Frontline Demonstrations on Pulses in North-West India

ICAR-Agricultural Technology Application Research Institute
Zone-I, PAU Campus, Ludhiana - 141 004

Frontline Demonstrations on Pulses in North-West India

Sponsored by

National Food Security Mission (NFSM)
Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW)

ICAR-Agricultural Technology Application Research Institute
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Preface

Pulses are important source of protein, especially in the Indian vegetarian diet. Constantly increasing demand of pulses in the country due to rising population and bettering purchasing power has led to import of pulses. Additionally, declining area under pulses cultivation has constantly worsened the situation. Looking into this situation, "Cluster Frontline Demonstrations on Pulses" project under National Food Security Mission (NFSM) of Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW) was started during rabi 2015 to give a boost to the domestic production of pulses. The project continued in 2017-18, in which *Krishi Vigyan Kendras* (KVKs) of Punjab, Jammu and Kashmir, Himachal Pradesh and Uttarakhand were given responsibility to demonstrate and popularize cultivation of pulses with improved package of practices and latest technologies for realizing better yield. NFSM sanctioned Rs. 123.6 Lakh to ICAR-ATARI Zone-I, Ludhiana for conducting cluster frontline demonstrations.

During the year, 52 Krishi Vigyan Kendras of Zone-I organized 6489 demonstrations on an area of 1400.53 ha on scientific cultivation of pulses viz. chickpea, lentil, field pea, green gram, horse gram, rajmash and black gram. The demonstrations reported significantly higher yields as compared to the local checks thereby convincing farmers about the viability of improved scientific practices. Extension activities organized by the KVKs have helped them in popularizing improved practices among farmers to make this project successful.

I would like to extend my sincere thanks to National Food Security Mission (NFSM) of Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) for funding the project. I thank Dr. T. Mohapatra, Secretary, DARE and DG, ICAR for his dynamic leadership and worthy guidance to the institute in performing its duties. I am grateful to Dr.

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I congratulate the project team at ICAR-ATARI, Ludhiana and other colleagues of the institute who enthusiastically participated and successfully implemented the project.

(RAJBIR SINGH)

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Acronyms

ATARI	Agricultural Technology Application Research Institute
BBF	Broad Bed and Furrows
CCSHAU	Chaudhary Charan Singh Haryana Agricultural University
CSKHPKV	Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya
DAC&FW	Department of Agriculture, Cooperation & Farmers Welfare
DAP	Di-ammonium Phosphate
DWD	Directorate of Wheat Development
FAO	Food and Agriculture Organization
FLD	Frontline Demonstration
GADVASU	Guru Angad Dev Veterinary and Animal Sciences University
ICAR	Indian Council of Agricultural Research
IIPR	Indian Institute of Pulses Research
IPM	Integrated Pest management
KVK	Krishi Vigyan Kendra
MSP	Minimum Support Price
NFSM	National Food Security Mission
NGO	Non-governmental Organization
NPDP	National Pulses Development Project
NWPZ	North Western Plain Zone
PC	Programme Coordinator
PSB	Phosphorus Solubilizing Bacteria
SKUAST	Sher-e-Kashmir University of Agricultural Sciences and Technology
SRF	Senior Research Fellow
WHO	World Health Organization
YSPUH&F	Dr. Yashwant Singh Parmar University of Horticulture and Forestry

कार्यकारी सारांश

नवीनतम उत्पादन प्रौद्योगिकी का प्रदर्शन कर दालों की उत्पादकता में सुधार लाने के उद्देश्य से राष्ट्रीय खाद्य सुरक्षा मिशन के तहत कृषि, सहकारिता एवं किसान कल्याण विभाग द्वारा ''Cluster Frontline Demonstrations on Rabi Pulses 2015-16'' नामक परियोजना शुरू की गयी। यह परियोजना वर्ष 2017-18 में ''Cluster Frontline Demonstrations on Pulses 2017-18'' शीर्षक के साथ जारी रही। परियोजना के तहत, कृषि विज्ञान केंद्रों को समुहों में अग्रिम्पंक्ति प्रदर्शन करने के लिए रु. 3000 प्रति एकड़ की राशी प्रदान की गयी। कृषि विज्ञान केंद्रों ने दालों की खेती को लोकप्रिय बनाने और किसानों को नई सुधारित प्रौद्योगिकियों की प्रभावशीलता के बारे में बताने के लिए दलहन उत्पादन की विविध तकनीकों का प्रदर्शन किया। जिसमे, बेहतर किस्में, बीज उपचार, सीधे पंक्तिमें बुवाई, अंतरफसल प्रणाली, एकीत कीट प्रबंधन इत्यादि तकनीकें शामिल थी। प्रदर्शन के साथ-साथ, कृषि विज्ञान केंद्रोंने विभिन्न विस्तार गतिविधियों जैसे कि किसानों-वैज्ञानिकों के बीच बातचीत, प्रक्षेत्र दिवस, किसान गोष्ठी, विधि प्रदर्शन, प्रशिक्षण आदि का भी आयोजन किया। इन प्रदर्शनों की निगरानी गेहूं विकास निदेशालय, गाजियाबाद; विस्तार शिक्षा निदेशालय, पंजाब कृषि विश्वविद्यालय, लुधियाना एवं कृषि प्रौद्योगिकी अनुप्रयोग अनुसंधान संस्थान, लुधियाना से सदस्यों द्वारा की गयी।

खरीफ ऋतु के दौरान, कुल 1786 प्रदर्शन 339.93 हेक्टेयर क्षेत्र में लगाए गए। पंजाब के प्रदर्शनों में, उरद और मूंग के प्रदर्शनों से क्रमशः 33.33 और 17.10 प्रतिशत अधिक पैदावार दर्ज की गई। इसी तरह, हिमाचल प्रदेश में, उरद और मूंग के प्रदर्शनों से क्रमशः 28.36 और 19.12 प्रतिशत अधिक पैदावार की सूचना मिली। जम्मू-कश्मीर में उरद, मूंग और राजमा के प्रदर्शनों के पैदावार में क्रमशः 40.91, 32.03 और 26.99 प्रतिशत की वृद्धि दर्ज की गई। इसी तरह, उत्तराखंड में, उरद और कुल्थी पर प्रदर्शनों में क्रमशः 42.48 और 27.39 प्रतिशत अधिक पैदावार दर्ज की गई।

रबी 2017-18 के दौरान, दलहनों पर 612.4 हेक्टेयर क्षेत्र पर कुल 3648 प्रदर्शन आयोजित किए गए। पंजाब, हिमाचल प्रदेश, जम्मू और कश्मीर और उत्तराखंड में स्थानीय परिस्थितियों की तुलना में चने पर प्रदर्शनों में क्रमशः 21.43, 37.59, 38.32 और 42.16 प्रतिशत अधिक पैदावार दर्ज की गई। क्षेत्र के मटर के प्रदर्शनों में, पंजाब और जम्मू और कश्मीर में क्रमशः 12.03 और 41.59 प्रतिशत अधिक पैदावार दर्ज की गई। इसी प्रकार, मसूर पर प्रदर्शनों में, पंजाब, हिमाचल प्रदेश और उत्तराखंड में क्रमशः 16.79, 12.5 और 35.72 अधिक पैदावार दर्ज की गई। गर्मी के मौसम में, मूंग और उरद की फसलों पर 448.2 हेक्टेयर के क्षेत्र में कुल 1055 प्रदर्शन लगाए गए। पंजाब मे इन प्रदर्शन में क्रमशः 24.02 और 29.62 प्रतिशत अधिक पैदावार दर्ज हुई।

Executive Summary

Looking into the huge demand-supply gap of pulses in the country, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) sanctioned the project "Cluster Frontline Demonstrations on Pulses 2017-18" under National Food Security Mission (NFSM) to demonstrate the best practices of pulses cultivation for higher productivity and profitability.

During the year, in Zone-1, the project was implemented by 52 KVKs of the states of Punjab, Himachal Pradesh, Jammu and Kashmir and Uttarakhand. The budget of Rs. 7500 per ha was provided to the respective KVKs for providing basic inputs like seed, biofertilizers *etc.* to the farmers for conducting cluster demonstrations. While conducting demonstrations, the technologies like improved varieties, seed treatment, microbial inoculation, line sowing of crop, different intercropping systems, integrated pest management (IPM) technologies like pheromone traps etc. were demonstrated at the farmer's field. Moreover, for promoting the cultivation of pulses under different cropping systems across the states of Zone-1, different extension activities viz. field visits, awareness camps, farmer-scientist interactions, field days, *kisan goshthis*, messages by Whatsapp groups, method demonstrations, mobile advisories, etc. were organized. Similarly, different teams were formed including officers from Directorate of Wheat Development, Ghaziabad; ICAR-ATARI, Ludhiana; and DEE offices of SAUs to visit and monitor the demonstrations conducted under the project.

During *kharif* season, total 1786 FLDs were laid on an area of 339.93 hectare on cultivation of black gram, green gram, field pea, rajmash and horse gram crops. In Punjab, as compared to the local check, 33.33 per cent and 17.10 per cent higher yields were recorded from the demonstrations of black gram and green gram respectively. In Himachal Pradesh, in comparison with local check, demonstrations on black gram and green gram reported 28.36 and 19.12 per cent higher yields respectively. Similarly in Jammu and Kashmir, demonstrations on black gram, green gram and rajmash recorded 40.91, 32.03 and 26.99 per cent increments in yield respectively. In Uttarakhand, FLDs on black gram and horse gram recorded 42.48 and 27.39 per cent higher yields respectively.

During *rabi 2017-18*, a total of 3648 FLDs were conducted on 612.4 ha area on pulses viz. chick pea, field pea and lentil. In chick pea FLDs, 21.43, 37.59, 38.32 and 42.16 per cent higher yields were recorded as compared to the local checks in Punjab, Himachal Pradesh, Jammu and Kashmir and Uttarakhand respectively. In demonstrations on field pea, 12.03 per cent and 41.59 per cent higher yields were recorded in Punjab and Jammu and Kashmir respectively. Similarly, in demonstrations on lentil, 16.79, 12.5 and 35.72 higher yields were recorded in Punjab, Himachal Pradesh and Uttarakhand respectively. During s*ummer* season, total 1055 FLDs were laid on an area of 448.2 ha on green gram and black gram crops. In Punjab, in comparison with local check, demonstrations on green gram and black gram recorded higher yields to the extent of 24.02 and 29.62 per cent respectively.

1. Introduction

Pulses, with the protein of high biological value, are an integral part of Indian vegetarian diet. Pulses provide nutritional and health related benefits to humans, fodder for the cattle and improve soil health as green manuring crops. Pulses with their short growth period are useful as cash crops and provide extra income when grown between two major crop seasons. This way pulses are important for agricultural sustainability as well as added financial support to the farmers. Moreover, value addition of pulses has given rise to roasted grain industry, *papad* industry, *dal* industry etc. Considering Indian pulses cultivation and production, the states like Madhya Pradesh, Maharashtra, Uttar Pradesh, Andhra Pradesh, Karnataka and Rajasthan are major hubs. Many pulses are grown in the country which majorly constitute chickpea or bengal gram or gram (*Cicer arietinum),* pigeonpea or red gram or *arhar* or *tur* (*Cajanus cajan)*, lentil or *masoor* (*Lens esculenta), urd* or black gram *(Vigna mungo*) and *moong* or green gram (*Vigna radiate)*.Other pulses which are grown in few pockets are horse gram (*Macrotyloma uniflorum),* cowpea (*Vigna unguiculata),* moth bean *(Vigna aconitifolia),* grass pea or *khesari (Lathyrus sativus)* and pea *(Pisum sativum var. arvense).*

Rising population and per capita income in the country has been constantly increasing demand for pulses. But, area under pulses cultivation has seen a decline resulting into considerably low levels of indigenous production of pulses, thereby creating a demand-supply gap. This gap has led to increase in the prices, making it difficult to access for poor. Farmers least preference for pulses is the result of uncertain yields and poor returns. Resultantly, farmers grow profitable crops on fertile and irrigated lands and pulses production suffers. Furthermore, poor adoption of improved cultivation practices, volatile market and lack of processing and value addition at farmer's level add to the worries of diminishing area under pulses cultivation. This makes a situation where India is the largest producer, consumer and importer of pulses in the world.

Considering the need to increase area under pulse cultivation and to increase indigenous production of pulses through achieving better productivity, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW), Government of India sanctioned the project “Cluster Frontline Demonstrations on Pulses” during *rabi* 2015 under National Food Security Mission (NFSM). This project was continued with a fresh sanction in year 2017-18. During 2017-18, National Food Security Mission (NFSM) sanctioned Rs. 123.6 Lakh to ICAR-ATARI Zone-I, Ludhiana for conducting cluster

frontline demonstrations (CFLDs) in the states of Punjab, Himachal Pradesh, Jammu and Kashmir and Uttarakhand. Thus, CFLDs were laid by 52 Krishi Vigyan Kendras (KVKs) during 2017-18 and they were provided Rs. 7500 per hectare for laying demonstrations on pulses viz. chickpea, lentil, field pea, green gram, horse gram, rajmash and black gram. ICAR-ATARI, Ludhiana was permitted to hire one Senior Research (SRF) and one Data Entry Operator (DEO) for implementing this project. The budget was also provided at the Zonal level for organization of one zonal workshop cum training, organization of two group meetings and miscellaneous expenditure on account of printing of reports (Annexure-I). Similarly, KVKs which would conduct CFLDs in at least 50 ha or more area either in *kharif, rabi* and *summer* season were allowed to hire one Pulse Technology Agent (PTA) for 6 months. The basic instructions given by the funding agency for implementing the project stated that the demonstrations of each pulse crop were to be organized in cluster approach covering at least 10 ha area in each cluster and for an individual farmer FLDs would not exceed more than 1 acre. Seed was considered as one critical input that was to be provided to the farmers for organizing the demonstrations. Improved varieties of the crops included in the demonstrations were not supposed to be older than 10 years. Chemical fertilizers were not allowed as an input to be given to the farmers. However, bio-fertilizers, soil ameliorants, micro-nutrients etc. were permitted. On an area of 1400.53 ha in the four states, a total of 6489 FLDs were organized (Annexure-V).

2. *Kharif* Season

Area under pulse crops cultivation in northern India is meager; more specifically, in the state of Punjab, it is negligible. Cropping pattern with rice and wheat as major crops is predominant in the region, consequently leading to very poor crop diversification. Therefore, with an objective to increase the area under pulses cultivation and promote diversification in the region, FLDs were allotted to cover an area of 452 ha during *Kharif* 2017-18 to 32 KVKs of Punjab, Himachal Pradesh (H.P.), Jammu and Kashmir (J&K) and Uttarakhand. The KVKs were supposed to demonstrate improved production technologies of pulse crops namely black gram, green gram, field pea, rajmash & horse gram, thereby popularizing pulses cultivation in the region.

