crop season.

WhatsApp group: Farm Advisories_IIWBR

The Farm Advisories on wheat and barley crops were sent through the WhatsApp group.

Advisories Linkage to MANAGE Portal

The advisories issued on different aspects of wheat and barley crop were linked / uploaded on the MANAGE Portal for wide circulation and use.

Coordination of visits at ICAR-IIWBR, Karnal during 2016-17

Date	Number of Visitors	From
National		
April 4, 2016	42 Officers	Chhittisgarh, AGRI, Delhi
April 6, 2016	14 Students	Gochar Mahavidyalaya, Rampur Maniharan, Saharanpur (UP) CCS University, Meerut
April 14, 2016	39 Students	COA, Lalsot (Dausa) (SKNAU, Jobner)
August 29, 2016	20 Agri Clinic Trainees	Center for Agriculture & Rural Development, Muzaffarnagar, Agri Clinic Trainees visit.
September 6, 2016	136 Students	Vanavarayar Institute of Agriculture, Affiliated to Tamil Nadu Agricultural University, Pollachi, Tamil Nadu
September 7, 2016	12 Farmers	Manav Vikash Sansthan, Kapurthala (Punjab)
September 8, 2016	42 Women Farmers	ATMA, Chamba (HP)
September 16, 2016	42 Students	Doon Valley Collage, Jundla Gate, Karnal (Haryana)
September 21, 2016	45 Farmers	Jhunjhunu (Rajasthan)
September 22, 2016	42 Farmers	PO, ATMA, Kangra (HP)
September 26, 2016	36 Farmers	Agri New Delhi, (Gujarat) Chota Vadipur & Varoda
September 27, 2016	26 Farmers	PO, ATMA, Gwalior
September 27, 2016	12 Students	Animal Nutrition Division, NDRI, Karnal, Haryana
October 5, 2016	17 Farmers	Development Block, Paonta Sahib, Sirmour (HP)
October 7, 2016	39 Farmers	ATMA, Project, Hamirpur (H.P.)
October 18, 2016	47 Student	ITM University, Gwalior (M.P.)
October 20, 2016	14 Farmers	District Kushinagar (UP)
October 21, 2016	50 Farmers	District Jaipur (Rajasthan)
November 3, 2016	61 Student	Dept. Of Maharishi Markandeshwar University, Mulana, Ambala (Haryana)
November 16, 2016	123 Student	Adhiparasakthi Agricultural Collage, Vellore, Tamil Nadu Agricultural University, Tamil Nadu
November 18, 2016	56 Student	Adhiparasakthi, Horticultured Collage, Vellore, TNAU, Tamil Nadu
November 21, 2016	78 Farmers	ATMA Project, Om Gaus Sewa Sansthan, Agra, Firozabad, Mathura, Mainpuri, Mau, Azamgarh
November 22, 2016	39 Farmers	ATMA, Una Grahak Suraksha Samiti
November 25, 2016	90 Students	AP, TRIARD (TNAU) Perambalur, Tamil Nadu
December 9, 2016	38 Farmers	ATMA, Sriganganagar (Rajasthan)
December 19, 2016	15 Farmers	Ambala, Karnal , FPO Farmers
December 21, 2016	11 Trainees	EEI, Nilokheri, Karnal
December 21, 2016	20 Students	SSR Collage, Kachhwa, Karnal
January 7, 2017	24 Women Farmers	ATMA Project, Una (H.P.)
January 20, 2017	23 Farmers	Poonch (J&K)
January 20, 2017	20 Farmers	Lal Bahadur Shastri Gaya Kisan Sansthan Lucknow (UP)
January 21, 2017	50 Farmers	Patan, Gujarat
February 16, 2017	50 Farmers	ATMA, Bundi (Rajasthan)
February 17, 2017	30 Farmers	Farmers of the training programme on "Climate Smart Agriculture for Enhancing Food and Nutrition Security" organised at ICAR-IIWBR, Karnal during February 16-18, 2017.
February 18, 2017	54 Farmers	Narmada (Gujarat)
February 19, 2017	40 Farmers	Aligarh (UP)
February 20, 2017	34 Farmers	Rajkot (Gujrat)
February 21, 2017	30 Farmers	Datia (MP)
February 25, 2017	45 Farmers	Mount Valley Development Association, Gangoh, Saharanpur (UP)
February 28, 2017	60 Farmers	Deputy Director of Agriculture, Kashmir Division (J&K)

Date	Number of Visitors	From
February 28, 2017	7 Farmers	Welfare & Agriculture Devision Department, Vidisha (MP)
February 28, 2017	16 Farmers	Districts Raison, Sagar, Datia and Sehore (MP)
March 1, 2017	16 Farmers	KVK Tepla, Ambala, Haryana under Skill Development Training Through Agriculture Skill Council of India
March 1, 2017	35 Farmers	PMKSY & ATMA, Project, Shamli (UP)
March 3, 2017	46 Farmers	Agriculture Department, district Dakshin Dinaspur (West Bengal)
March 6, 2017	40 Farmers	Gurgaon (Haryana)
March 7, 2017	7 Farmers	Morena (MP)
March 17, 2017	90 Farmers	Bharatpur (Rajasthan)
March 21, 2017	52 Farmers	Banaskantha, Gujarat
March 22, 2017	37 Farmers	Gurez, Kashmir
March 25, 2017	50 Farmers	Vadodra, Gujarat
March 28, 2017	60 Farmers	Jammu & Kashmir
March 30, 2017	23 Students	Collage of Agriculture, Fatehpur-Shekhawati, Sikar (Rajasthan)
March 31, 2017	45 Students	Guru Nanak College, Mansa (Punjab)
International		
December 12, 2016	10 Officers	Ten Bhutanese Officers from Department of Agriculture & Forests, Thimphu, Bhutan.

Annexure – I : Category wise number of wheat FLDs farmers during 2016-17

S.N.	Name of Centre	Allocation		Achievement		Achievement Men, Area in ha, (No. of Farmers)				Achievement Women, Area in ha, (No. of Farmers)				Men	Women	Total
		No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
	NHZ															
1.	VPKAS, Almora (Uttarakhand)	8	8	8	8.19*	0.39 (2)	-	-	7.64 (83)	-	-	-	0.16 (5)	8.03 (85)	0.16 (5)	8.19 (90)
2.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	5	5	3	3.0	0.6 (2)	-	-	2.2 (9)	-	-	-	0.20 (1)	2.8 (11)	0.20 (1)	3.0 (12)
3.	CSKHPKV, RWRC, Malan, Kangra (HP)	5	5	5	5.0	-	0.64 (2)	0.68 (4)	3.24 (12)	-	-	0.20 (1)	0.24 (1)	4.56 (18)	0.44 (2)	5.0 (20)
4.	CSKHPKV,PCRS, Berthin, Bilaspur (HP)	5	5	Not conduc ted	-	-	-	-	-	-	-	-	-	-	-	-
5.	CSKHPKV, HAREC, Dhaulakuan, Sirmour (HP)	5	5	5	5.0	0.5 (2)	-	-	0.7 (3)	2.9 (11)	-	-	0.9 (4)	1.2 (5)	3.8 (15)	5.0 (20)
6.	IARI, RS, Amartara Cottage, Shimla (HP)	5	5	3	3.0	-	-	-	2.2 (13)	0.2 (1)	-	-	0.6 (3)	2.2 (13)	0.8 (4)	3 (17)
7.	ICAR-IIWBR, RS, Flowerdale, Shimla (HP)	5	5	Not conduc ted	-	-	-	-	-	-	-	-	-	-	-	-
8.	RR&RS, SKUAST-K, Khudwani, Anantnag (J&K)	5	5	4	4.0	-	-	-	4.0 (8)	-	-	-	-	4.0 (8)	-	4.0 (8)
9.	RARS, SKUAST-Jammu, Tandwal, Rajouri (J&K)	5	5	Not conduc ted	-	-	-	-	-	-	-	-	-	-	-	-
10.	KVK (CSKHPKV), Bara, Hamirpur (HP)	5	5	4	4.0	0.72 (3)	-	0.4 (2)	2.36 (14)	-	-	-	0.52 (4)	3.48 (19)	0.52 (4)	4.0 (23)
11.	AICW&BIP Sub-Centre, CAU, Imphal (Manipur)	2	2	Not conduc ted	-	-	-	-	-	-	-	-	-	-	-	-
	NEPZ															
12.	NDUA&T, Faizabad (UP)	7	7	7	7.0	2.8 (7)	-	2.6 (4)	1.2 (3)	-	-	-	0.4 (1)	6.6 (14)	0.4 (1)	7.0 (15)
13.	CSAUA&T, Kanpur (UP)	10	10	10	10.0	0.4 (1)	-	1.2 (3)	8.4 (21)	-	-	-	-	10.0 (25)	-	10.0 (25)
14.	BHU, Varanasi (UP)	10	10	10	10.0	1.50 (1)	-	-	8.5 (5)	-	-	-	-	10.0 (6)	-	10.0 (6)
15.	KVK, Sohna, Sidharthnagar (UP)	10	10	10	10.0	2.0 (5)	-	3.6 (9)	4.0 (10)	-	-	-	0.4 (1)	9.6 (24)	0.4 (1)	10.0 (25)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
16.	KVK, Sultanpur (UP)	5	5	5	5.2*	-	-	1.2 (3)	4.0 (9)	-	-	0.65 (3)	0.12 (1)	5.2 (12)	-	5.2 (12)
17.	BCKV, Kalyani, Nadia (West Bengal)	10	10	10	10.0	5.14 (27)	-	1.89 (17)	1.80 (14)	0.4 (3)	-	-	-	8.83 (58)	1.17 (7)	10.0 (65)
18.	UBKVV, Pundibari, Coochbehar (West Bengal)	10	10	8	8.0	4.4 (11)	-	2.4 (6)	-	1.2 (3)	-	-	0.5 (1)	6.8 (17)	1.2 (3)	8.0 (20)
19.	KVK-Dimapur, Jharnapani, MEDZIPHEMA (Nagaland)	10	10	10	10.0	-	5.0 (10)	-	4.5 (9)	-	-	-	-	9.5 (19)	0.5 (1)	10.0 (20)
20.	RARS, AAU, Shillongani, Nagaon (Assam)	10	10	10	10.0	-	1.0 (1)	4.0 (4)	5.0 (5)	-	-	-	0.4 (1)	10.0 (10)	-	10.0 (10)
21.	KVK (AAU)-Darrang , Mangaldai, Darrang (Assam)	5	5	5	5.0	-	-	1.33 (3)	3.27 (8)	-	-	-	-	4.6 (11)	0.4 (1)	5.0 (12)
22.	KVK (AAU), Chirakuta, (Revenue village Jamduar Pt.II) Dhubri (Assam)	5	5	5	5.0	-	-	4.22 (13)	0.78 (3)	-	-	-	-	5.0 (16)	-	5.0 (16)
23.	KVK (AAU), Citrus Research station, Gellapukhuri, Tinsukia (Assam)	7	7	7	7.0	-	1.3 (4)	2.7 (6)	3.0 (8)	-	-	-	-	7.0 (18)	-	7.0 (18)
24.	KVK (AAU), Napam, Tejpur, Sonitpur (Assam)	7	7	6	6.0	-	-	-	6.0 (5)	-	-	-	-	6.0 (5)	-	6.0 (5)
25.	KVK (AAU), Kajalgaon, Chirang (Assam)	5	5	5	5.0	-	-	-	5.0 (14)	-	-	-	-	5.0 (14)	-	5.0 (14)
26.	IARI, RS, Pusa, Samastipur (Bihar)	5	5	5	5.0	-	-	3.5 (7)	1.5 (3)	-	-	-	-	5.0 (10)	-	5.0 (10)
27.	KVK, Sokhodeora, Nawadah (Bihar)	5	5	5	5.0	-	-	4.0 (4)	1.0 (1)	-	-	-	-	5.0 (5)	-	5.0 (5)
28.	KVK, RAU, Hariharpur,Vaishali (Bihar)	5	5	5	5.0	0.8 (1)	-	1.6 (2)	2.6 (3)	-	-	-	-	5.0 (6)	-	5.0 (6)
29.	KVK, Adhaura, Kaimur, Bhabua (Bihar)	5	5	5	5.0	0.40 (1)	-	-	4.0 (9)	0.20 (1)	-	-	0.40 (1)	4.4 (10)	0.60 (2)	5.0 (12)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
30.	KVK, Chanpura-Basaith, Madhubani (Bihar)	5	5	5	5.0	0.25 (1)	-	1.05 (3)	3.7 (10)	-	-	-	-	5.0 (14)	-	5.0 (14)
31.	KVK (RAU), Pipra Kothi, East Champaran (Bihar)	5	5	5	5.0	-	-	-	5.0 (11)	-	-	-	-	5.0 (11)	-	5.0 (11)
32.	KVK (RAU), Madhopur, West Champaran (Bihar)	5	5	5	5.0	-	-	-	4.6 (10)	-	-	-	0.4 (1)	4.6 (10)	0.4 (1)	5.0 (11)
33.	BAU, Kanke, Ranchi (Jharkhand)	7	7	7	7.0	-	-	2.0 (5)	4.0 (9)	-	-	-	1.0 (2)	6.0 (14)	**1.0 (2)**	7.0 (16)
34.	KVK, Morabadi, Ranchi (Jharkhand)	10	10	10	10.0	-	6.0 (15)	4.0 (10)	-	-	-	-	-	10.0 (25)	-	10.0 (25)
35.	KVK, BAU, West Singhbhum (Jharkhand)	7	7	6	6.0	-	6.0 (15)	-	-	-	-	-	-	6.0 (15)	-	6.0 (15)
	NWPZ															
36.	KVK (CSKHPKV), Una (HP)	5	5	5	5.0	-	-	-	5.0 (6)	-	-	-	-	5.0 (6)	-	5.0 (6)
37.	KVK (SKUAST-Jammu), Rajhani, Kathua, Jammu (J&K)	10	10	10	10.0		-	-	10.0 (25)	-	-	-	-	10.0 (25)	-	10.0 (25)
38.	PAU, Ludhiana (Punjab)	10	10	10	10.0	2.0 (2)	-	-	4.0 (4)	-	-	-	4.0 (4)	6.0 (6)	4.0 (4)	10.0 (10)
39.	PAU, RRS, Gurdaspur (Punjab)	7	7	7	7.0	-	-	-	7.0 (7)	-	-	-	-	7.0 (7)	-	7.0 (7)
40.	KVK, Haveli Kalan, Rupnagar (Punjab)	6	6	6	6.0	-	-	0.4 (1)	5.6 (14)	-	-	-	-	6.0 (15)	-	6.0 (15)
41.	KVK, Usman, Amritsar (Punjab)	6	6	5	5.0	-	-		5.0 (9)	-	-	-	-	5.0 (9)	-	5.0 (9)
42.	RBS College, Bichpuri, Agra (UP)	6	6	6	6.0	-	-	5.0 (5)	1.0 (1)	-	-	-	-	6.0 (6)	-	6.0 (6)