Out of the allotted FLDs, few KVKs were unable to meet the targets either due to unavailability of the quality seeds or due to incidences of rainfall during sowing time in Uttarakhand and Jammu and Kashmir. The deficit FLDs from *Kharif* season were thus reallocated to *Rabi* season to meet the allotted target. The state wise and crop wise details of the allotted and conducted FLDs in Zone-1 during *Kharif* season is given in Table 1.

Table 1 : Details of *Kharif* season CFLDs during the year 2017-18

State	Crop	Target		Achievements	
		No. of Demo	Area (ha)	No. of Demo	Area (ha)
Punjab	Black Gram	25	10.00	26	10.00
	Green Gram	100	40.00	100	40.00
	Total (A)	**125**	**50.00**	**126**	**50.00**
Himachal Pradesh	Black Gram	250	100.00	550	97.00
	Green Gram	50	20.00	109	20.00
	Total (B)	**300**	**120.00**	**659**	**117.00**
Jammu and Kashmir	Black Gram	100	40.00	320	40.00
	Green Gram	50	20.00	73	17.00
	Field Pea	25	10.00	00	0.00
	Rajmash	225	90.00	420	79.2
	Total (C)	**400**	**160.00**	**813**	**136.2**
Uttarakhand	Black Gram	200	80.00	88	28.73
	Green Gram	50	20.00	00	0.00
	Horse Gram	55	22.00	100	8.00
	Total (D)	**305**	**122.00**	**188**	**36.73**
Total (A+B+C+D)		**1130**	**452.00**	**1786**	**339.93**

RESULTS

Punjab

In the state of Punjab, a total of 126 demonstrations were conducted on an area of 50 ha. In Hoshiarpur district, 26 FLDs on black gram were conducted on an area of 10 ha across Mahilpur, Bunga and Garhshankar blocks. The recommended package of practices of PAU, Ludhiana i.e. improved variety Mash-114, seed rate of 6-8 kg seed per acre, row to row spacing of 30 cm, weed management through pre-emergence application of Stomp 30 EC (Pendimethalin) @ 1litre per acre, nutrient management through application of urea @ 11 kg per acre and superphosphate @ 60 kg per acre were followed while conducting the FLDs. Moreover, for sucking pests (Jassid, aphid and white fly) management, Malathion 50 EC @ 375 ml per acre or Roger 30 EC @ 250 ml per acre or Metasystox 25 EC @ 250 ml per acre was recommended. Similarly, for managing tobacco caterpiller, Acephate 75 SP @ 800 gm or Chloropyriphos 20 EC @ 1.5 litre was used and Zineb 75 WP @ 400 gm was also used for managing whitefly to control yellow mosaic virus. Following the scientific cultivation practices resulted in 33.33 per cent higher yield in the demonstration fields over that of the local check (Table 2).

KVK scientists' visit to demonstration plot during sowing of greengram in Ferozpur

KVK Scientist interacting with farmer demonstrating cultivation of blackgram in Hoshiarpur

Table 2: Results of *Kharif* season CFLDs in Punjab

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo	
Black Gram						
Hoshiarpur	Mash 114	26	10.00	5.4	7.2	33.33
Total		**26**	**10.00**	**5.4**	**7.2**	**33.33**
Green Gram						
Ferozpur	ML 2056	50	20.00	8.6	9.8	13.95
Mohali	ML 2056	50	20.00	10.7	12.8	19.63
Total		**100**	**40.00**	**9.65**	**11.3**	**17.10**

Demonstrations on green gram variety ML-2056 were laid in Ferozpur and Mohali districts on an area of 40 ha across Ferozpur, Gallkhurd and Derabassi, Majri, Kharar blocks, by following the pest management technologies like application of Deltamethrin 2.8 EC @ 200 ml for managing blister beetle and Indoxacarb 14.5 SC @ 200 ml for controlling pod borer in 100 litres of water with manually operated knapsack sprayer.

Diagonistic visit to demonstration on greengram in Gammewala, Ferozpur

Similarly, Acephate 75 SP @ 800 gm or Chloropyriphos 20 EC @ 1.5 litre was also used for managing whitefly to control the spread of yellow mosaic virus. In green gram crop, maximum yield was recorded in Mohali district i.e. 12.8 q/ha, the reasons for higher yield was that the farmers have followed recommendations of PAU, Ludhiana as well as latest technical know-how of other research organizations. Farmers sprayed N:P:K solution along with micro nutrients like zinc sulphate and manganese sulphate, these inputs were not provided by KVK Mohali, but purchased and used by farmers themselves. Majority of demonstration fields had heavy textured soil, having higher water holding capacity and better nutrient status. Thus, the crop did not face water stress condition at any stage and yield was higher. Overall, as compared to the local check, 17.10 per cent higher yield was recorded from the demonstrations.

Himachal Pradesh

In Himachal Pradesh, total 659 CFLDs were conducted on an area of 117.00 ha. In Bilaspur, Hamirpur, Kullu, Mandi, Sirmaur, Una, Chamba and Shimla districts, 550 FLDs on black gram were conducted on an area of 97 ha across different blocks. As compared to the local check, 28.36 per cent higher yield was recorded from the demonstrations in different districts.

In Ghumarwin, Jhandutta and Sadar blocks of Bilaspur district, UG 218 variety of

black gram was demonstrated by following recommended integrated pest management (IPM) and other scientific production technologies. Whereas, in Hamirpur district, Him Mash 1 and UG 218 varieties were demonstrated in Bhoranj, Nadaun, Tauni Devi and Bhijar blocks by following recommended integrated nutrient management (INM) and other technologies. As compared to the local check, 62.90 per cent and 16.13 per cent higher demonstration yields were recorded in Bilaspur and Hamirpur districts respectively.

Field preparation & Line sowing of black gram in Shimla

Intercropping of Blackgram and Maize in Sirmaur

Black gram varieties Palampur 93 and UG 218 were demonstrated in Banjar, Kullu and Balh, Drang, Gopalpur, Karsog, Sundernagar blocks of respectively Kullu and Mandi districts. In FLDs of Kullu, seed treatment with Bavistin @ 2.5 g/kg seed was done and crop was sown by *Pora* method (manual line sowing). Resultantly, as compared to the local check, 15.00 per cent higher yield was obtained from the demonstrations plots. In Mandi, as compared to local check, 31.37 per cent higher yield was recorded under

Farmers and KVK Scientists interacting in Sirmaur

Demonstration on Blackgram variety UG-218 in Bilaspur district

demonstrations where biofertilizer application to seed was followed. Likewise, in Sirmaur, Una, Chamba and Shimla districts, Him Mash-1 veriety was demonstrated in different blocks following line sowing method, which resulted 28.57, 48.08, 33.33, 8.33, per cent higher yields over that of the local checks respectively.

Table 3 : Results of *Kharif* season CFLDs in Himachal Pradesh

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Black Gram						
Bilaspur	UG 218	50	20.00	6.2	10.1	62.90
Hamirpur	Him mash 1 & UG 218	40	10.00	6.2	7.2	16.13
Kullu	Palampur 93 & UG 218	109	10.00	6.0	6.9	15.00
Mandi	Palampur 93, Him mash 1 & UG 218	62	20.00	5.1	6.7	31.37
Sirmaur	Him mash 1	73	10.00	6.3	8.1	28.57
Una	Him mash 1	89	10.00	5.2	7.7	48.08
Chamba	Him mash 1	60	10.00	3.6	4.8	33.33
Shimla	Him mash 1	67	7.00	9.6	10.4	8.33
Total		**550**	**97.00**	**6.03**	**7.74**	**28.36**
Green Gram						
Una	SML 668	109	20.00	6.8	8.1	19.12
Total		**109**	**20.00**	**6.8**	**8.1**	**19.12**

KVK Scientist inspecting blackgram crop in Hamirpur

Field Day on Blackgram in Mandi

Demonstrations on green gram variety SML 668 were laid in Una district on an area of 20 ha across Amb, Gagret, Haroli and Una blocks by following line sowing method, which resulted in 19.12 per cent higher yield over that of the local check.

Jammu & Kashmir

The demonstrations on black gram were conducted in Doda, Jammu, Rajouri and Reasi districts and demonstrations on green gram were conducted in Anantnag and Pulwama districts. Whereas; in Anantnag, Bandipora, Kupwara, Pulwama, Shopian, Poonch and Baramula districts production technologies of rajmash were also demonstrated. The demonstrations on black gram resulted in 40.91 per cent higher yield than the local check, where 320 demonstrations were conducted on 40 ha area. Over the local check, 32.03 per cent higher yield was recorded from the demonstrations of green gram, where 17 ha area was covered under 73 demonstrations. The demonstrations on rajmash resulted in 26.99 per cent higher yield than the local check, where 420 demonstrations were conducted on 79.20 ha area. Details of the demonstrations have been given in Table 4.

Farmers and farm women interacting with KVK scientist in Doda

KVK scientists with farm women on a demonstration plot in Rajouri

Farmers inspecting blackgram crop in Jammu

Farmers visiting FLD on Blackgram in Jammu

In Doda, Jammu and Rajouri districts, different blocks were selected to demonstrate PU 31 variety of black gram. As compared to the local check, respectively 28.95, 51.28 and 32.26 per cent higher yields were obtained from FLDs due to adoption of weed management and plant protection measures. Similarly, black gram variety Shekher-3 was demonstrated in Pouni, Katra, Panchari, Reasi and Panthal blocks of Reasi district, where 47.83 per cent higher yield was recorded, which can be attributed to adoption of recommended production technologies.

In Anantnag and Pulwama districts, KM-2241 variety of green gram was demonstrated. As compared to the local check, respectively 23.53 and 41.67 per cent higher yields were obtained from FLDs due to adoption of weed management and plant protection measures.

Table 4 : Results of *Kharif* season CFLDs in Jammu and Kashmir

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Black Gram						
Doda	PU 31	50	10.00	3.8	4.9	28.95
Jammu	PU 31	71	10.00	3.9	5.9	51.28
Rajouri	PU 31, Shekher 3	95	10.00	3.1	4.1	32.26
Reasi	Shekher 3	104	10.00	4.6	6.8	47.83
Total		**320**	**40.00**	**3.85**	**5.43**	**40.91**
Green Gram						
Anantnag	KM 2241	30	10.00	6.8	8.4	23.53
Pulwama	KM 2241	43	7.00	6.0	8.5	41.67
Total		**73**	**17.00**	**6.4**	**8.45**	**32.03**
Rajmash						
Anantnag	Madew Rajmash	45	10.00	6.2	7.6	22.58
Bandipora	Gureezi and Kudara Rajmash	97	10.00	8.5	11.0	29.41
Kupwara	Canadian Red	53	10.00	7.1	10.5	47.89
Pulwama	Madew Rajmash	30	6.00	9.3	12.0	29.03
Shopian	Shalimar rajmash 1	20	3.20	6.5	7.9	21.54
Poonch	BR 104	25	10.00	3.3	3.6	9.09
Baramula	Canadian Red	150	30.00	8.0	9.5	18.75
Total		**420**	**79.20**	**6.99**	**8.87**	**26.99**

Different blocks of Anantnag, Bandipora, Kupwara, Pulwama, Shopian, Poonch and Baramula districts were chosen for conducting the demonstrations on rajmash. From the demonstrations, the lowest percentage increment in rajmash crop yield was recorded in Poonch district i.e. 9.09 per cent, while highest was in Kupwara district i.e. 47.89 per cent which was due to improved variety and line sowing (Table 4).

KVK scientist diagnosing disease in blackgram crop in Reasi

Scientist-farmer field interphase in Reasi

Uttarakhand

In Uttarakhand, on PU 31 variety of black gram, a total of 88 demonstrations were conducted on an area of 28.73 ha in Dehradun, Haridwar, Udham Singh Nagar and Tehri Garhwal districts. As a result, overall 42.48 per cent higher yield was recorded from the demonstration plots over that of the local check. The lowest percentage increment in black gram crop yield was recorded in Tehri Garhwal i.e. 25.00 per cent, while the highest was in Dehradun i.e. 66.67 per cent due to adoption of weed management and plant protection measures (Table 5).

FLD on Horsegram variety VL Gahat 10 in Bageshwar

Similarly, a total of 100 demonstrations on horse gram cultivation were conducted on an area of 8.00 ha in Almora and Bageshwar districts. As a result, overall 27.39 per cent higher yield was recorded from the demonstration plots over that of the local check. In Almora and Bageshwar districts, improved variety and other production technologies were followed in different blocks while conducting demonstrations. As a result, respectively 38.98 and 20.41 per cent higher yields were recorded from the FLDs over the local check.

Table 5: Results of *Kharif* season CFLDs in Uttarakhand

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Black Gram						
Dehradun	PU 31	15	7.00	4.2	7.0	66.67
Haridwar	PU 31	25	10.00	5.9	8.1	37.29
Udham Singh Nagar	PU 31	25	10.00	6.5	9.6	47.69
Tehri Garhwal	PU 31	23	1.73	6.0	7.5	25.00
Total		**88**	**28.73**	**5.65**	**8.05**	**42.48**
Horse Gram						
Almora	VL Gahat15 & VL Gahat 19	50	6.00	5.9	8.2	38.98
Bageshwar	VL Gahat 10	50	2.00	9.8	11.8	20.41
Total		**100**	**8.00**	**7.85**	**10.00**	**27.39**

Demonstration field of Horsegram in Almora

Demonstration on blackgram in Haridwar

Extension activities

Across the states of Zone-1, different extension activities viz. awareness camps, diagnostic visits, farmer-scientist interactions, field days, field visits, monitoring visits and other miscellaneous activities were conducted during *Kharif* 2017-18 in which 2646 farmers took part along with 193 extension personnel (Table 6). The aim of the extension activities was to promote cultivation of pulses under different cropping systems. Different trainings were also organized by the KVKs on pulses cultivation (Table 7) in which total 1219 farmers participated.