43.	KVK, Baghara, Muzaffarnagar (UP)	6	6	6	6.0	-	-	3.0 (7)	3.0 (7)	-	-	-	-	6.0 (14)	-	6.0 (14)
44.	ZARS, Nagina, Bijnor (UP)	5	5	5	5.0	0.5 (1)	-	1.5 (3)	3.0 (3)	-	-	-	-	5.0 (7)	-	5.0 (7)
45.	KVK, Khajuri Bagh, New Gopal Nagar, Saharanpur,UP	5	5	5	5.0	0.8 (2)	-	3.0 (7)	1.2 (3)	-	-	-	-	5.0 (12)	-	5.0 (12)
46.	ICAR-IIFSR, Modipuram, Meerut (UP)	7	7	7	7.0	-	-	7.0 (18)	-	-	-	-	-	7.0 (18)	-	7.0 (18)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
47.	Amity Centre for Extension Services, AUUP Campus, Sector-125, Noida (UP)	6	6	6	6.0	1.2 (3)	-	4.0 (10)		0.40 (1)	-	0.40 (1)	-	5.2 (13)	0.8 (2)	6.0 (15)
48.	GBPUA&T, Pantnagar, USNagar (Uttarakhand)	7	7	7	7.0	-	-	3.0 (3)	4.0 (4)	-	-	-	-	7.0 (7)	-	7.0 (7)
49.	CATAT, IARI, New Delhi	7	7	7	7.0	4.2 (8)	-	2.4 (6)	-	0.40 (1)	-	-	-	6.6 (14)	0.40 (1)	7.0 (15)
50.	KVK (NHRDF), Ujwa, New Delhi	7	7	7	7.0		-	5.8 (14)	0.4 (1)	-	-	0.4 (1)	0.4 (1)	6.2 (15)	0.8 (2)	7.0 (17)
51.	ICAR-IIWBR, Karnal (Haryana)	7	7	7	7.0	1.0 (1)	-	2.0 (5)	4.0 (5)	-	-	-	-	7.0 (11)	-	7.0 (11)
52.	ICAR-CSSRI, Karnal (Haryana)	7	7	7	7.2*	-	-	-	7.2 (18)	-	-	-	-	7.2 (18)	-	7.2 (18)
53.	CCSHAU, Hisar (Haryana)	6	6	6	6.0	-	-	-	6.0 (6)	-	-	-	-	6.0 (6)	-	6.0 (6)
54.	KVK, Bhiwani (Haryana)	5	5	5	5.0	1.2 (3)	-	-	3.8 (7)	-	-	-	-	5.0 (10)	-	5.0 (10)
55.	KVK, Tepla, Ambala (Haryana)	5	5	5	5.0	-	-	-	5.0 (10)	-	-	-	-	5.0 (10)	-	5.0 (10)
56.	KVK, Peoda Road, Kaithal (Haryana)	5	5	5	5.0	-	-	1.0 (1)	4.0 (4)	-	-	-	-	5.0 (5)	-	5.0 (5)
57.	RARI, SKNAU, Durgapura, Jaipur (Rajasthan)	5	5	5	5.0	-	-	3.8 (9)	1.2 (3)	-	-	-	-	5.0 (12)	-	5.0 (12)
58.	KVK, Ajmer (Rajasthan)	5	5	5	5.0	1.2 (3)	-	3.8 (9)	-	-	-	-	-	5.0 (12)	-	5.0 (12)
59.	KVK, Banasthali Vidyapeeth, District-Tonk (Rajasthan)	5	5	5	5.0	3.5 (7)	0.5 (1)	0.5 (1)	0.5 (1)	-	-	-	-	5.0 (10)	-	5.0 (10)
60.	ARS (RAU), Sriganganagar (Rajasthan)	5	5	5	5.0	-	-	5.0 (5)	-	-	-	-	-	5.0 (5)	-	5.0 (5)
	CZ															
61.	RCOA (MPUA&T), Udaipur (Rajasthan)	7	7	7	7.0	1.5 (3)	1.0 (2)	-	0.4 (1)	-	4.1 (9)	-	-	2.9 (6)	4.1 (9)	7.0 (15)
62.	ARS, MPUA&T, Banswara (Rajasthan)	7	7	7	7.0	-	5.8 (14)	-	-	-	1.2 (3)	-	-	5.8 (14)	1.2 (3)	7.0 (17)
63.	ARS, MPUA&T, Kota (Rajasthan)	7	7	7	7.0	2.0 (3)	1.0 (1)	3.0 (3)	1.0 (1)	-	-	-	-	7.0 (8)	-	7.0 (8)
64.	KVK, Sawai Madhopur (Rajasthan)	5	5	5	5.0	0.4 (1)	-	4.6 (11)	-	-	-	-	-	5.0 (12)	-	5.0 (12)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
65.	WRS, JAU, Junagarh (Gujarat)	10	10	4	4.0	-	-	0.4 (1)	2.8 (7)	-	-	-	0.8 (2)	3.2 (8)	0.8 (2)	4.0 (10)
66.	MWRS, SDAU, Vijapur, Mehsana (Gujarat)	10	10	7	7.0	-	-	1.6 (4)	5.4 (12)	-	-	-	-	7.0 (16)	-	7.0 (16)
67.	JNKVV, Jabalpur (MP)	10	10	5	5.0	-	-	3.0 (2)	2.0 (1)	-	-	-	-	5.0 (3)	-	5.0 (3)
68.	IARI, RWRS, Indore (MP)	10	10	10	13.50*	0.9 (2)	-	12.0 (24)	0.6 (2)	-	-	-	-	13.50 (28)	-	13.50 (28)
69.	KVK (JNKVV), Purushottampur, Panna (MP)	7	7	7	7.0	-	-	2.2 (5)	3.6 (9)	-	-	0.8 (2)	0.4 (1)	5.8 (14)	1.2 (3)	7.0 (17)
70.	KVK, Kalukhera Shiksha Samiti, Kalukhera, Ratlam (MP)	10	10	10	10.0	0.8 (2)	1.6 (4)	4.0 (10)	2.8 (7)	-	0.4 (1)	0.4 (1)	-	9.2 (23)	0.8 (2)	10.0 (25)
71.	KVK (RVSKVV), Pipersama, Neemuch(MP)	5	5	5	5.0	-	-	2.6 (6)	2.0 (5)	-	-	0.4 (1)	-	4.6 (11)	0.4 (1)	5.0 (12)
72.	KVK (RVSKVV),COH, Mandsour (MP)	5	5	5	5.0	0.4 (1)	-	2.0 (5)	2.6 (6)	-	-	-	-	5.0 (12)	-	5.0 (12)
73.	KVK (RVSKVV), MLNagar, Ujjain (MP)	10	10	10	10.0	2.8 (7)	-	4.4 (11)	-	0.8 (2)	-	1.6 (4)	0.4 (1)	7.2 (18)	2.8 (7)	10.0 (25)
74.	KVK (RVSKVV), Budhapura, Lahar, Bhind(MP)	5	5	5	5.0	0.8 (2)	-	1.6 (4)	2.6 (6)	-	-	-	-	5.0 (12)	-	5.0 (12)
75.	KVK, RRS, IGKVV, Jagdalpur, Bastar (CG)	7	7	7	7.0	-	4.8 (10)	-	1.0 (1)	-	1.2 (3)	-	-	5.8 (11)	1.2 (3)	7.0 (14)
76.	IGAU, RARS, Sarkanda, Bilaspur (CG)	10	10	10	10.0	3.0 (3)	4.0 (4)	-	-	-	-	-	3.0 (3)	7.0 (7)	3.0 (3)	10.0 (10)
	PZ															
77.	PDKV, Akola (Maharashtra)	10	10	10	10.0	3.0 (3)	-	4.0 (4)	1.0 (1)	-	1.0 (1)	1.0 (1)	-	8.0 (8)	2.0 (2)	10.0 (10)
78.	ARS, Niphad, Nasik (Maharashtra)	10	10	10	10.0	1.0 (1)	-	-	9.0 (9)	-	-	-	-	10.0 (10)	-	10.0 (10)
79.	MAU, Parbhani (Maharashtra)	10	10	5	5.0	-	-	0.8 (2)	4.2 (10)	-	-	-	-	5.0 (12)	-	5.0 (12)
80.	ARI, MACS, Pune (Maharashtra)	10	10	10	10.0	-	-	4.0 (4)	4.0 (4)	-	-	1.0 (1)	2.0 (2)	8.0 (8)	3.0 (3)	10.0 (11)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
81.	UAS, Dharwad (Karnataka)	20	20	20	20.0	-	-	-	20.0 (20)	-	-	-	-	20.0 (20)	-	20.0 (20)
82.	BIRDS KVK, Tukkanatti, Gokak, Belgaum (Karnataka)	10	10	5	5.0	-	-	-	5.0 (8)	-	-	-	-	5.0 (8)	-	5.0 (8)
	SHZ															
83.	IARI, RS, Wellington (Tamil Nadu)	15	15	15	15.2*	1.0 (2)	-	5.4 (18)	5.0 (12)	-	-	3.4 (12)	0.4 (1)	11.4 (32)	3.8 (13)	15.2 (45)
	Very High Altitude Areas of NHZ						-	-	-	-	-	-	-	-	-	
84.	ICAR-IIWBR, Karnal (FLDs conducted in HP)	10	10	5	5.1		5.1 (26)			-	-	-	-	5.1 (26)	-	5.1 (26)
	Total	**600**	**600**	**543**	**547.4**	**52.1 (124)**	**43.74 (109)**	**148.83 (323)**	**260.44 (572)**	**6.5 (23)**	**7.9 (17)**	**10.25 (28)**	**17.64 (42)**	**505.11 (1128)**	**42.29 (110)**	**547.4 (1238)**

Note : The figures in brackets indicate the number of farmers. *Area covered more than allotted which is restricted to area equal to allotted FLDs.

Annexure - II : Category wise number of barley FLDs farmers during 2016-17

S.N.	Name of Centre	Allocation		Achievement		Achievement Men, Area in ha, (No. of Farmers)				Achievement Women, Area in ha, (No. of Farmers)				Men	Women	Total
		No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
	NHZ															
1.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	5	5	2	2.0	0.30 (2)	-	-	1.70 (10)	-	-	-	-	2.0 (12)	-	2.0 (12)
2.	IARI, RS, Amartara Cottage, Shimla (HP)	5	5	Not conducted	-	-	-	-	-	-	-	-	-	-	-	-
	NEPZ															
3.	NDUA&T, Narendranagar, Kumarganj, Faizabad (UP)	5	5	5	5.4*	-	-	1.60 (2)	3.50 (6)	-	-	-	0.30 (1)	5.1 (8)	0.30 (1)	5.4 (9)
4.	KVK (IAS-BHU), Barkachha, Mirzapur (UP)	5	5	Not conducted	-	-	-	-	-	-	-	-	-	-	-	-
5.	CSAUA&T, Kanpur (UP)	5	5	5	6.4*	-	-	0.4 (1)	6.0 (15)	-	-	-	-	6.4 (16)	-	6.4 (16)
6.	BHU, Varanasi (UP)	5	5	3	2.5	-	-	-	2.5 (3)	-	-	-	-	2.5 (3)	-	2.5 (3)
	NWPZ														-	
7.	ICAR-IIFSR, Modipuram, Meerut (UP)	5	5	5	6.6	-	-	6.6 (18)	-	-	-	-	-	6.6 (18)	-	6.6 (18)
8.	PAU, Ludhiana (Punjab)	5	5	5	5.0	0.5 (1)	-	4.5 (8)	-	-	-	-	-	5.0 (9)	-	5.0 (9)
9.	CCSHAU, Hisar (Haryana)	5	5	5	5.0	-	-	0.8 (2)	4.20 (8)	-	-	-	-	5.0 (10)	-	5.0 (10)
10.	KVK (CCSHAU), Fatehabad (Haryana)	5	5	5	6.4	-	-	0.4 (1)	6.0 (15)	-	-	-	-	6.4 (16)	-	6.4 (16)
11.	KVK, Rampura, Rewari (Haryana)	5	5	5	5.0	-	-	5.0 (11)	-	-	-	-	-	5.0 (11)	-	5.0 (11)
12.	KVK (CCSHAU), Bhiwani (Haryana)	5	5	5	6.6*	0.80 (1)	-	-	5.00 (8)	-	-	-	0.8 (2)	5.80 (9)	0.80 (2)	6.6 (11)