Table 6: Details of participants in extension activities

Activities	Farmers			Extension Personnel		
	Men	Women	Total	Men	Women	Total
Awareness camp	158	23	**181**	14	0	**14**
Diagnostic visit	227	217	**444**	23	7	**30**
Farmer Scientist interaction	184	44	**228**	9	0	**9**
Field day	391	174	**565**	33	5	**38**
Field visit	353	177	**530**	34	12	**46**
Monitoring	254	82	**336**	38	3	**41**
Others	218	144	**362**	12	3	**15**
Total	**1785**	**861**	**2646**	**163**	**30**	**193**

Table 7 : Details of participants in trainings

Training	Farmers (General)-A			Farmers (SC/ST)-B			Total (A+B)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Off campus	364	175	**539**	355	189	**544**	719	364	**1083**
On campus	83	46	**129**	4	3	**7**	87	49	**136**
Total	**447**	**221**	**668**	**359**	**192**	**551**	**806**	**413**	**1219**

Glimpses of extension activities conducted during *Kharif* season 2017-18

Punjab

Training and distribution of inputs for conducting demonstrations in Ferozpur

Training on scientific cultivation of greengram in Lalru, Mohali

Kisan goshthi at Bachhohi in Hoshiarpur

Field day on greengram cultivation at Mundo Sangtian, Mohali

Jammu & Kashmir

Training programme on pulses cultivation in Doda

Field days on Blackgram in Doda

Himachal Pradesh

Awareness programme on Blackgram cultivation in Sirmaur

Method Demonstration on field preparation and line sowing of Blackgram in Shimla

Field Day on Black gram in Sirmaur

Field Day on Blackgram cultivation in Kullu

Field Day on Pulses cultivation in Hamirpur

Uttarakhand

Training for conducting FLDs on Horsegram in Bageshwar

Method demonstration on line sowing of Horsegram in Almora

Field Day on Blackgram in Haridwar

KVK scientists interacting with farmers on demonstration field in Pithoragarh

3. *Rabi* Season

During *rabi* season 2017-18; total 3648 demonstrations on chickpea, field pea and lentil were conducted on an area of 612.4 ha (Table 8). In Punjab, a total of 945 FLDs were conducted on chickpea, field pea and lentil on 300.00 ha area. In Himachal Pradesh, a total of 378 FLDs were conducted on chickpea and lentil on 73.60 ha area, while 431 FLDs were organized on chickpea and field pea crop on 58.80 ha area in Jammu and Kashmir. Similarly, in Uttarakhand, a total of 1894 demonstrations on lentil and chickpea were conducted on an area of 180.00 ha. The target FLDs on chickpea could not be achieved due to incidences of rainfall during sowing time in Himachal Pradesh. Similarly, few FLDs on field pea could not be laid in the state of Jammu and Kashmir because of social unrest in the region. Therefore, the deficit FLDs were reallocated to the succeeding season to meet the target.

Table 8: Details of *Rabi* season CFLDs during the year 2017-18

State	Crop	Target		Achievements	
		No. of Demo	Area (ha)	No. of Demo	Area (ha)
	Chick Pea	600	240.00	696	240.00
Punjab	Field Pea	25	10.00	35	10.00
	Lentil	125	50.00	214	50.00
	Total (A)	**750**	**300.00**	**945**	**300.00**
Himachal	Chick Pea	175	70.00	329	63.60
Pradesh	Lentil	25	10.00	49	10.00
	Total (B)	**200**	**80.00**	**378**	**73.60**
Jammu and	Chick Pea	50	20.00	220	20.00
Kashmir	Field Pea	125	50.00	211	38.80
	Total (C)	**175**	**70.00**	**431**	**58.80**
Uttarakhand	Lentil	350	140.00	1875	173.00
	Chick Pea	00	00	19	7.00
	Total (D)	**350**	**140.00**	**1894**	**180.00**
Total (A+B+C+D)		**1475**	**590.00**	**3648**	**612.4**

Results

Punjab

In Punjab; Amritsar, Bathinda, Faridkot, Fatehgarh Sahib, Ferozpur, Gurdaspur, Hoshiarpur, Nawanshehar, Patiala, Sangrur, Barnala, Mohali and Fazilka districts were selected to demonstrate the scientific cultivation of chickpea crop with varieties PBG-5, PBG-7 and GNG-1581. A total of 696 FLDs on chickpea were conducted on an area of

240 ha in Punjab (Table 9). The major production technologies like seed treatment with Rhizobium culture, application of Chloropyriphos and Bavistin, weed management practices, plant protection measures and other recommended package of practices were followed to conduct the demonstration at the farmer's field. Consequently, from the demonstration fields of chickpea, 21.43 per cent higher average yield was recorded over the field cultivated as local check for comparison. The maximum percentage increment in yield was recorded in Nawanshehar i.e. 38.05 per cent, while the lowest was in Bathinda i.e. 6.81 per cent. The field pea crop variety Punjab-89 was demonstrated in Barnala with

KVK Scientist inspecting the gram crop in Ferozpur

Scientist inspecting the gram crop at Badhni, Ferozpur

Demonstration on chickpea in Sangrur

KVK scientist and farmers discussing Lentil crop condition on a demonstration plot in Gurdaspur

35 FLDs on an area of 10 ha. The demonstrated plots recorded 12.03 per cent higher yield over the local check. Similarly, lentil crop variety LL-931 was demonstrated in Fatehgarh Sahib, Gurdaspur and Ropar with 214 FLDs on an area of 50.00 ha. The demonstration plots recorded 16.79 per cent higher average yield over that of the local check.

Table 9: Results of Rabi season CFLDs in Punjab

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Chick Pea						
Amritsar	PBG 7	61	20.00	13.9	16.7	20.14
Bathinda	PBG 7	45	30.00	19.1	20.4	6.81
Faridkot	PBG 7	112	20.00	10.5	13.2	25.71
Fatehgarh Sahib	PBG 7	96	20.00	14.8	18.8	27.03
Ferozpur	PBG 7	50	20.00	16.1	18.8	16.77
Gurdaspur	PBG 7	28	10.00	15.0	16.8	12.00
Hoshiarpur	PBG 5	43	10.00	10.0	12.3	23.00
Nawanshehar	PBG 5	41	20.00	11.3	15.6	38.05
Patiala	PBG 7	50	20.00	11.8	16.2	37.29
Sangrur	PBG 7	25	10.00	14.5	19.1	31.72
Barnala	PBG 7	67	20.00	14.8	17.7	19.59
Mohali	PBG 7	50	20.00	16.4	19.9	21.34
Fazilka	PBG 7, GNG 1581	28	20.00	16.1	18.3	13.66
Total		**696**	**240.00**	**14.18**	**17.22**	**21.43**
Field Pea						
Barnala	Punjab 89	35	10.00	13.3	14.9	12.03
Total		**35**	**10.00**	**13.3**	**14.9**	**12.03**
Lentil						
Fatehgarh Sahib	LL 931	128	20.00	8.7	10.5	20.69
Gurdaspur	LL 931	25	10.00	9.6	10.7	11.46
Ropar	LL 931	61	20.00	8.5	10.1	18.82
Total		**214**	**50.00**	**8.93**	**10.43**	**16.79**

KVK scientist with farmers on a demonstration plot in Hoshiarpur

KVK scientists inspecting chickpea crop in Faridkot

The package of practice recommended by PAU, Ludhiana for cultivating chickpea included recommended varieties [*desi* gram (irrigated)- PBG 7, PBG 5, PBG 2; *desi* gram (rainfed)- PDG 3, PDG 4; *kabuli* gram- L 552, BG 1053, L 550]; sowing time under rainfed conditions from 10 to 25 October, while 25 October to 10 November under irrigated, sowing by following *pora* method (line sowing) with row-to-row distance of 30 cm, seed treatment [insecticide (Chloropyriphos 20 EC@10 ml/kg), fungicide (Captan/Bavistin @3g or Rovral @2.5 g per kg of seed), seed inoculation with Mesorhizobium (LGR 33) and Rhizobacterium (RB-1)], weed management [hand weeding (30 and 60 DAS) or pre-plant application of Treflan 48 EC @1 litre or pre-emergence Stomp 30 EC @1 litre] and nutrient management [13 kg urea and 50 kg SSP per acre for *desi* gram and 13 kg urea and 100 kg SSP per acre for *kabuli* gram]. Under plant protection measures, Chloropyriphos 20 EC @ 10 ml/kg for termite control, 20 ml Indoxcarb 14.5 SC or 60 ml Spinosid 45 SC per acre for gram caterpillar control and Indofil M 45 was used for controlling the blight and grey mould.

Harvest of chickpea cultivated under FLD in Mohali

KVK scientists visit while threshing of Chickpea grown as demonstration in Bathinda

In Majithia, Baba Bakala, Harsha Chinna, Amritsar, Attari and Verka blocks of Amritsar district, chickpea crop variety PBG 7 was demonstrated. Seed and bio-fertilizers were provided as inputs to the farmers. As compared to that of local check, 20.14 per cent higher yield was recorded from the frontline demonstrations. Similarly, in Bathinda, the increase in the yield was 6.81 per cent over the local check. Likewise, complete package of practices as per the recommendations of PAU, Ludhiana were followed to conduct the FLDs on PBG 7 variety of chickpea in different blocks of Faridkot, Fatehgarh Sahib, Ferozpur and Gurdaspur districts, where demonstrational increase in yields were respectively 25.71, 27.03, 16.77 and 12.00 per cent. Likewise, as compared to the local check, 23.00 and 38.05 per cent higher average yields were recorded from FLDs of chickpea variety PBG-5 in different blocks of Hoshiarpur and Nawanshehar respectively.

Chickpea variety PBG-7 was demonstrated in different blocks of Patiala, Sangrur, Barnala and Mohali districts, as compared to the local check, respectively 37.29, 31.72, 19.59 and 21.34 per cent higher average yields were recorded, which can be attributed to the followed recommendations. Similarly, in Fazilka, PBG-7 and GNG-1581 varieties of chickpea were demonstrated in Fazilka, Abohar and Khuuian Sarwar blocks, which resulted in increase in the yield by 13.66 per cent over the local check.

Further, Punjab-89 variety of field pea was demonstrated in Mehal kalan, Shehna and Barnala blocks of Barnala district. As compared to the local check, 12.03 per cent higher yield was recorded by following the recommended practices.

Similarly, lentil variety LL-931 was demonstrated in different blocks of Fatehgarh Sahib, Gurdaspur and Ropar districts, as compared to the local check, respectively, 20.69, 11.46 and 18.82 per cent higher yields were recorded by following the recommendations of PAU, Ludhiana.

Himachal Pradesh

In Himachal Pradesh, major recommended technologies like improved variety, seed treatment with fungicide, phosphate solubilizing bacteria (PSB) and Rhizobium etc. were followed to demonstrate pulses production technologies. A total of 329 CFLDs on chickpea were conducted on an area of 63.6 ha at the farmers' fields in Bilaspur, Mandi, Shimla, Sirmaur, Una districts (Table 10). Chickpea varieties viz. HC-2, HC-5, GPF-2, GNG-1581 and Aman-515 were used for demonstrations, which resulted in increase in the average yield by 37.59 per cent over that of the local check.

FLD on Chickpea in Bilaspur

Chickpea intercropped with Apple at Devidhar, Chirgaon Block, Shimla

Demonstration on Chickpea in Una

Jhandutta, Sadar, Ghumarwin and Swarghat blocks of Bilaspur district were selected to conduct the FLDs on chickpea varieties HC-2 and GPF-2 by following weed management and integrated pest management technologies. This resulted in 85.48 per cent higher yield in the demonstration plots as compared to the local check. Similarly, in Mandi district, CFLDs on chickpea varieties HC-2 and GNG-1581 were laid in Sundernagar, Balh, Sarkaghat and Karsog blocks. Over the local check, 26.67 per cent higher yield was recorded from CFLDs. This increment could be attributed to the improved variety, seed inoculation with Rhizobium and PSB and line sowing of the crop.

In Shimla, line sowing method was the demonstrated and as compared to the local check, 31.48 per cent higher yield was recorded from demonstrated HC-5 variety of chickpea. Similarly, in Sirmaur district, integrated nutrient management technologies were followed to conduct the CFLDs on HC 2 variety of chickpea in Painta Sahib block. This resulted in 21.13 per cent higher yield over that of the local check. In Una district, as compared to the local check, 20.69 per cent higher yield was recorded from FLDs of chickpea variety HC 5 and Aman-515.

Table 10: Results of *Rabi* season CFLDs in Himachal Pradesh

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Chick Pea						
Bilaspur	Himachal Channa-2, GPF-2	48	20.00	6.2	11.5	85.48
Mandi	Himachal Channa-2 (HC-2), GNG-1581	96	20.00	4.5	5.7	26.67
Shimla	Haryana Channa-5 (HC-5)	68	10.00	5.4	7.1	31.48
Sirmaur	Himachal Channa-2	41	3.60	7.1	8.6	21.13
Una	Haryana Channa-5 (HC-5), Aman-515 (CSJ-515)	76	10.00	5.8	7.0	20.69
Total		**329**	**63.6**	**5.8**	**7.98**	**37.59**
Lentil						
Sirmaur	Vipasha	49	10.00	5.6	6.3	12.5
Total		**49**	**10.00**	**5.6**	**6.3**	**12.5**

Similarly, a total of 49 CFLDs on cultivation of lentil were conducted on an area of 10 ha at the farmers' fields in Sirmaur district. Lentil variety Vipasha was used for demonstrations, which, as compared to local check, recorded 12.5 per cent higher yield.

Field Day on Chickpea in Mandi


KVK personnel interacting with farm women in Sirmaur

KVK Scientist interacting with farm women in Bilaspur

KVK Scientist on a farmer's field in Una

Jammu and Kashmir

In the state of Jammu and Kashmir, 220 demonstrations were conducted on an area of 20 ha in Jammu and Reasi districts on chickpea variety GNG-1581 and PG-186 (Table 11). High yielding variety and complete package of practices recommended by SKUAST, Jammu were followed to conduct the demonstrations. As a result, overall 38.32 per cent higher yield was recorded from the demonstrations plots over that of the local check.

GNG-1581 and PG-186 varieties of chickpea were demonstrated in Jammu district. As compared to the local check, 23.53 per cent higher yield was recorded from the demonstrations and this increment can be attributed to use of the technologies like improved variety, nutrient management and integrated pest management. Pheromone traps, as a part of integrated pest management, were also used for controlling *Helicoverpa armigera* insect in chickpea.

Demonstration on chickpea in Jammu

Farmer-scientist interaction in demonstration field in Jammu

Similarly, Reasi, Pouni, Bhomag, Katra and Painthal blocks of Reasi district were selected to demonstrate the GNG-1581 variety of chickpea. Over the local check, 51.79 per cent higher yield was recorded from CFLDs and this can be ascribed to use of technologies like INM, line sowing and IPM practices followed while conducting CFLDs.