S.N.	Name of Centre	No. of FLDs	Area under FLDs (ha)	No. of FLDs	Area under FLDs (ha)	SC	ST	OBC	Gen	SC	ST	OBC	Gen	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)	Area(ha) (No. of Farmers)
13.	RARI (SKNAU), Durgapura, Jaipur (Rajasthan)	5	5	5	5.0	1.0 (2)	-	2.6 (5)	0.9 (1)	-	-	0.5 (1)	-	4.5 (8)	0.5 (1)	5.0 (9)
14.	KVK, Tankarda, Chomu, Jaipur (Rajasthan)	5	5	5	5.0	0.6 (1)	-	4.4 (7)		-	-	-	-	5.0 (8)	-	5.0 (8)
	CZ															
15.	RCOA, MPUA&T, Udaipur (Rajasthan)	5	5	5	5.0	1.0 (2)	0.5 (1)	3.0 (6)	0.5 (1)	-	-	-	-	5.0 (10)	-	5.0 (10)
16.	KVK (MPUA&T), Dhoinda, Rajasmand (Rajasthan)	5	5	5	5.0	-	-	4.0 (10)	0.5 (1)	-	-	0.5 (1)	-	4.5 (11)	0.5 (1)	5.0 (12)
17.	ZARP, COA, JNKVV, Kuthulia Farm, Rewa (MP)	5	5	5	5.0	-	1 (1)		4 (4)	-	-	-	-	5 (5)	-	5.0 (5)
18.	KVK (JNKVV), Purushottampur, Panna (MP)	5	5	5	5.0	-	-	3.0 (10)	1.7 (4)	-	-	0.3 (1)		4.7 (14)	0.3 (1)	5.0 (15)
19.	KVK (RVSKVV), Juara Khurd, AB Road, Morena (MP)	5	5	5	6.4*	0.4 (1)	-	1.6 (4)	4.4 (11)	-	-	-	-	6.4 (16)	-	6.4 (16)
20.	KVK (RVSKVV), Lahar, Bhind (MP)	5	5	5	6.4*	0.4 (2)	-	2.0 (5)	3.6 (9)	0.4 (1)	-	-	-	6.0 (15)	0.4 (1)	6.4 (16)
	Total	**100**	**100**	**85**	**93.7**	**5.0 (11)**	**1.5 (2)**	**39.9 (90)**	**44.5 (96)**	**0.4 (1)**	**-**	**1.3 (3)**	**1.1 (3)**	**90.9 (199)**	**2.8 (7)**	**93.7 (206)**

Note : The figures in brackets indicate the number of farmers. ** Area covered more than allotted which is restricted equal to allotted FLDs.*

Annexure-III : Information on wheat varieties demonstrated in Front Line Demonstrations (FLDs) during 2016-17

Name of Variety	**HS 562**
Zone/State	Northern Hill Zone
Production condition	Timely sown
Year of release	2016
Released by CVRC/SVRC	CVRC
Developed by	ICAR-IARI, New Delhi
Plant height (cm)	Rainfed: 97cm Irrigated: 101cm
Days to maturity (days)	Rainfed: 183 Irrigated: 175
1000-grain weight (g)	43
Average yield (q/ha)	Rainfed: 36 Irrigated: 52.7
Potential yield (q/ha)	Rainfed: 58.8 Irrigated: 62.2
Special Feature: It has tapering ear shape, waxy peduncle and leaf sheath.	
Name of Variety	**HS 507**
Zone/State	NHZ
Production condition	Timely sown, Rainfed/Irrigated
Year of release	2011
Released by CVRC/SVRC	CVRC
Developed by	IARI, RS, Shimla
Plant height (cm)	Rainfed: 79, Irrigated: 95
Days to maturity (days)	Rainfed: 179, Irrigated: 165
1000-grain weight (g)	Rainfed: 36, Irrigated: 41.0
Average yield (q/ha)	Rainfed: 26.6, Irrigated: 46.8
Potential yield (q/ha)	Rainfed: 54.3, Irrigated: 60.1
Special Feature: Substantial yield superiority under both rainfed and irrigated conditions. The variety has high degree of resistantance to yellow and stripe rusts. Good for chapati, bread and biscuit making.	
Name of Variety	**VL 907**
Zone/State	NHZ
Production condition	Early sown, Rainfed
Year of release	2010
Released by CVRC/SVRC	CVRC
Developed by	VPKAS, Almora
Plant height (cm)	Rainfed: 82, Irrigated: 97
Days to maturity (days)	Rainfed: 180, Irrigated: 167
1000-grain weight (g)	Rainfed: 39.2, Irrigated: 41.0
Average yield (q/ha)	Rainfed: 27.9, Irrigated: 44.3
Potential yield (q/ha)	Rainfed: 52.5, Irrigated: 56.9
Special Feature: yield superiority under rainfed and irrigated conditions. This genotype is good sources of micro elements iron, zinc, copper and manganese. Resistant to yellow and brown rusts.	
Name of Variety	**HPW 349**
Zone/State	NHZ
Production condition	Timely sown, Rainfed/Irrigated
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	CSKHPKVV, Palampur
Plant height (cm)	Rainfed: 86(RF),102(IR)
Days to maturity (days)	Rainfed: 175, Irrigated: 171
1000-grain weight (g)	Rainfed: 37.3, Irrigated: 42.3
Average yield (q/ha)	Rainfed: 25.9, Irrigated: 47.0
Potential yield (q/ha)	Rainfed: 42.1, Irrigated: 61.4
Special Feature: High yield potential for rainfed as well as irrigated conditions. Responsive to higher doses of nitrogen fertilizer. Resistant to yellow and brown rusts as evident by diversity for seedling resistant genes. The variety is good in chapatti making and also better nutrition quality.	