Further, 211 demonstrations on fieldpea were conducted on an area of 38.80 ha in Pulwama, Kupwara, Shopian, Anantnag and Bandipora districts. As a result, overall, 41.59 per cent higher yield was recorded from the demonstrations over that of the local check.

Table 11: Results of *Rabi* season CFLDs in Jammu and Kashmir

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Chick Pea						
Jammu	GNG 1581, PG 186	120	10.00	5.1	6.3	23.53
Reasi	GNG 1581	100	10.00	5.6	8.5	51.79
Total		**220**	**20.00**	**5.35**	**7.4**	**38.32**
Field Pea						
Pulwama	Shalimar pea-1, HFP-715, Rachna	50	10.00	7.75	12.5	61.29
Kupwara	Rachna	21	5.50	6.0	8.0	33.33
Shopian	Prakash	20	3.30	10.0	14.0	40.00
Anantnag	Prakash	30	10.00	13.5	18.5	37.04
Bandipora	Prakash	90	10.00	8.55	11.85	38.60
Total		**211**	**38.80**	**9.16**	**12.97**	**41.59**

KVK scientist interacting with farmers about cultivation of chickpea in Reasi

KVK scientist answering to the queries raised by farm women at Bharakh, Reasi

Shalimar pea-1, HFP-715 and Rachna varieties of fieldpea were demonstrated in Pulwama district. As compared to the local check, 61.29 per cent higher yield was recorded from the demonstrations. Rachna variety of fieldpea was demonstrated in Kupwara district. As compared to the local check, 33.33 per cent higher yield was recorded from the demonstrations. Similarly, Prakash variety of fieldpea was demonstrated in Shopian, Anantnag and Bandipora districts, which resulted in respectively 40.00, 37.04 and 38.60 per cent higher yield as compared to the local check and this increment can be attributed to use of the technologies like improved variety, nutrient management and integrated pest management.

KVK Scientist inspecting field pea crop in Bandipora

Observation of field pea produce at harvest stage in Bandipora

Uttarakhand

Total 1875 FLDs on lentil varieties namely PL 8 and VL Masoor 514 were organized in Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, Pauri Garhwal, Pithoragarh, Tehri Garhwal, Udham singh Nagar and Uttarkashi districts of Uttarakhand on an area of 173 ha (Table 12). As compared to the local check, 35.72 per

Demonstraion on Lentil in Almora

cent higher yield was recorded from the demonstrations of lentil crop. The maximum percentage increment in yield was recorded in Bageshwar i.e. 57.14 per cent, while the lowest was in Nainital i.e. 20.00 per cent.

Table 12: Results of *Rabi* season CFLDs in Uttarakhand

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Lentil						
Almora	PL 8	140	14.00	6.4	8.3	29.69
Bageshwar	PL 8	100	5.00	3.5	5.5	57.14
Chamoli	PL 8	326	20.00	4.5	6.1	35.56
Champawat	PL 8	421	20.00	6.6	8.7	31.82
Dehradun	PL 8	54	10.00	5.5	7.8	41.82
Haridwar	PL 8	25	10.00	5.9	7.2	22.03
Nainital	PL 8	158	30.00	12.5	15.0	20.00
Pauri Garhwal	PL 8	167	6.00	6.0	8.0	33.33
Pithoragarh	PL 8	144	20.00	7.0	8.5	21.43
Tehri Garhwal	PL 8	138	8.00	4.8	7.3	52.08
Udham Singh Nagar	PL 8	79	20.00	11.5	17.7	53.91
Uttarkashi	VLMasoor 514	123	10.00	9.5	13.5	42.11
Total		**1875**	**173.00**	**6.98**	**9.47**	**35.72**
Chick Pea						
Udham Singh Nagar	Pant G 186	19	7.00	10.2	14.5	42.16
Total		**19**	**7.00**	**10.2**	**14.5**	**42.16**

KVK Expert inspecting Lentil crop (PL-8) in Bedibagar, Bageshwar

KVK Expert inspecting Lentil crop in Bageshwar

Similarly, total 19 FLDs on chickpea variety Pant G 186 were organized in Udham Singh Nagar on an area of 7 ha. As compared to the local check, 42.16 per cent higher yield was recorded from the demonstrations of chickpea crop. This increment in yield can be attributed to improved variety and weed management.

Farm women on demonstration plot in Chamoli

Scientist-farmer discussing crop condition in Chamoli

Threashing of Lentil in Dehradun

Extension activities

With the objective to disseminate the improved production technologies among farmers, extension programmes were organized by the KVKs in which 3452 farmers including men and women participated along with 258 extension personnel (Table 13). Activities like field visits, farmer-scientist interactions, field day, awareness camp, monitoring visits and other activities were carried out for the better adoption of recommended technologies among farmers. Moreover, various off and on campus trainings on topics like production technologies of chickpea, INM in *rabi* pulses, installation of pheromone traps, weed management and plant protections measures in pulses, importance of pulse crops in diversified agriculture, training on seed treatment of gram etc. were also organized (Table 14) in which total 1653 farmers participated.

Table 13: Details of participants in Extension activities

Activities	Farmers			Extension Personnel		
	Men	Women	Total	Men	Women	Total
Field visits	689	91	**780**	80	34	**114**
Farmer scientist interactions	377	56	**433**	13	3	**16**
Field Day	475	97	**572**	32	7	**39**
Awareness camp	897	12	**909**	24	04	**28**
Monitoring visit	177	41	**218**	25	04	**29**
Other activities	426	114	**540**	22	10	**32**
Total	**3041**	**411**	**3452**	**196**	**62**	**258**

Table 14: Details of participants in Trainings

Training	Farmers (General)-A			Farmers (SC/ST)-B			Total (A+B)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Off campus	600	165	**765**	262	97	**359**	862	262	**1124**
On campus	464	49	**513**	14	2	**16**	478	51	**529**
Total	**1064**	**214**	**1278**	**276**	**99**	**375**	**1340**	**313**	**1653**

Glimpses of extension activities conducted during *Rabi* season 2017-18

Punjab

Kisan Gosthi on pulses in Hoshiarpur

Field day on chickpea in Barnala

Field day on chickpea in Nawanshahar

Field Day on chickpea in Gurdaspur

Field day on chickpea in Mundosangatia, Mohali

Field Day on cultivation of Chickpea in Fatehgarh sahib

Field day on chickpea in Sangrur

Field day on cultivation of chickpea in Faridkot

Training on cultivation of chickpea in Barnala

Training on cultivation of Field pea in Barnala

Uttarakhand

Field day on Lentil in Dehradun

Field day on Lentil in Haridwar

Himachal Pradesh

Method demonstration on line sowing at Karalash (Rohru), Shimla

Method Demonstration on seed inoculation with PSB and Rhizobium in Mandi

Field day on Chickpea at Devidhar, Chirgaon Block, Shimla

Field day on Chickpea in Mandi

Field day on Lentil in Sirmaur

Diagnostic visit to Chickpea field in Sirmaur

4. Summer Season

During summer 2017-18, 1200 FLDs were allotted to cover an area of 480 ha by 21 KVKs of Punjab. The KVKs were supposed to demonstrate improved production technologies of pulse crops namely black gram and green gram, thereby popularizing pulses cultivation in the region. However, total 1055 demonstrations on green gram and black gram were conducted on an area of 448.2 ha. A total of 979 FLDs were conducted on green gram on 420 ha area while 76 FLDs were organized on black gram on 28.2 ha area. The crop wise details of the allotted and conducted area under FLDs in Zone-1 during summer season are given in Table 15.

Table 15: Details of summer season CFLDs during the year 2017-18

State	Crop	Target of FLDs approved		Achievements of FLDs	
		No. of Demo	Area (ha)	No. of Demo	Area (ha)
Punjab	Green gram	1100	440	979	420
	Black gram	100	40	76	28.2
Total		**1200**	**480**	**1055**	**448.2**

In the state of Punjab, the target for conducting FLDs was for 480 ha area, which could not be achieved due to two reasons; the first, as green gram acts as a alternate host for cotton whitefly, cultivating green gram in cotton growing belt specifically Fazilka district is not recommended and the second, as farmers reap higher benefits from cultivating rice over any pulse crop, making it difficult for the KVK personnel to convince farmers for growing pulses. Thus, KVKs were able to conduct demonstrations on area of 448.2 ha only.

Training for conducting FLDs in Gurdaspur

In districts of Punjab, 979 FLDs on green gram were conducted on an area of 420 ha (Table 16). Different blocks from these districts were selected to conduct the FLDs. The recommended package of practices by PAU, Ludhiana i.e. improved variety SML-668 and SML-832, seed rate of 15 kg seed per acre for SML-668 and 12 kg seed for SML-832, row to row spacing of 22.5 cm, weed management through application of stomp 30 EC (Pendimethalin) @ 1.0 litre per acre, nutrient management through application of urea @ 11 kg/ acre and superphosphate @ 100 kg/acre etc. were followed while conducting the FLDs. Following scientific cultivation practices resulted in 24.02 percent higher yield in the demonstrations of green gram fields over that of the local checks. The maximum percentage increment in green gram crop yield was recorded in Barnala i.e. 86.40 per cent, the reasons for higher yield was that the local variety was sown by broadcasting with narrow spacing and higher dose of fertilizers resulted in attack of insect pests and diseases. While, the lowest yield increment was in Mohali i.e. 10.92 per cent, the reasons being that better management practices are already followed by farmers as they are well aware about improved cultivation practices of pulses and already using improved seeds from private companies. Therefore, inputs provided under CFLD did not show significant jump in crop yield. The maximum yield increment in SML 832 variety of green gram crop was recorded in Moga i.e. 16.05 q/ha because firstly, summer moong is generally sown after potato in paddy-potato-summer moong rotation, which results in timely sowing of summer moong, whereas, sowing of summer moong gets delayed after wheat and secondly, higher dose of phosphatic fertilizers is used in potato as compared to wheat which results in higher summer moong yield due to residual effect of phosphatic fertilizers.

Farmer-scientist interaction in Moga

Table 16: Results of summer season CFLDs in Punjab

Crop/ Name of KVK	Variety	Demonstrations		Yield (q/ha)		Increase in yield (%)
		FLDs (no.)	Area (ha)	Local check	Demo field	
Green gram						
Amritsar	SML 668	40	20	8.7	10.3	18.39
Barnala	SML 668	50	20	7.13	13.29	86.40
Bathinda	SML 668	75	30	10.3	11.5	11.65
Faridkot	SML 668	52	20	7.0	9.5	35.71
Fatehgarh Sahib	SML 832	31	20	7.2	8.45	17.36
Ferozpur	SML 668	75	30	9.83	11.95	21.57
Gurdaspur	SML 832	25	10	8.89	10.55	18.67
Hoshiarpur	SML 832	24	10	7.20	8.78	21.94
Jalandhar	SML 668 SML 832	50	20	9.89	10.98	11.02
Kapurthala	SML 668	36	20	8.15	10.5	28.83
Nawashahar	SML 668	25	10	6.40	7.90	23.44
Mansa	SML 668	50	20	9.3	10.8	16.13
Moga	SML 832	50	20	11.25	16.05	42.67
Mohali	SML 668	55	30	11.45	12.7	10.92
Sri Mukatsar Sahib	SML 668	75	30	6.68	8.03	20.21
Patiala	SML 668	75	30	10.75	12.2	13.49
Ludhiana	SML 668	65	30	10.83	13.15	21.42
Sangrur	SML 832	21	10	9.1	11.2	23.08
Taran Taran	SML 668	105	40	9.2	12.1	31.52
Total		**979**	**420**	**8.91**	**11.05**	**24.02**
Black gram						
Hoshiarpur	Mash 1008	19	6	6.47	8.10	25.19
Nawashahar	Mash 1008	27	12.2	6.75	8.50	25.93
Ropar	Mash 1008	30	10	7.23	9.93	37.34
Total		**76**	**28.2**	**6.82**	**8.84**	**29.62**

Demonstrations on black gram variety Mash-1008 were laid in districts of Punjab on an area 28.2 ha. The seed rate of 20 kg seed per acre, row to row spacing 22.5 cm, weed management through application Stomp 30 EC (Pendimethalin) @ 1.0 litre per acre, nutrient management through application of urea @ 11 kg/acre and superphosphate @ 60 kg/ acre etc. were followed while conducting the FLDs. As compared the local check, 29.62 per cent higher yield was recorded from the demonstrations. The maximum percentage increment in black gram crop yield was recorded in Ropar i.e. 37.34 per cent, while the lowest was in Hoshiarpur i.e. 25.19 per cent.

Moreover, plant-protection measures of black gram and green gram crop include managing thrips by spraying the crop at bud initation stage with 600 ml Hostathion 40

Farmer-scientist interaction in Kapurthala

Demonstration on greengram in Fatehgarh sahib

Farmer scientist interaction at summer moong field in Ferozpur

(triazophos) or 100 ml of Rogor 30 EC (dimethoate) or Malathion 50 EC (malathion) in 80 to 100 litres of water per acre and managing pod borer through spraying the crop at the appearance of larvae with 60 ml Tracer 45 SC (spinosad) or 200 ml Kingdoxa 14.5 SC (indoxacarb) or 800 g Asataf 75 SP (acephate) in 80 to 100 litres of water per acre. Similarly, Tobacco caterpillar can be controlled by spraying 150 ml of Rimon 10 EC (novaluron) or 800 g of Asataf 75 SP (acephate) or 1.5 litres of Dursban 20 EC (chlorpyriphos) using 100 litres of water per acre and 40 g Actara 25 WG (thiamethoxam) or 600 ml Hostathion 40 EC (triazophos) using 80-100 litres of water per acre were also used for managing whitefly to control mosaic virus.

Extension activities

Across the state of Punjab, different extension activities viz. field visits, farmer scientist interactions, method demonstrations, field days, farmers camp, *kisan goshthis*, monitoring visits and other activities were conducted during summer season 2017-18 in which 5331 farmers took part along with 390 extension personals (Table 17). The aim of

the extension activities was to promote cultivation of pulses under different cropping systems. Different trainings were also organized by the KVKs on pulses cultivation (Table 18) in which total 2084 farmers participated.

Table 17: Details of participants in Extension activities

Activities	Farmers			Extension Personnel		
	Men	Women	Total	Men	Women	Total
Field visits	1025	05	**1030**	125	56	**181**
Farmer scientist interactions	569	67	**636**	16	06	**22**
Method demonstrations	226	53	**279**	08	03	**11**
Field day	559	20	**579**	31	08	**39**
Farmers camp	1635	----	**1635**	33	07	**40**
Kisan goshthi	344	13	**357**	24	08	**32**
Monitoring of FLDs	99	----	**99**	12	05	**17**
Other activities	633	83	**716**	31	17	**48**
Total	**5090**	**241**	**5331**	**280**	**110**	**390**

Table 18: Details of participants in Trainings

Training	Farmers (General)-A			Farmers (SC/ST)-B			Total (A+B)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Off campus	836	155	**991**	169	5	**174**	1005	160	**1165**
On campus	845	51	**896**	23	----	**23**	868	51	**919**
Total	**1681**	**206**	**1887**	**192**	**5**	**197**	**1873**	**211**	**2084**

Glimpses of extension activities conducted during Summer season 2017-18

Method demonstrations in Moga

Field day on blackgram in Ropar

Field day on summer green gram in Muktsar

Field day on summer green gram in Abuwal, Ludhiana

Field day on summer greengram in Barnala

Success Stories

1. Intercropping of summer black gram with sugarcane in Ropar

Mr. Gurdit Singh is a progressive farmer of Rasidpur village of district Ropar. Krishi Vigyan Kendra, Ropar conducted demonstrations on cultivation of black gram on his field. The seed of improved variety of black gram Mash-1008 was provided to him by the KVK. Mash-1008 is a short statured variety with profuse pod bearing having 6-7 grains per pod that matures in about 72 days. This variety has bold grains with around 24 percent protein. The mash crop was sown in lines by *pora* method as an intercrop in sugarcane crop. He cultivated his mash crop as per the recommended package of practices as advised by the KVK. For the control of sucking pests and yellow mosaic disease, Thiamethoxam @ 40g/ acre was sprayed once on the crop. Similarly, weeds were kept under control by regular weeding operations.

As a result, because of following the recommended management practices, Mr. Gurdit Singh obtained the yield of 11.25 q/ha from his field. This yield was around 3.75 q higher than the yield of the local variety of mash.

2. Scientific cultivation of black gram in Hoshiarpur of Punjab

S. Kulwinder Singh is a farmer of village Bachhohi of block Mahilpur of Hoshiarpur District. The village is located in *kandi* area where agriculture is dependent on rains and the crops are frequently damaged by the wild animals. S. Kulwinder Singh has been cultivating pulses like soybean, mash, moong, lentil, etc. for the last five years.

During Kharif 2017-18, KVK, Hoshiarpur organized demonstration on black gram variety Mash-114 on this farmer's field on an area of 0.4 ha. Line sowing was followed while conducting demonstrations and the farmer applied different fertilizers depending on the soil test basis as recommended by the KVK. Moreover, for weed management, a spray of Imazethapyr @300 ml per acre during 25 days after sowing was undertaken. Other recommended technologies were also followed to obtain good results.

As a result, he reaped yield of 7.5 q/ha from the demonstration field, which was 26.42 percent higher than that of the local check. He had to incur Rs. 30,348/- as the total cost of cultivation, which fetched him Rs. 41,250/- as the gross income thereby earning Rs. 10,902/- as the net profit. Thus, the B:C ratio of cultivating black gram was calculated to be 1.35.

3. Demonstrating yield potential of Kudara Rajmash in Bandipora, Jammu & Kashmir

Village Upper Kudara of district Bandipora in Jammu & Kashmir is famous for quality rajmash production. Mushtaq Ahmad Khan S/o Durirehaman Khan is a 38 years old resident of this village who owns 1.75 acre land and has 23 years of farming experience. He mainly uses organic inputs in his farm and has established infrastructure to utilize up to 5.0 tonnes of cattle manure and FYM. He manages 90 percent of the inputs from his farm itself and only 10 percent of inputs are purchased from the market.

	Farmers practice	Demonstration
Sowing date	01-06-2017	14-05-2017
Method of sowing	Broadcasting	Line sowing
Spacing	-	50 cm
Harvesting date	13-10-2017	24-09-2017
Seed yield (q/ha)	9	14
Straw yield (q/ha)	40	50
Gross return (Rs./ha)	1,43,000	2,22,500
Net return (Rs./ha)	93,000	1,64,500
B:C Ratio	1.86	2.83

He used to sow Rajmash by broadcasting method, because of which conducting intercultural operations was a very difficult task. Under CFLD Pulses project, KVK, Bandipora

provided him inputs for conducting demonstrations and training on scientific cultivation of rajmash. He has sown the crop with line sowing method by keeping row to row spacing of 50 cm. He also followed other recommended practices during the entire growing period. Resultantly, he obtained demonstrational grain yield of 14 q/ha, which was recorded 9 q/ha where farmer's traditional practices were followed. This 55.55 percent increase in demonstrational yield has fetched him B:C ratio of 2.83 which was only 1.86 in local check.

4. Mash Growers of Doda district of Jammu & Kashmir

Kishore Kumar S/o Late Sh. Briz Lal is a 40 years old farmer from Rounda village of Bhaderwah Tehsil and Block of District Doda of Jammu and Kashmir. He has educational qualification up to matric level and he owns 0.6 hectares of land out of which only 0.2 ha is irrigated.

During Kharif 2017, Krishi Vigyan Kendra, Doda contacted him and undertook Front Line Demonstrations (FLDs) on Mash crop. He not only actively participated in the FLD programs but also acted as the Key Ambassador of the KVK during the entire CFLD programme implemented in his village. After getting training from KVK Doda, Kishore Kumar undertook cultivation of Mash variety PU-31 in an area of 0.2 ha. Besides, he also undertook cultivation of local variety with his own practices in the same area as control plot. During the entire period of demonstration, he remained in touch with the KVK staff and received advisories on different aspects of scientific mash cultivation. He followed seed treatment with Carbendazim 50 % WP and applied balanced fertilizer doses in the plot as recommended by the KVK. Resultantly, he obtained 4.90 q/ha yield of mash from the demonstration field; whereas, it was only 3.37 q/ha in the local check plot.

In case of demonstration field, the cost of cultivation was Rs 22,200/-; whereas, the gross return and net return were Rs 46,550/- and Rs 24,350/- respectively with B:C ratio of 1:2.1. Contrarily, in case local control, the cost of cultivation was Rs 21,600/- and the gross and net returns were Rs. 32,015/- and Rs. 10,415/- respectively. Thus, the demonstration recorded 45.40 percent increase in yield and 133.8 percent increase in net income over that of the local check.

Throughout the cluster of villages including Rounda village, the demonstrational yield reported was 4.94 q/ha; whereas, yield obtained under local checks was 3.84 q/ha. The B:C ratio of FLD plots in the cluster was 1:2.1 and in case of control plot it was 1:1.69. Thus, the overall increase yield was 28.9 percent.

5. Gurinder Singh cultivating summer moong after field pea in Muktsar

Gurinder Singh, a resident of village Mohlan has 14 acre of farming land. He is a member of Progressive Farmer Club of KVK, Muktsar as well as PAU Kisan Club. He only has canal water facility for irrigation as the underground water is not fit for irrigation.

KVK, Muktsar conducted 75 frontline demonstrations on summer green gram variety SML-668 at different farmers' fields during *Zaid Rabi* 2017-18. The cluster no. 2 (Malout area) of the district grows field pea during *rabi* season and the fields remain vacant during the month of March. Thus, earlier Gurinder Singh did not grow any crop after pea. He took proper training regarding successful cultivation of summer moong crop before *kharif* crop at KVK, Muktsar. From this training, he was motivated to grow the summer moong crop after field pea. From the demonstrated plot, he obtained 11.5 q/ha yield. He got net return of Rs.32325/- per ha as an additional income. All the farmers from the area got encouraged after seeing the results.

The system of growing cereal after cereal has adversely affected the soil health in the area. Thus, there is a need to alter this cropping system with some short duration crops and summer green gram offers the farmers an opportunity to do so. Moong bean has low input requirements and has ability to fix the atmospheric nitrogen into soil (58-109 kg/ha), which enables the crop to meet its own nitrogen requirement and also benefits to the succeeding crops.

6. S. Jaswinder Singh of Dalla village, Jalandhar

KVK, Jalandhar organized FLDs on summer green gram variety SML-832 on the field of S. Jaswinder Singh of Dalla village. Seeds were treated with Captain @ 3 g per kg seed for the management of

seed borne diseases and inoculated with rhizobium as biofertilizer. Crop was sown with row-to-row spacing of 22.5 cm by *pora* method on 20th March 2018. The farmer was advised to follow hand weeding after four weeks of sowing. In addition, time to time monitoring visits for insect-pest and disease appraisal were conducted by the KVK scientists and farmer. With the appearance of pod borer *Helicoverpa armigera* during the month of April, the critical input in the form of insecticide Kingdoxa 14.5 SC @ 200 ml/acre was sprayed twice at the interval of 15 days. At the bud initiation stage, crop was sprayed with 100 ml of Rogor 30 EC in 100 litres of water per acre to escape the attack of thrips. As a result, he obtained the yield of 5.9 q/acre and sold it @ Rs. 5200/- per qt market price. Thus, he earned a gross income of Rs.30680/-. Considering the total cost of cultivation, transportation and marketing of summer moong as Rs.11560/-, he earned net profit of Rs.19120/- per acre. Now, he is encouraging other farmers in his village to grow the summer moong particularly after the harvest of potato and fodder crops.

7. Bumper production of summer green gram in Moga

KVK, Moga demonstrated cultivation of summer green gram in the district in 50 acres area. The improved and promising technologies were demonstrated on the farmer's field including improved variety SML-832, seed treatment with biofertilizer etc. Some of the facts about production of summer green gram:

- Potential yield of the variety: 11.5 q/ha
- District average (previous year): 8.25 q/ha
- State average(Previous year): 8.45 q/ha
- National average Yield: 5.62 q/ha

The demonstration has led to following results:

Crop/Variety	Demo Yield (q/ha)	Local check Yield (q/ha)	Yield gap (q/ha) over local check	Yield increase (%)	Net Return (Rs/ha)	B:C
Summer green gram (SML-832)	16.05	11.25	4.8	42.26	62375	2.34

One of the farmers involved in the demonstration was S. Jagseer Singh S/o Joginder Singh, village Jhandewala, block Moga I, who has reported demonstration yield of 20q/ha.

Crop/Variety	Demo Yield (q/ha)	Local check Yield (q/ha)	Yield increase (%)	Increase in Net Return (Rs/ha)	B:C
Summer green gram (SML-832)	20	11.98	66.94	35675	2.9

8. S. Gurinderpal Singh of Barnala

S. Gurinderpal Singh of village Dhanaula Khurd in District Barnala was practicing rice-potato cropping system and used to keep his farm land follow during *zaid* season or used to grow fodder crops in some area. Now, after the introduction of summer green gram through FLDs by KVK, Barnala, he started to grow third crop in a year.

The KVK introduced HYV of summer Moong i.e. SML-668 and demonstrated technologies like seed treatment with Captan @ 3g per kg of seed and *Rhizobium* sp. LSMR-1and *Rhizobacterium* RB-3 culture. Moreover, the crop was sown with line sowing method to maintain optimum plant population through proper spacing. KVK organized training before conducting FLD on the aspects of cultivating pulses. Additionally, regular field visits were made by the KVK staff and guided the farmer at every stage of crop period. The crop was timely sown with recommended seed rate. Three irrigations at 27, 39 and 46 days after sowing were advised by the KVK. Moreover, for the control of yellow mosaic disease, a spray of 40 g Actara 25 WG (Thiamethoxam) using 80 litre of water for 1 acre was recommended. The farmer harvested 19.06 q/ha moong yield and earned Rs. 78696/ha (net income) with an investment of Rs.16264/ha only. The B:C ratio was calculated to be 5.83.

9. S. Gurjot Singh- An Inspiration to Diversify Cropping in Faridkot

S. Gurjot Singh is a 23 years old farmer from village Bhagthala of Faridkot district. When, KVK, Faridkot adopted his village during 2015, he was practicing monoculture of paddy/basmati-wheat on his 42 acres land. He attended various training camps & farmers meetings organized by the KVK. He was made aware of the fact that use of balanced fertilizers, legumes and organic manures improve soil health, thereby, economizing the farming. He was convinced to

break monoculture through crop diversification. Now, by including pulses and oil seeds in his cropping system, he grows three crops in a year. Initially, he tried sowing of gram, Gobhi sarson and summer Moong on his 0.125 acre under CFLD programme of the KVK. Whatever he produced, it was used for domestic consumption.

At present, he is following paddy-oilseed-summer moong cropping system. During summer, he had sown summer moong (SML-668) after harvesting Gobhi sarson (GSC-7) and produced 4.7 q /acre seed yield. The crop generated employment of 12 man days and earned him an additional income of Rs.24336/-, spending Rs. 10500/- per acre (B:C Ratio=2.31:1) just in 63 days period. He incorporated the crop residue in soil before transplanting paddy, enriched the soil which not only saved 1/3rd urea fertilizer but also helped the succeeding paddy crop synergistically. Seeing the performance and benefits of summer moong varieties in the fields of S. Gurjot Singh, farmers of village Bhagthala have set a goal to grow summer moong on their fields.

10. S. Pargat Singh farmer of Kaheru village, Sangrur

S. Pargat Singh conducted demonstration on cultivation of summer moong variety SML- 832 under irrigated conditions as per the recommendations of KVK, Sangrur. The crop was sown with seed drill with the row-to-row distance of 30 cm following *pora* method on March 14th, 2018. Fertilizers, 100 kg SSP and 11 kg urea, were also applied. One hand hoeing operation was done at 25 days after sowing. First irrigation was applied after 30 days of sowing and second at the flowering stage. In addition, time to time monitoring of the demonstrated plot was conducted by KVK scientists. During initial stage, i.e. at 5 to 6 leaves stage, the incidences of occurrence of pod borer were reported and an application of Kindoxa 14.5 SC @ 500 ml per ha with 200 litres of water after the irrigation was undertaken. Similarly, thrips attack was reported at flowering stage and crop was sprayed with Rogor 30 EC @ 250 ml per ha with 250 litres of water. Overall crop condition was very well and plants were of determinate type with medium stature. Pod bearing was in clusters with synchronous maturity and each pod contained 8-10 seeds. Grains were green, medium sized and shining with good culinary properties.

Thus, after successful cultivation of summer moong, he obtained the yield of 14 q/ha (53.84% higher than local check) which was sold @ Rs. 5550/- per qt. Thus, his gross income was Rs.77,700/- per hectare. After deducting the total cost of cultivation, transportation and marketing of summer moong Rs. 24,380/- per hectare, he earned a net profit of Rs. 53,320/- from one hectare with benefit cost ratio of 3.18. S. Pargat Singh is very satisfied with the cultivation of summer moong and willing to grow the same on a regular basis from now on.