Name of Variety	**VL 953**
Zone/State	Uttarakhand Hills and Uttarakhand Plains
Production condition	Timely sown irrigated organic conditions of hills Timely sown irrigated conditions of Plains
Year of release	2016
Released by CVRC/SVRC	SVRC
Developed by	ICAR-VPKAS, Almora
Plant height (cm)	85-90 cm (hills) 95-100 cm (Plains)
Days to maturity (days)	160-165 (hills) 135-137 days (Plains)
1000-grain weight (g)	46-48 gm
Average yield (q/ha)	30-35 q/ha (hills), 40-45 q/ha (Plains)
Potential yield (q/ha)	41.16 q/ha(hills) ,65.22 q/ha (Plains)
Special Feature: Recommended for Hills as well as Plains both	
Name of Variety	**SW 2 (SKW 355)**
Zone/State	NHZ /J&K
Production condition	Timely sown, Rainfed
Year of release	2013
Released by CVRC/SVRC	SVRC
Developed by	SKUAST, Srinagar
Plant height (cm)	110-115
Days to maturity (days)	215-220
1000-grain weight (g)	34 g (Avg.)
Average yield (q/ha)	35-38
Potential yield (q/ha)	45
Special Feature: Early maturing which suits in Wheat-Rice cropping system under Kashmir valley conditions.	
Name of Variety	**HPW 360 (*Him PalamGehun* 1)**
Zone/State	Himachal Pradesh
Production condition	Early sown, Rainfed
Year of release	2016
Released by CVRC/SVRC	SVRC
Developed by	RWRC, Malan
Plant height (cm)	83
Days to maturity (days)	204
1000-grain weight (g)	42
Average yield (q/ha)	25.5
Potential yield (q/ha)	33.6
Special Feature: Highly resistant to yellow rust loose smut, Karnal bunt, hill bunt and foot rot diseases, high number of grains/ spike and highly resistant to lodging	
Name of Variety	**HD2967**
Zone/State	NWPZ & NEPZ
Production condition	Timely sown, Irrigated
Year of release	2011
Released by CVRC/SVRC	CVRC
Developed by	IARI, New- Delhi
Plant height (cm)	98
Days to maturity (days)	143
1000-grain weight (g)	42.1
Average yield (q/ha)	50.4
Potential yield (q/ha)	66.1
Special Feature: Recommended for two mega zones (NWPZ & NEPZ). This genotype has adult plant resistant to yellow and brown rusts. It has high zinc, copper and iron thereby securing nutritional security.	

Name of Variety	**DBW 107**
Zone/State	NEPZ
Production condition	Late sown, Irrigated
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	IIWBR, Karnal
Plant height (cm)	89
Days to maturity (days)	109
1000-grain weight (g)	39
Average yield (q/ha)	41.3
Potential yield (q/ha)	68.7
Special Feature: DBW 107 has shown high yield potential under late sown conditions with lower reduction under very late condition thus showing its adaptability to sowing dates. This variety has resistance to leaf rust and blight and thus providing features of tolerance under varying environments. The variety has high protein content zinc and iron making it rich for nutritional quality.	
Name of Variety	**HD 3118**
Zone/State	NEPZ
Production condition	Late sown, Irrigated
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	IARI, New Delhi
Plant height (cm)	94
Days to maturity (days)	112
1000-grain weight (g)	37
Average yield (q/ha)	41.7
Potential yield (q/ha)	66.4
Special Feature: The variety has shown genetic potential of higher yield under late and very late conditions. This has high levels of resistance against leaf rust and tolerance to leaf blight. The variety has shown higher values of bread loaf volume, protein content and bread quality score.	
Name of Variety	**HD 3086**
Zone/State	NWPZ
Production condition	Timely sown, Irrigated
Year of release	2014
Released by CVRC/SVRC	CVRC
Developed by	IARI, New Delhi
Plant height (cm)	98
Days to maturity (days)	143
1000-grain weight (g)	39
Average yield (q/ha)	54.6
Potential yield (q/ha)	71.1
Special Feature: The variety has higher yield, resistant to yellow and brown rust.	
Name of Variety	**DBW 88**
Zone/State	NWPZ
Production condition	Timely sown, Irrigated
Year of release	2014
Released by CVRC/SVRC	CVRC
Developed by	IIWBR, Karnal
Plant height (cm)	97
Days to maturity (days)	143
1000-grain weight (g)	38
Average yield (q/ha)	54.2
Potential yield (q/ha)	69.9
Special Feature: DBD 88 has higher protein content, resistant to yellow and brown rust and elasticity for sowing time thereby suitable for varying planting dates.	

Name of Variety	**WH 1105**
Zone/State	NWPZ
Production condition	Timely sown, Irrigated
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	CCSHAU, Hisar
Plant height (cm)	99
Days to maturity (days)	142
1000-grain weight (g)	41.1
Average yield (q/ha)	52.5
Potential yield (q/ha)	71.6
Special Feature: High yield and resistant to yellow rust, leaf blight and powdery mildew disease, possesses good chapatti making quality and has tolerance to terminal heat stress.	
Name of Variety	**DBW 71**
Zone/State	NWPZ
Production condition	Late sown, Irrigated
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	IIWBR, Karnal
Plant height (cm)	90
Days to maturity (days)	119
1000-grain weight (g)	37.1
Average yield (q/ha)	42.7
Potential yield (q/ha)	68.9
Special Feature: The high yield potential of DBW 71 under irrigated late sown condition of NWPZ possess disease resistance and heat tolerance. The genotype has high protein, chapatti score, yellow pigment and micro nutrients.	
Name of Variety	**KRL 210**
Zone/State	Northern Plains Zone
Production condition	Timely sown, Irrigated, saline soils
Year of release	2012
Released by CVRC/SVRC	CVRC
Developed by	CSSRI, KARNAL
Plant height (cm)	99
Days to maturity (days)	143
1000-grain weight (g)	40.1
Average yield (q/ha)	33.7
Potential yield (q/ha)	49.3
Special Feature: KRL 210 has shown high yielding ability along with salt tolerance over years and locations. This variety is lodging resistance, possessing resistance to yellow and brown rust along with good quality parameters.	
Name of Variety	**HI 8737(d)**
Zone/State	CZ
Production condition	Timely sown, Irrigated
Year of release	2014
Released by CVRC/SVRC	CVRC
Developed by	IARI, Indore
Plant height (cm)	85
Days to maturity (days)	124
1000-grain weight (g)	51
Average yield (q/ha)	53.4
Potential yield (q/ha)	81.0
Special Feature: HI 8737 is a widely adopted high yielding durum genotype that has shown yield stability under timely and late sown conditions. The variety has good levels of resistance against leaf and stem rust seedling resistance test indicated presence of diverse genes for resistance. The variety is good for chapatti making and also for pasta preparations and essential micro-nutrients like iron and zinc.	

Name of Variety	**DBW 110**
Zone/State	CZ
Production condition	Timely sown, Restricted Irrigation
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	IIWBR, Karnal
Plant height (cm)	89
Days to maturity (days)	124
1000-grain weight (g)	43
Average yield (q/ha)	39.2
Potential yield (q/ha)	50.1
Special Feature: DBW 110 has high yield potential under timely sown restricted irrigation condition in central zone. This genotype is resistance to brown and black rust. It is also resistance to Karnal bunt. This genotype has shown promise for better yield with two irrigations. It has good protein, test weight and good chapatti/bread making score.	