Visits of DAC&FW officials

1. Monitoring visit to FLD conducted under CFLD Pulses project in Jalandhar and Amritsar districts of Punjab during 2-3 June 2017

A visit was organized to frontline demonstrations conducted under CFLD Pulses project in Jalandhar and Amritsar districts of Punjab during 2-3 June 2017. The monitoring team comprised Dr. M.N. Singh, Deputy Commissioner (Crops), DAC&FW, New Delhi and Director, Directorate of Wheat Development, Ghaziabad; Dr. D.S. Bhatti (Additional Director Extension), Dr. Guriqbal Singh (Senior Agronomist) and Dr. Pankaj Sharma (Asst. Pathologist) from PAU Ludhiana; Dr. Ashish Santosh Murai, Scientist & Nodal Officer CFLD Pulses Project and Mr. Narender Singh, SRF from ICAR-ATARI, Ludhiana.

The team visited fields of Sh. Satnam Singh of village Fatehpur, Sh. Jaswinder Singh and Sh. Santosh Singh of village Dalla in Nurmahal block; and Sh. Surender Singh of village Sharkarpur in Nakodar block. KVK Jalandhar demonstrated the improved Summer Green Gram variety SML-668 which was sown with seed rate of 15 kg/ha and other production technologies like seed treatment with biofertilizer and fungicide, plant protection measures etc. The crop condition was good and farmers were satisfied with the technologies being demonstrated. In few fields, crop was sprayed with a chemical to shed leaves and for preparing it for mechanical harvesting. Farmers reported issues of marketing the farm produce. The team also visited some of the FLD conducted by the Punjab State Department of Agriculture for the cross learning.

The team also visited fields where FLD on Sunflower were conducted under CFLD Oilseeds project. The FLDs on Sunflower were conducted only in Shakot block of

Jalandhar district. Thus, the team visited farms of Sh. Sukhmanpreet Singh, Sh. Gurvinder Singh and Sh. Jarnail Singh of Kangana village, where PSH 1962 variety of Sunflower was used to conduct demonstrations. The crop was sown in the second week of March 2017 and the condition of the crop was good.

In Amritsar district, the team visited fields of Sh. Avtar Singh, Sh. Sarabjit Singh, Sh. Sukhdeep Singh and Sh. Harvinder Singh of village Nag Nave and fields of Sh. Jagdish Singh, Sh. Navraj Singh and Sh. Simarjeet Singh of village Nag Kalan of Majitha block. Summer green gram was sown during last week of March and SML-832 variety was used for demonstration. The team also visited some of the FLD conducted by the Punjab State Department of Agriculture for the cross learning.

2. Visit of Dr. P. K. Saha

Dr. P. K. Saha, National Consultant (NFSM) visited Amritsar on 29.11.2017 and Ludhiana on 30.11.2017 to review and monitor the progress of CFLD Pulses and Oilseeds projects.

He visited frontline demonstrations laid under CFLD Pulses project in Amritsar on 29.11.2017 and reviewed the progress of the KVK in terms of physical and financial achievements.

He interacted with the Programme Coordinators/ project in-charges of KVKs of Punjab with respect to the problems faced and issues to be taken care at policy level with regards to the project.

3. Visit of Dr. Vikrant Singh

Dr. Vikrant Singh, Assistant Director, Directorate of Wheat Development, Ghaziabad visited demonstration conducted under CFLD Pulses 2017-18 in Ropar and Ludhiana districts on 26.03.2018.

He visited villages namely Mahlan and Mohan majra in Ropar along with Dr. Anuj Kumar, Principal Scientist, ICAR-IIWBR, Karnal. He interacted with farmers conducting demonstrations as well as the staff of KVK, Ropar to know various issues concerning the effective implementation of the project. The team also visited village Gulal in Ludhiana district.

4. Visits of Director, DSD, Lucknow

Director, DSD, Lucknow visits FLD in Almora and Dhakrani in Dehradun

Visits of other officials


Monitoring in CFLD pulses by DEE, GBPUAT, Pantnagar


Monitoring in CFLD pulses by Dr. V.P. Chahal, ADG (Extension), ICAR


Director, ICAR-ATARI, Ludhiana visits FLDs on green gram in Moga

Dr. H. K. Verma, DEE, GADVASU visits FLDs on greengram in Barnala

Visit of DEE, GBPUAT, Pantnagar to FLD on Lentil Field in Haridwar

Visit of Nodal Officer, CFLD Pulses project, ICAR-ATARI, Ludhiana to CFLD plot on gram in Hoshiarpur

Visit of Vice Chancellor, CSKHPKV, Palampur to the FLDs on Black gram in Kullu

Annexure I

Administrative approval of the project CFLD Pulse 2017-18

F.No. CPS 18-6/2017-NFSM
Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation and Farmers Welfare
(NFSM-Cell)

Krishi Bhawan, New Delhi,
Dated: 24.05.2017

To,

Assistant Director General (Agri. Extn.)
ICAR, Division of Agriculture Extension
Krishi Anusandhan Bhavan-I,
Pusa, New Delhi-110012

Sub: Project on **"Cluster Frontline Demonstrations on Pulses during 2017-18"** funding under NFSM- Administrative Approval-reg.

Sir,

I am directed to refer to your D.O. No. 10-35/2017-AE-II dated 17th April, 2017 and to convey the approval of the competent authority for the project entitled "Cluster Frontline Demonstrations on Pulses during 2017-18" funding under Centrally Sponsored Scheme of National Food Security Mission (NFSM) for the financial year 2017-18 with a total outlay of **Rs. 2611.25 Lakhs (Rupees two thousand six hundred eleven and twenty five thousand only).**

2. The component wise/ATARI/Zone-wise budget approved is as under:-

Implementing agency/ Zone	No. Of KVK	No. Of FLDs (Area in ha)	Budget (in Rs.)	*Contractual Staff (in Rs.)			Zonal Workshop cum Training	Organization of Group meeting	Misc. exp.	Total (in Rs.)
				SRF (12 month)	DEO (12 month)	Technology Agent at KVKs @10000/- month				
ATARI,Zone –I, Ludhiana	52	1522	11415000	360000	180000	420000	90000	50000	31000	12546000
ATARI, Zone –II, Jodhpur	49	3520	26400000	360000	180000	2520000	90000	50000	31000	29631000
ATARI,Zone-III, Kanpur	68	4220	31650000	750000	360000	2520000	90000	50000	60000	35480000
ATARI,Zone-IV, Patna	62	4350	32625000	360000	180000	2700000	90000	50000	31000	36036000
ATARI,Zone-V, Kolkata	49	3080	23100000	390000	180000	1740000	90000	50000	31000	25581000
ATARI,Zone-VI, Guwahati	32	1510	11325000	330000	180000	720000	90000	50000	31000	12726000
ATARI,Zone-VII, Barapani	**16**	880	6600000	330000	180000	600000	90000	50000	31000	7881000
ATARI,Zone-VIII, Pune	67	3810	28575000	390000	180000	2220000	90000	50000	31000	31536000
ATARI,Zone-IX, Jabalpur	63	4440	33300000	360000	180000	2580000	90000	50000	31000	36591000
ATARI,Zone-X, Hyderabad	58	2750	20625000	390000	180000	900000	90000	50000	31000	22266000
ATARI,Zone-XI, Bangalore	33	1284	9630000	390000	180000	480000	90000	50000	31000	10851000
Total	**549**	**31366**	**235245000**	**4410000**	**2160000**	**17400000**	**990000**	**550000**	**370000**	**261125000**

*Contractual staff including one SRF and one Data entry operator for each ATARI and one SRF & one Data entry operator for ICAR headquarter. One workshop-cum-training and one group meeting for each ATARI.

Contd..2/-

Omar 24/5/17

3. The above project has been approved with the following conditions:

- The demonstrations of each pulse crop should be organized in cluster approach (atleast 10 ha. in each cluster).
- ICAR should provide seed as one of the critical inputs to farmers for organization of demonstrations.
- The High Yielding Varieties of pulse crops to be included in the demonstrations should not be older than 10 years.
- More focus should be given to organize demonstration on pulses in rice fallow areas in eastern India.
- 10% of FLD fund earmarked (total Rs. 7500/ha) is allowed to utilized for monitoring, distribution of literature and organization of field days.
- Chemical fertilizers are not allowed as input under FLD. However payment of various operations/ services and inputs (seed, bio-fertilizers, soil ameliorants, micro-nutrients etc.) are allowed. Farmers have to apply recommended dose of chemical fertilizers to attain potential yield.
- The scientists from KVK will conduct visit to the demonstrations site to resolve problem on spot.
- Each KVK will furnish cafeteria of interventions for each crop to be undertaken at the demonstration site.
- For individual farmer, FLDs should not exceed more than 0.80ha.
- The qualification and salary of Senior Research Fellow and Data Entry Operator is admissible as per the approved norms of the ICAR/University.
- One SRF and one Data entry operator is allowed at ICAR, headquarter, New Delhi.
- Incentive for Zonal and National pulses fellow awards is not permissible under the project.
- Travelling Allowance and Daily Allowance is admissible as per norms of Govt. of India.
- The organization of workshop cum training and group meetings should be organized as per norms of ICAR.
- The list of beneficiary-farmers should be maintained at each ATARI level.
- The contribution of individual intervention should also be documented.
- KVKs which shall conduct FLDs in 100 ha or more area during both the cropping season of a year is allowed to hire Pulse Technology Agent (PTA) for 12 months and KVK which shall conduct FLDs in atleast 50 ha or more area either in Kharif, Rabi and summer season is allowed PTA for six months.
- Each KVK should try to choose interior areas; farmers have generally been deprived of demonstrations conducted by extension agencies.
- KVK should focus on use of micro-nutrients, soil ameliorants and IPM practices.
- Farmers should be trained for seed production, primary processing etc.
- Each ATARI designated for a particular zone will prepare a detailed report on the demonstrations of pulses and a final report will be submitted by Agricultural Extension Division, ICAR, New Delhi.

Yours faithfully

SS Tomar 24/5/17

(Dr. S.S. Tomar)
Additional Commissioner (Crops)

Copy to:

1. Director General, ICAR, Krishi Bhawan, New Delhi

Contd..3/-

2. Deputy Director General (CS), Krishi Bhawan, New Delhi
3. Deputy Director General (Agriculture Extension), ICAR, New Delhi.
4. Director, ATARI, Zone-I, Ludhiana, Punjab.
5. Director, ATARI, Zone-II, Jodhpur, Rajasthan.
6. Director, ATARI, Zone-III, Kanpur, Uttar Pradesh,
7. Director, ATARI, Zone-IV, Patna, Bihar,
8. Director, ATARI, Zone-V, Kolkata, West Bengal.
9. Director, ATARI, Zone-VI, Guwwahati, Assam,
10. Director, ATARI, Zone-VII, Umian (Barapani) Meghalaya.
11. Director, ATARI, Zone-VIII, Pune, Maharashtra.
12. Director, ATARI, Zone-IX, Jabalpur, Madhya Pradesh.
13. Director, ATARI, Zone-X, Hyderabad, Andhra Pradesh
14. Director, ATARI, Zone-XI, Bengaluru, Karnataka
15. Director of Agriculture, Government of Assam, Arunachal Pradesh, Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, J&K, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Mizoram, Meghalaya, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Telangana, Tripura, Uttar Pradesh, Uttarakhand and West Bengal.
16. Director, Crops Development Directorate, DWD-Ghaziabad, DJD-Kolkata, DSD-Lucknow, DOD- Hyderabad, DMD-Jaipur, DPD-Bhopal, DCD-Nagpur and DRD Patna.

Copy also to:-

1. Under Secretary (Finance), DAC&FW, Krishi Bhavan, New Delhi.
2. Under Secretary (CA-V), DAC&FW, Krishi Bhavan, New Delhi.
3. Sr. PPS to Secretary (AC&FW), Krishi Bhawan, New Delhi.
4. Sr. PS to Agriculture Commissioner, DAC&FW, Krishi Bhavan, New Delhi.
5. PPS to JS (Crops), DAC&FW, Krishi Bhavan, New Delhi.
6. PS to Director (Crops), DAC&FW, Krishi Bhavan, New Delhi.
7. PS to Additional Commissioner (Crops), Krishi Bhavan, New Delhi.
8. Deputy Commissioner (Crops)/Consultants, NFSM/AD/STA (Crops), Krishi Bhavan, New Delhi.
9. Programmer NFSM.
10. Guard file

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Omar 24/5/17

Annexure II

State-Wise &Crop-wise summery for conducting cluster demonstration of pulses by KVKs along with area and proposed budget for 2017-18

S.No.	Crops	State	No. of KVKs involved in Cluster Demonstration		No. of Demonstration	Area (in ha)	Budget (in Rs.)
			Unique KVKs	KVKs repeated			
1	2	3	4	5	6	7	8
1. Kharif Season							
1	**Black Gram**	Punjab	1	0	25	10	75000
		Himachal Pradesh	8	0	250	100	750000
		Jammu & Kashmir	4	0	100	40	300000
		Uttarakhand	8	0	200	80	600000
2	**Green Gram**	Punjab	3	0	100	40	300000
		Himachal Pradesh	0	1	50	20	150000
		Jammu & Kashmir	2	0	50	20	150000
		Uttarakhand	0	2	50	20	150000
3	**Fieldpea**	Jammu & Kashmir	1	0	25	10	75000
4	**Rajmash**	Jammu & Kashmir	4	3	225	90	675000
5	**Horsegram**	Uttarakhand	2	1	55	22	165000
Total Kharif Season			**33**		**1130**	**452**	**3390000**
2.Rabi Season							
1	**Chickpea**	Punjab	9	4	600	240	1800000
		Himachal Pradesh	0	5	175	70	525000
		Jammu & Kashmir	0	2	50	20	150000
2	**Fieldpea**	Punjab	0	1	25	10	75000
		Jammu & Kashmir	0	5	125	50	375000
3	**Lentil**	Punjab	1	2	125	50	375000
		Himachal Pradesh	0	1	25	10	75000
		Uttarakhand	2	10	350	140	1050000
Total Rabi Season			**12**		**1475**	**590**	**4425000**
3.Summer Season							
1	**Green Gram**	Punjab	7	12	1100	440	3300000
2	**Black Gram**	Punjab	0	3	100	40	300000
Total Summer			**7**		**1200**	**480**	**3600000**
Total(Kharif+Rabi+Summer)			**52**		**3805**	**1522**	**11415000**
4	Organization of one Zonal Workshop cum training @ Rs 90000/-						90000
5	Organization of One Group Meeting @ Rs 50000/-						50000
6	One Senior Research Fellow(SRF) @ Rs 25000 +HRA@20% for twelve months.						360000
7	One Data entry operator (DEO) at ATARI @ Rs 15000(consolidated)per month for twelve month.						180000
8	Miscellaneous expenditure on account of printing of reports etc @40000/for each ATARI.						31000
9	One Pulses Technology Agent each at 7 KVKs@ Rs 10000/- consolidated per month for six month						420000
10	Incentive for one Zonal Pulses Felloe Award at ATARI level @ Rs.50,000 to incentivises to scientists for promotion of Pulses in their district						50000
Total (4 to 10)							**1181000**
Grand Total							**125,96,000**

State-Wise &Crop-wise summery for conducting cluster demonstration of pulses by KVKs along with area and proposed budget for 2017-18

State : Punjab

S.No.	Name of KVKs	Kharif Pulses		Rabi Pulses			Summer Pulses		Total Area in ha	Total Demo
		Black gram	Green gram	Chick pea	Field Pea	Lentil	Green gram	Black gram		
1	KVK FaridKot	0	0	20	0	0	20	0	40	100
2	KVK Gurudashpur	0	0	10	0	10	10	0	30	75
3	KVK Firozpur	0	20	20	0	0	30	0	70	175
4	KVK Bathinda	0	0	30	0	0	30	0	60	150
5	KVK Hoshiarpur	10	0	10	0	0	10	10	40	100
6	KVK Patiala	0	0	20	0	0	30	0	50	125
7	KVK Kapurthala	0	0	0	0	0	20	0	20	50
8	KVK Sangrur	0	0	10	0	0	10	0	20	50
9	KVK Nawashahar	0	0	20	0	0	10	20	50	125
10	KVK Ropar	0	0	0	0	20	0	10	30	75
11	KVK Ludhiana	0	0	0	0	0	30	0	30	75
12	KVK Amritsar	0	0	20	0	0	20	0	40	100
13	KVK Muktshar	0	0	0	0	0	30	0	30	75
14	KVK Fatehgarh Shahib	0	0	20	0	20	20	0	60	150
15	KVK Moga	0	0	0	0	0	20	0	20	50
16	KVK Jalandhar	0	0	0	0	0	20	0	20	50
17	KVK Mansa	0	0	0	0	0	20	0	20	50
18	KVK Mohali	0	20	20	0	0	30	0	70	175
19	KVK Taran Taran	0	0	0	0	0	40	0	40	100
20	KVK Barnala	0	0	20	10	0	20	0	50	125
21	KVK Fazilka	0	0	20	0	0	20	0	40	100
Total		**10**	**40**	**240**	**10**	**50**	**440**	**40**	**830**	**2075**

State : Himachal Pradesh

S.No.	Name of KVKs	Kharif Pulses		Rabi Pulses		Total Area in ha	Total Demo
		Blackgram	Greengram	Chickpea	Lentil		
1	KVK Kullu	10	0	0	0	10	25
2	KVK Una	10	20	10	0	40	100
3	KVK Mandi	20	0	20	0	40	100
4	KVK Sirmaur	10	0	10	10	30	75
5	KVK Hamirpur	10	0	0	0	10	25
6	KVK Bilaspur	20	0	20	0	40	100
7	KVK Chamba	10	0	0	0	10	25
8	KVK Shimla	10	0	10	0	20	50
Total		**100**	**20**	**70**	**10**	**200**	**500**

State : Jammu & Kashmir

S.No.	Name of KVKs	Kharif Pulses				Rabi Pulses		Total Area in ha	Total Demo
		Black gram	Green gram	Field Pea	Rajmash	Chick pea	Field pea		
1	KVK Jammu	10	0	0	0	10	0	20	50
2	KVK Rajouri	10	0	0	0	0	0	10	25
3	KVK Doda	10	0	0	0	0	0	10	25
4	KVK Poonch	0	0	0	10	0	0	10	25
5	KVK Pulwama	0	10	0	10	0	10	30	75
6	KVK Baramula	0	0	0	30	0	0	30	75
7	KVK Kupwara	0	0	10	10	0	10	30	75
8	KVK Shopian	0	0	0	10	0	10	20	50
9	KVK Anantnag	0	10	0	10	0	10	30	75
10	KVK Reasi	10	0	0	0	10	0	20	50
11	KVK Bondipora	0	0	0	10	0	10	20	50
Total		**40**	**20**	**10**	**90**	**20**	**50**	**230**	**575**

State:- Uttarakhand

S.No.	Name of KVKs	Kharif Pulses			Rabi Pulses	Total Area in ha	Total Demo
		Blackgram	Greengram	Horsegram	Lentil		
1	KVK Champawat	10	0	10	10	30	75
2	KVK Tehri Garhwal	10	0	0	10	20	50
3	KVK Nainital	10	10	0	20	40	100
4	KVK Chamoli	10	0	0	10	20	50
5	KVK Haridwar	10	0	0	10	20	50
6	KVK Almora	0	0	10	10	20	50
7	KVK Pauri Garhwal	0	0	0	10	10	25
8	KVK Udhamnagar	10	0	0	20	30	75
9	KVK Pithoragarh	10	0	0	10	20	50
10	KVK Dehradun	10	10	0	10	30	75
11	KVK Uttarakshi	0	0	0	10	10	25
12	KVK Bageshwar	0	0	2	10	12	30
Total		**80**	**20**	**22**	**140**	**262**	**655**

Annexure III

Release of Funds to ATARI

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
(DIVISION OF AGRICULTURAL EXTENSION)
KAB-I, PUSA, NEW DELHI-12

F.No. 10-35/2017-AE-II **Dated: 30.08.2017**

OFFICE ORDER

The Competent authority is pleased to sanction an amount of Rs 8,92,14,340/-(Rupees Eight Crores Ninety two Lakh Fourteen Thousand Three Hundred Forty only) for release to eleven Agricultural Technology Application Research Institutes (ATARIs) for implementation of project titled "Cluster Frontline Demonstration on Pulses" funded under NFSN during 2017-18. The funds have been received under R-Deposit 'General Bank Account Vide RI No.24 dated 31/07/2017. The details are given as under:

S.No	Implementing ATARIs	Proposed Release (Rs in lakh)
1	ATARI,Zone-I,Ludhiana	80.20
2	ATARI,Zone-II,Jodhpur	82.00
3	ATARI,Zone-III,Kanpur	85.00
4	ATARI,Zone-IV,Patna	80.20
5	ATARI,Zone-V,Kolkata	82.1434
6	ATARI,Zone-VI,Guwahati	80.30
7	ATARI,Zone-VII, Barapani	82.00
8	ATARI,Zone-VIII,Pune	80.20
9	ATARI,Zone-IX,Jabalpur	80.10
10	ATARI,Zone-X,Hyderabad	80.00
11	ATARI,Zone-XI,Bangalore	80.00
Total		**892.1434**

The expenditure of Rs 8,92,14,340/-(Rupees Eight Crores Ninety two Lakh Fourteen Thousand Three Hundred Forty only) is debitable to the Head R-Deposit 'General Bank Account' for the financial year 2017-18.

This issues with the approval of AS&FA,ICAR vide Dy No. 1992/F dated 21 /08/2017.

(Harish Nair)
Under Secretary (Agril. Extn.)

Distribution:

1. Directors, ATARIs(I to XI) with a request to furnish AUCs/UCs in time.
2. Smt. Rashmi Rao,Deputy Director Finance (II), ICAR, Krishi Bhawan, New Delhi.
3. Audit –I Section,ICAR, Krishi Bhawan, New Delhi along with bill (in duplicate).
4. Accounts-I Section,ICAR, Krishi Bhawan, New Delhi with a request to release the amount as indicated above to concerned ATARIs.
5. Assistant Director General (Dr. V. P. Chahal), AE Division,ICAR.
6. PPS to DDG(AE).
7. PS to Director (AE).
8. Guard File.

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
(DIVISION OF AGRICULTURAL EXTENSION)
KAB-I, PUSA, NEW DELHI-12

F.No. 10-35/2017-AE-II **Dated: 30.08.2017**

Classification: **R-Deposit implementation of project titled "Cluster Frontline Demonstration on Pulses" funded under NFSN during 2017-18 to the Eleven Agricultural Technology Application Research Institutes (ATARIs).**

With the approval of competent authority, it has been decided to release an amount of Rs 8,92,14,340/-(Rupees Eight Crores Ninety two Lakh Fourteen Thousand Three Hundred Forty only) to the Eleven Agricultural Technology Application Research Institutes (ATARIs) for implementation of project titled "Cluster Frontline Demonstration on Pulses" funded under NFSN during 2017-18 to the Eleven Agricultural Technology Application Research Institutes (ATARIs)during 2017-18. The Grant-in-Aid received from Department of Agriculture Cooperation & Farmers Welfare has been credited to the ICAR Account.

(B.S.K.Soreng)
Section Officer (Agril. Extn.-II)

Passed for Rs 8,92,14,340/-(Rupees Eight Crores Ninety two Lakh Fourteen Thousand Three Hundred Forty only).

(Harish Nair)
Under Secretary (Agril. Extn.)

Annexure IV

Utilization of Funds under CFLD Pulses 2017-18

(Amount in Rs.)

KVK	Season	Crop/PTA	FLDs (acre)	Amount Sanctioned during 2017-18	Opening Balance on 1.04.2017	Release during 2017-18	Total Release (OB + Release)	Expenditure as per AUC	Closing Balance as on 31.03.2018
Amritsar	Rabi	Chickpea	50	150000	50	142450	142500	142500	0
	Summer	Green gram	50	150000	0	90000	90000	90000	0
Bathinda	Rabi	Chickpea	75	225000	1305	212445	213750	194045	19705
	Summer	Green gram	75	225000	0	135000	135000	132750	2250
		PTA		60000	6129	53871	60000	60000	0
Faridkot	Rabi	Chickpea	50	150000	0	142500	142500	142500	0
	Summer	Green gram	50	150000	0	90000	90000	90000	0
Fatehgarh Sahib	Rabi	Chickpea	50	150000	78	142422	142500	141890	610
	Rabi	Lentil	50	150000	0	142500	142500	142478	22
	Summer	Green gram	50	150000	0	90000	90000	87188	2812
		PTA		60000	0	60000	60000	55233	4767
Ferozepur	Rabi	Chickpea	50	150000	0	142500	142500	142500	0
	Kharif	Greengram	50	150000	0	142500	142500	142500	0
	Summer	Green gram	75	225000	0	135000	135000	135000	0
		PTA		60000	5806	54194	60000	57119	2881
Gurdaspur	Rabi	Chickpea	25	75000	115	71135	71250	70599	651
	Rabi	Lentil	25	75000	0	71250	71250	67875	3375
	Summer	Green gram	25	75000	0	45000	45000	44803	197
Hoshiarpur	Rabi	Chickpea	25	75000	42	71208	71250	71250	0
	Kharif	Blackgram	25	75000	0	71250	71250	71122	128
	Summer	Green gram	25	75000	0	45000	45000	44931	69
	Summer	Black gram	25	75000	0	45000	45000	44931	69
Jalandhar	Summer	Green gram	50	150000	0	90000	90000	90000	0
Kapurthala	Summer	Green gram	50	150000	0	90000	90000	89650	350
Ludhiana	Summer	Green gram	75	225000	25	134985	135010	134942	68
Muktsar	Summer	Green gram	75	225000	0	135000	135000	135000	0
Moga	Summer	Green gram	50	150000	1160	89304	90464	89269	1195
Mansa	Summer	Green gram	50	150000	23212	76073	99285	75850	23435
Nawanshahar	Rabi	Chickpea	50	150000	580	141920	142500	140180	2320
	Summer	Green gram	25	75000	0	45000	45000	44112	888
	Summer	Black gram	50	150000	0	90000	90000	89121	879
		PTA		60000	0	60000	60000	42666	17334
Patiala	Rabi	Chickpea	50	150000	0	142500	142500	142500	0
	Summer	Green gram	75	225000	0	135000	135000	135000	0
		PAT		60000	0	60000	60000	36150	23850
Ropar	Rabi	Lentil	50	150000	45	142455	142500	141376	1124
	Summer	Black gram	25	75000	0	45000	45000	44923	77
Sangrur	Rabi	Chickpea	25	75000	0	71250	71250	71250	0
	Summer	Green gram	25	75000	0	45000	45000	45000	0
PAU, Ludhiana			**1575**	**5025000**	**38547**	**3788712**	**3827259**	**3718203**	**109056**
Barnala	Rabi	Chickpea	50	150000	79	142421	142500	119860	22640
	Rabi	Field pea	25	75000	0	71250	71250	49851	21399
	Summer	Green gram	50	150000	0	150000	150000	96050	53950
		PTA		60000	0	60000	60000	29355	30645
Mohali	Rabi	Chickpea	50	150000	47302	95198	142500	90000	52500
	Kharif	Green gram	50	150000	0	142500	142500	95462	47038
	Summer	Green gram	75	225000	0	225000	225000	204972	20028
		PTA		60000	0	60000	60000	27742	32258
Taran Taran	Summer	Green gram	100	300000	0	300000	300000	300000	0
GADVASU, Ludhiana			**400**	**1320000**	**47381**	**1246369**	**1293750**	**1013292**	**280458**
Fazilka	Rabi	Chickpea	100	300000	0	292500	292500	142625	149875