Name of Variety	**HI 8713 (d)**
Zone/State	Central Zone
Production condition	Timely sown, Irrigated conditions
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	ICAR-IARI Regional Station, Indore (MP)
Plant height (cm)	90-95
Days to maturity (days)	120-125
1000-grain weight (g)	45
Average yield (q/ha)	52.5
Potential yield (q/ha)	68.2
Special Feature: It can contribute to "nutritional security" in central India, because of its high protein content (~12.0 %), high yellow pigment (~7.16 ppm) and good levels of essential micronutrients like iron, zinc, copper and manganese.	

Name of Variety	**HI 8759 (d)**
Zone/State	Central Zone
Production condition	Timely sown, Irrigated conditions
Year of release	2016
Released by CVRC/SVRC	CVRC
Developed by	ICAR-IARI Regional Station, Indore (MP)
Plant height (cm)	80-85
Days to maturity (days)	115-120
1000-grain weight (g)	50-55
Average yield (q/ha)	56.9
Potential yield (q/ha)	75.5
Special Feature: It can serve as a "dual purpose" variety suitable both for making chapati and for pasta preparations due to its moderate SDS-sedimentation value (~35 ml) and high protein content (~12.0 %), good levels of yellow pigment (~5.7 ppm), and essential micronutrients like iron (42.1 ppm) and zinc (42.8 ppm).	

Name of Variety	**HI 1605**
Zone/State	Peninsular Zone
Production condition	Timely sown, Restricted Irrigation Conditions
Year of release	2016
Released by CVRC/SVRC	CVRC
Developed by	ICAR-IARI Regional Station, Indore (MP)
Plant height (cm)	80-85
Days to maturity (days)	105-110
1000-grain weight (g)	35 - 40
Average yield (q/ha)	29.1
Potential yield (q/ha)	44.0
Special Feature: HI 1605 is a good quality wheat genotype with high protein content (~13%), good grain appearance (~6.5), high sedimentation value (~55 ml), high extraction rate (~74%), good bread, chapatti and biscuit quality with good levels of micronutrients like iron (43.0 ppm) and zinc (35.0 ppm).	

Name of Variety	**Raj 4238**
Zone/State	CZ
Production condition	Late sown, Irrigated
Year of release	2016
Released by CVRC/SVRC	CVRC
Developed by	RS, RAU, Durgapura
Plant height (cm)	84
Days to maturity (days)	114
1000-grain weight (g)	40
Average yield (q/ha)	45.5
Potential yield (q/ha)	62.8
Special Feature: Good for chapatti (score 8.0)	
Name of Variety	**GJW 463**
Zone/State	Gujarat
Production condition	Early sown, irrigated condition of Saurashtra region and Timely sown, irrigated condition of Gujarat
Year of release	2016
Released by CVRC/SVRC	SVRC
Developed by	WRS, JAU, Junagadh (Gujarat)
Plant height (cm)	80-86 cm
Days to maturity (days)	103-118 days
1000-grain weight (g)	42-46 gm
Average yield (q/ha)	55.75 ES, 50.91 TS
Potential yield (q/ha)	75.90 (NIVT-II Powarkheda centre)
Special Feature: Heat tolerance (HSI-0.48)	
Name of Variety	**GW 451**
Zone/State	Gujarat
Production condition	Timely sown, Irrigated
Year of release	2016
Released by CVRC/SVRC	SVRC
Developed by	Vijapur
Plant height (cm)	76 (68-88)
Days to maturity (days)	105 (95-113)
1000-grain weight (g)	45.8 (37-48)
Average yield (q/ha)	53.9
Potential yield (q/ha)	66.0
Name of Variety	**GDW 1255 (d)**
Zone/State	Gujarat (excluding South Gujarat)
Production condition	Timely sown, Irrigated
Year of release	2013
Released by CVRC/SVRC	SVRC
Developed by	Vijapur
Average yield (q/ha)	47.6
Potential yield (q/ha)	66.1

Name of Variety	**HD3090**
Zone/State	PZ
Production condition	Late sown, Irrigated
Year of release	2014
Released by CVRC/SVRC	CVRC
Developed by	IARI, New Delhi
Plant height (cm)	80
Days to maturity (days)	101
1000-grain weight (g)	37.2
Average yield (q/ha)	41.4
Potential yield (q/ha)	63.1
Special Feature: This genotype is an early maturity semi dwarf with high yield potential under timely irrigation late sown conditions. It has high degree of resistance against leaf and stem rusts. The variety has high protein content, high biscuit spread factor and also good for chapatti making.	
Name of Variety	**NIAW 1994 (*Phule Samadhan*)**
Zone/State	Maharashtra state
Production condition	Late sown irrigated and Timely sown irrigated
Year of release	2014
Released by CVRC/SVRC	SVRC
Developed by	ARS, Niphad, MPKV, Rahuri, Ahmednagar, (Maharashtra)
Plant height (cm)	Timely sown irrigated: 73-87 cm Late sown irrigated : 67-84 cm
Days to maturity (days)	Timely sown irrigated: 108(95-118) days Late sown irrigated: 97 (91-102) days
1000-grain weight (g)	Timely sown irrigated: Large 43g (42-44g) Late sown irrigated: Medium 39g (36g-42g)
Average yield (q/ha)	Timely sown irrigated: 46.12 q/ha Late sown irrigated: 44.23 q/ha
Special Feature: NIAW 1994 is a thermo-tolerant variety which suits both the sowing conditions viz., Late sown irrigated and Timely sown irrigated. c*hapati* quality of NIAW 1994 is superior than the checks *viz.* MACS 6222, NIAW 34 and NIAW 917 . Grain protein content in NIAW 1994 varies between 12.5 to13.8 % under different conditions. Under late sown condition NIAW 1994 is superior in hectoliter weight (81.1) against HD 2392 (80.0), similarly under timely sown condition NIAW 1994 (81.5) showed higher test weight than MACS 6222 (81.1).	
Name of Variety	**MACS 6478**
Zone/State	PZ
Production condition	Timely sown, Irrigated
Year of release	2014
Released by CVRC/SVRC	CVRC
Developed by	ARI, Pune
Plant height (cm)	78
Days to maturity (days)	105
1000-grain weight (g)	45.1
Average yield (q/ha)	45
Potential yield (q/ha)	65.7
Special Feature: Variety MACS 6478 is highly resistant to both black and brown rust and carries adult plant resistant genes. This variety has high yield potential and thus can give better yield with matching agronomic practices. The variety has high protein content and better nutritional quality for zinc and iron thereby making it good for chapatti and bread quality.	

Name of Variety	**MACS 3949 (d)**
Zone/State	Peninsular Zone
Production condition	Irrigated timely sown condition
Year of release	2017
Released by CVRC/SVRC	CVRC
Developed by	Agharkar Research Institute (MACS), Pune
Plant height (cm)	81 cm (78 to 83 cm)
Days to maturity (days)	112 days (108 to 117)
1000-grain weight (g)	47 g
Average yield (q/ha)	43.9 q/ha
Potential yield (q/ha)	53.5 q/ha
Special Feature: MACS 3949 (d) has bold & lustrous grain with 47g 1000-grain weight with high protein content (12.9 %), better nutritional quality (Zinc 40.6 ppm, Iron 38.6 ppm) with good milling quality (Test weight 81.4 kg/hl) and highest overall acceptability 7.25 (best cooking quality for pasta product out of 9). It has also shown resistance against stem and leaf rusts under both natural and artificial screening conditions. MACS 3949 (d) also showed resistance against leaf blight, powdery mildew, flag smut and Karnal bunts. It has also shown good level of resistance to insect pests than checks.	
Name of Variety	**UAS 304**
Zone/State	PZ
Production condition	Timely sown, Irrigated
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	UAS, Dharwad
Plant height (cm)	80
Days to maturity (days)	109
1000-grain weight (g)	41.7
Average yield (q/ha)	46.8
Potential yield (q/ha)	59.9
Special Feature: UAS 304 is widely adopted genotype of bread wheat possessing multiple disease resistance to prevailing leaf and stem rust races and spot blotch. This variety good protein, bold grain and acceptable grain quality.	
Name of Variety	**UAS 446 (d)**
Zone/State	PZ
Production condition	Timely sown, Rainfed
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	UAS Dharwad
Plant height (cm)	66
Days to maturity (days)	96
1000-grain weight (g)	44
Average yield (q/ha)	18.3
Potential yield (q/ha)	24.4
Special Feature: UAS 446 is a high yielding durum wheat genotype suitable for rainfed condition and responded well to different doses of fertilizers. It is resistant to black and brown rusts.	
Name of Variety	**UAS 347**
Zone/State	PZ
Production condition	Timely sown, Rainfed
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	UAS, Dharwad
Average yield (q/ha)	18.4
Potential yield (q/ha)	24.6
Special Feature: Good for biscuit quality (score 8.47)	

Name of Variety	**UAS 415 (d)**
Zone/State	PZ
Production condition	Timely sown, Irrigated
Year of release	2009
Released by CVRC/SVRC	CVRC
Developed by	UAS Dharwad
Plant height (cm)	84
Days to maturity (days)	112
1000-grain weight (g)	43.7
Average yield (q/ha)	49.6
Potential yield (q/ha)	61.8
Special Feature: UAS 415 (d) has shown high yield for timely and late sowing in Peninsular India and thus wider adaptation. It has multiple disease resistance for leaf and stem rusts, foliar blight, powdery mildew and flag smut.	
Name of Variety	**HW 5216**
Zone/State	SHZ
Production condition	Timely sown, Restricted irrigation
Year of release	2013
Released by CVRC/SVRC	CVRC
Developed by	IARI-RS, Wellngton
Plant height (cm)	86
Days to maturity (days)	105
1000-grain weight (g)	43.7
Average yield (q/ha)	45.6
Potential yield (q/ha)	62.4
Special Feature: HW 5216 has good yield potential under varied irrigation level, has high degree of seedling resistance to stem, leaf and yellow rust against all the prevalent races. This variety has good grain appearance, high test weight and better grain quality.	
Name of Variety	**HW 5207 as COW3**
Zone/State	Tamil Nadu including hilly regions
Production condition	Restricted irrigated, medium fertility, timely sown conditions in Tamil Nadu including hills
Year of release	2017 by CVRC
Released by CVRC/SVRC	2017 by CVRC and 2015 by SVRC
Developed by	IARI, Regional Station, Wellington, Tamil Nadu
Plant height (cm)	90 cms
Days to maturity (days)	95-100 Days
1000-grain weight (g)	40.5gm
Average yield (q/ha)	40.70q/ha
Potential yield (q/ha)	59.60q/ha
Special Feature: HW 5207(COW3) has recorded the highest mean grain yield (4076 kg/ha) which is 12 per cent increase over the check COW (W) 1 (3641 kg/ha) in a total of 131 trials. The variety mature in about 100 days still yielding over 40 q/ha and the per day productivity is much higher. It has the ideal plant height (90 cm) with erect plant type, strong and resilient stem providing resistance to lodging. It produces very nutritious grain, registering a mean test weight of 40.5g with more than 11 per cent protein, and high level of Iron (53.1ppm), Zinc (46.3ppm), Copper (5.33ppm) and Manganese (47.5ppm) indicating excellent grain nutritional quality. In addition, this variety has high scores for bread making quality (7.0 out of 10), *chapathi* quality (7.4 out of 10) with Glu-1 score of 8 out 10 and mean sedimentation value of 45.5, high Hectolitre weight of 78.3. The variety HW 5207(COW3) showed high degree of resistance to stem, leaf and stripe rusts under both artificial and natural epiphytotic conditions against all the pathotypes occurring in the Nilgiris which is a hot spot for rust incidence.	
Name of Variety	**HW 1098 (Dicoccum)**
Zone/State	SHZ
Production condition	Timely sown, Irrigated
Year of release	2015
Released by CVRC/SVRC	CVRC
Developed by	IARI-RS, Wellington
Plant height (cm)	85
Days to maturity (days)	106
1000-grain weight (g)	40.3
Average yield (q/ha)	45.5
Potential yield (q/ha)	59.0
Special Feature:Dicoccum variety HW1098 has high yield potential and showed wider adaptability for planting under normal and late sown conditions. This is a semi dwarf variety that has required level of resistance, medium bold grains, early maturing and good protein content.	

Annexure-IV : Information on barley varieties demonstrated in Front Line Demonstrations (FLDs) during 2016-17

Variety	Zone	Production condition	Year	Developed by	Height (cm)	Days to maturity	TGW (gm)	Average Yield (q/ha)	Pot. Yield (q/ha)
BHS 400	NHZ	Rainfed, Timely sown	2014	IARI, Regional Station, Shimla, HP	83	168	39.13	32.71	58.70
RD 2794	NWPZ NEPZ	Saline/Alkaline soils	2016	RARI, Durgapura, Jaipur, Rajasthan	69	121	41.45	29.90	49.60
HUB 113	NEPZ	Irrigated, Timely sown	2014	Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, UP	101.5	120	45.98	43.20	63.40
BH 946	NWPZ	Irrigated, Timely sown	2014	Department of Genetics and Plant Breeding , CCS HAU, Hisar, Haryana	103	131	40.86	51.96	66.30
DWRB 101	NWPZ	Irrigated, Timely sown, Malt barley	2015	ICAR-IIWBR, Karnal, Haryana	97	132	48.22	50.10	67.40
BH 959	CZ	Irrigated, Timely sown	2015	Department of Genetics and Plant Breeding , CCS HAU, Hisar, Haryana	71.5	109	36.75	49.90	67.50

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