KVK	Season	Crop/PTA	FLDs (acre)	Amount Sanctioned during 2017-18	Opening Balance on 1.04.2017	Release during 2017-18	Total Release (OB + Release)	Expenditure as per AUC	Closing Balance as on 31.03.2018
ICAR-CIPHET, Ludhiana			**100**	**300000**	**0**	**292500**	**292500**	**142625**	**149875**
Bilaspur	Rabi	Chickpea	50	150000	70797	71703	142500	120800	21700
	Kharif	Blackgram	50	150000	0	142500	142500	115570	26930
Kullu	Kharif	Blackgram	25	75000	0	71250	71250	71250	0
Sirmaur	Rabi	Chickpea	25	75000	0	71250	71250	25402	45848
	Rabi	Lentil	25	75000	0	71250	71250	29620	41630
	Kharif	Blackgram	25	75000	0	71250	71250	26000	45250
Mandi	Rabi	Chickpea	50	150000	597	149403	150000	149403	597
	Kharif	Blackgram	50	150000	5	149995	150000	149995	5
Hamirpur	Kharif	Blackgram	25	75000	44668	30332	75000	41095	33905
Una	Kharif/Rabi/Summer	Blackgram/ Chickpea/ Greengram	100	300000	92500	0	92500	0	92500
CSKHPKV, Palampur			**425**	**1275000**	**208567**	**828933**	**1037500**	**729135**	**308365**
Chamba	Kharif	Blackgram	25	75000	0	71250	71250	0	71250
Shimla	Rabi	Chickpea	25	75000	26522	44728	71250	43680	27570
	Kharif	Blackgram	17.5	52500	0	49875	49875	28380	21495
YSPUH&F, Solan			**67.5**	**202500**	**26522**	**165853**	**192375**	**72060**	**120315**
Doda	Kharif	Blackgram	25	75000	0	71250	71250	49428	21822
Jammu	Rabi	Chickpea	25	75000	33180	68750	101930	39184	62746
	Kharif	Blackgram	25	75000	0	71250	71250	17960	53290
	Summer	Green gram	0	0	1938	0	1938	0	1938
Poonch	Kharif	Rajmash	25	75000	0	71250	71250	0	71250
Rajouri	Kharif	Blackgram	25	75000	24200	0	24200	22641	1559
	Rabi	Chickpea	0	0	60750	0	60750	0	60750
Reasi	Rabi	Chickpea	25	75000	3750	55650	59400	45735	13665
	Kharif	Blackgram	25	75000	11850	57550	69400	14400	55000
Kathua			0	0	57550	0	57550	0	57550
SKUAST, Jammu			**175**	**525000**	**193218**	**395700**	**588918**	**189348**	**399570**
Anantnag	Rabi	Fieldpea	25	75000	96187	71250	167437	71250	96187
	Kharif	Greengram	25	75000	0	71250	71250	70973	277
	Kharif	Rajmash	25	75000	0	71250	71250	71250	0
Bandipora	Rabi	Fieldpea	25	75000	0	71250	71250	71250	0
	Kharif	Rajmash	25	75000	0	71250	71250	71250	0
Kupwara	Rabi	Fieldpea	25	75000	0	71250	71250	65990	5260
	Kharif	Rajmash	25	75000	0	71250	71250	71125	125
Pulwama	Rabi	Fieldpea	25	75000	11125	60125	71250	71129	121
	Kharif	Greengram	16.75	50250	0	47738	47738	46890	848
	Kharif	Rajmash	14.75	44250	0	42037	42037	42000	37
Shopian	Rabi	Fieldpea	25	75000	0	71250	71250	71250	0
	Kharif	Rajmash	8	24000	0	22800	22800	22800	0
Budgam			0	0	71250	0	71250	0	71250
Leh- II			0	0	8250	0	8250	0	8250
SKUAST, Srinagar			**264.5**	**793500**	**186812**	**742700**	**929512**	**747157**	**182355**
Baramula	Kharif	Rajmash	75	225000	0	213750	213750	213641	109
ICAR-CITH, Srinagar			**75**	**225000**	**0**	**213750**	**213750**	**213641**	**109**
Almora	Rabi	Lentil	25	75000	74845	0	74845	71400	3445
	Kharif	Horsegram	25	75000	0	0	0	14250	-14250
Chamoli	Rabi	Lentil	25	75000	96155	0	96155	102000	-5845
	Kharif	Blackgram	25	75000					
Champawat	Rabi	Lentil	25	75000	169345	0	169345	102000	67345
	Kharif	Blackgram	25	75000					
	Kharif	Horsegram	25	75000					
Dehradun	Rabi	Lentil	25	75000	155400	0	155400	60568	94832
Haridwar	Rabi	Lentil	25	75000	87600	0	87600	57000	30600
	Kharif	Blackgram	25	75000	0	0	0	27000	-27000
Nainital	Rabi	Lentil	50	150000	340155	0	340155	133875	206280
Pithoragarh	Rabi	Lentil	25	75000	110587	0	110587	111149	-562
	Kharif	Blackgram	25	75000					

KVK	Season	Crop/PTA	FLDs (acre)	Amount Sanctioned during 2017-18	Opening Balance on 1.04.2017	Release during 2017-18	Total Release (OB + Release)	Expenditure as per AUC	Closing Balance as on 31.03.2018
Udham Singh Nagar	Rabi	Chickpea	17.5	52500	150000	0	150000	45360	104640
	Rabi	Lentil	50	150000	0	0	0	66563	-66563
	Kharif	Blackgram	25	75000	0	0	0	17920	-17920
GBP UA&T, Pantnagar			**442.5**	**1327500**	**1184087**	**0**	**1184087**	**809085**	**375002**
Pauri Garhwal	Rabi	Lentil	25	75000	95900	0	95900	0	95900
Tehri Garhwal	Rabi	Lentil	25	75000	194484	0	194484	31850	162634
	Kharif	Blackgram	4.3	12900	12900	0	12900	0	12900
V.C.S.G. Uttarakhand UHF			**54.3**	**162900**	**303284**	**0**	**303284**	**31850**	**271434**
Bageshwar	Rabi	Lentil	25	75000	62500	0	62500	19600	42900
	Kharif	Horsegram	5	15000	32950	0	32950	12100	20850
Uttaraksh i	Rabi	Lentil	25	75000	71250	0	71250	42328	28922
ICAR-VPKAS, Almora			**55**	**165000**	**166700**	**0**	**166700**	**74028**	**92672**
KVKs TOTAL			**3634**	**11321400**	**2355118**	**7674517**	**10029635**	**7740424**	**2289211**
ICAR-ATARI, Ludhiana				**711000**	**151277**	**345483**	**496760**	**495634**	**1126**
Total Zone-I				**12032400**	**2506395**	**8020000**	**10526395**	**8236058**	**2290337**

Annexure V

DARE report: Summary of Progress Report of CFLDs on Pulses during 2017-18

Sl.No	Crops	State	Target of FLDs approved		Achievements of FLDs		Average yield (q/ha)		Yield increase (%)	Difference of yield between demo and local (q/ha)
			No. of Demos	Area (ha)	No. of Demos	Area (ha)	Demo	Local		
Kharif season										
1	Blackgram	Punjab	25	10	26	10	7.2	5.4	33.33	1.8
		Himachal Pradesh	250	100	550	97	7.74	6.03	28.36	1.71
		Jammu and Kashmir	100	40	320	40	5.43	3.85	40.91	1.58
		Uttarakhand	200	80	88	28.73	8.05	5.65	42.48	2.4
2	Greengram	Punjab	100	40	100	40	11.3	9.65	17.1	1.65
		Himachal Pradesh	50	20	109	20	8.1	6.8	19.12	1.3
		Jammu and Kashmir	50	20	73	17	8.45	6.4	32.03	2.05
		Uttarakhand	50	20	0	0	0	0	0	0
3	Fieldpea	Jammu and Kashmir	25	10	0	0	0	0	0	0
4	Horsegram	Uttarakhand	55	22	100	8	10	7.85	27.39	2.15
6	Rajmash	Jammu and Kashmir	225	90	420	79.2	8.87	6.99	26.99	1.88
Total (kharif)			**1130**	**452**	**1786**	**339.93**				
Rabi season										
1	Chickpea	Punjab	600	240	696	240	17.22	14.18	21.43	3.04
		Himachal Pradesh	175	70	329	63.6	7.98	5.8	37.59	2.18
		Jammu and Kashmir	50	20	220	20	7.4	5.35	38.32	2.05
		Uttarakhand	0	0	19	7	14.5	10.2	42.16	4.3
2	Fieldpea	Punjab	25	10	35	10	14.9	13.3	12.03	1.6
		Jammu and Kashmir	125	50	211	38.8	12.97	9.16	41.59	3.81
3	lentil	Punjab	125	50	214	50	10.43	8.93	16.79	1.5
		Himachal Pradesh	25	10	49	10	6.3	5.6	12.5	0.7
		Uttarakhand	350	140	1875	173	9.47	6.98	35.72	2.49
Total (Rabi)			**1475**	**590**	**3648**	**612.4**				
Summer Season										
1	Blackgram	Punjab	100	40	76	28.2	8.84	6.82	29.62	2.02
2	Greengram	Punjab	1100	440	979	420	11.05	8.91	24.02	2.14
Total (Summer)			**1200**	**480**	**1055**	**448.2**				
Grand Total (Kharif+Rabi+Summer)			**3805**	**1522**	**6489**	**1400.53**				

Crop/Season	Variety	Area (ha)	No. of farmers	Farmer Practice (q/ha)	Yield			Economics of Local Check (Rs./ha)				Economics of Demonstration (Rs./ha)			
					Demo (q/ha)	% increase	District Avg. (q/ha)	Gross Cost	Gross return	Net return	BC ratio	Gross Cost	Gross return	Net Return	BC ratio
Kharif season															
Blackgram	Mash 114	10	26	5.4	7.2	33.33	5.4	30448	32500	2052	0.07	30348	39600	9252	0.30
	Him Mash 1	97	550	6.03	7.74	28.36	5.76	21190	43644	22454	1.06	22653	62214	39561	1.75
	PU 31	68.73	408	4.75	6.74	41.84	5.11	19067	30666	11599	0.61	21235	42629	21394	1.01
Green gram	ML 2056	40	100	9.65	11.3	17.1	8.9	14563	44950	30388	2.09	15669	56251	40583	2.59
	SML 668	20	109	6.8	8.1	19.12	4.5	26000	40800	14800	0.57	26000	48816	22816	0.88
	KM 2241	17	73	6.4	8.45	32.03	9.5	69798	119600	49802	0.71	73348	157800	84452	1.15
Horsegram	VLG 15	8	100	7.85	10	27.39	8.05	19200	35135	15935	0.83	21150	48050	26900	1.27
Rajmash	Madew rajmash	79.2	420	6.99	8.87	26.99	10	47880	90523	42643	0.89	53698	121264	67566	1.26
	Total	**339.93**	**1786**												
Rabi season															
Chickpea	PBG 7	240	696	14.18	17.22	21.43	12.73	24761	55081	30320	1.22	25404	62717	37313	1.47
	HC 2	63.6	329	5.8	7.98	37.59	5.1	20356	33028	12672	0.62	22044	47553	25509	1.16
	GNG 1581	20	220	5.35	7.4	38.32	4.9	14175	28575	14400	1.02	15520	38875	23355	1.50
	Pant G 186	7	19	10.2	14.5	42.16	7.1	30000	71400	41400	1.38	35000	101500	66500	1.90
Field pea	Punjab 89	10	35	13.3	14.9	12.03	14.9	17452	33345	15893	0.91	16629	38293	21664	1.30
	Prakash	38.8	211	9.16	12.97	41.59	7.56	39800	66285	26485	0.67	41620	89025	47405	1.14
Lentil	LL 931	50	214	8.93	10.43	16.79	8.3	23404	41842	18438	0.79	20204	48728	28524	1.41
	Vipasha	10	49	5.6	6.3	37.59	5.26	19000	28000	9000	0.47	21000	31500	10500	0.50
	PL 8	173	1875	6.98	9.47	35.72	7.82	15735	35960	20226	1.29	16637	50347	33709	2.03
	Total	**612.4**	**3648**												
Summer season															
Blackgram	Mash 1008	28.2	76	6.82	8.84	29.62	10.02	25918	35075	9158	0.35	25168	42083	16916	0.67
Greengram	SML 668	350	828	8.97	11.06	23.3	8.01	22550	41159	18609	0.83	22209	50662	28453	1.28
	SML 832	70	151	8.73	11.01	26.12	9.39	21843	41484	19641	0.90	21719	52024	30306	1.40
	Total	**448.2**	**1055**												

DETAILS OF VARIETIES

Annexure VI

Crop	Variety	Variety releasing organization	Year of release	Areas of adaptation state/ zone	Potential yield (q/ha)	Days to maturity	Remarks
Black gram	Mash 114	PAU, Ludhiana	2010	Punjab	9.0	83	Resistant to MYMV
	UG 218	CSKHPKV, Palampur	1996	Low and Mid hills of HP	12.00	80-85	Resistant to yellow mosaic virus
	Him Mash 1	CSKHPKV, Palampur	2007	Low and Mid hills of HP	14-15	74-76	Resistant to mosaic curl leaf and powdery mildew
	Palampur 93	CSKHPKV, Palampur	2010	High hills of HP	8-10	85-90	Tolerant to rust and powdery mildew
	PU 31	GBPUAT, Pantnagar	2008	NWPZ	12.5	75-80	Resistant to YMV
	Shekhar 3	CSAUAST, Kanpur	2004	NWPZ	10-12	85-90	Resistant to yellow mosaic virus
	Mash 1008	PAU, Ludhiana	2004	Punjab	11.25	72	Early, Resistant to MYMV & leaf Crinkle virus
Green gram	ML 2056	PAU, Ludhiana	2016	Punjab	11.5	71	Resistant to yellow mosaic virus
	SML 668	PAU, Ludhiana	2002	Punjab	11.25	60	Grains are very bold with good cooking quality
	SML 832	PAU, Ludhiana	2010	Punjab	11.50	61	Grain are shining green and medium sized with good culinary properties
	KM 2241	CSAUA&T Kanpur	2008	Northern zone	10-11	65-70	Resistant to yellow mosaic virus
Rajmash	Canadian Red	National pulse research institute, Tamilnadu	1981	Northern zone	12-15	100-112	Resistant to disease
	Shalimar rajmash 1	SKUAST, Kashmir	2009	J&K	10-12	105-110	Moderately resistant to anthracnose disease
Horse gram	VL Gahat 15	ICAR-VPKAS, Almora, CVRC	2009	Northern and Central India	7.75	113-118	Moderate resistance against anthracnose and leaf spot disease
	VL Gahat 19	ICAR-VPKAS, Almora, CVRC	2010	Northern India	5.64	90-100	Resistant to root rot and also exhibit moderate resistance against anthracnose, collar rot, powdery mildew and leaf spot disease
	VL Gahat 10	ICAR-VPKAS, Almora	2006	Uttarakhand hills	9-12	113-117	Resistant to anthracnose and leaf curl disease
Chick pea	PBG 7	PAU, Ludhiana	2014	Punjab	20.00	159	Fairly resistant to wilt

Crop	Variety	Variety releasing organization	Year of release	Areas of adaptation state/ zone	Potential yield (q/ha)	Days to maturity	Remarks
Chick pea	PBG 7	PAU, Ludhiana	2014	Punjab	20.00	159	Fairly resistant to wilt
	PBG 5	PAU, Ludhiana	2002	Punjab	19.00	165	Tolerant to Ascochyta blight
	GNG 1581	ARS, Sriganganagar	2008	NWPZ	24.00	127-177	Resistant to water logging condition
	Himachal channa 2 (HC 2)	CSKHPKV, Palampur	2006	Himachal Pradesh	12.00	185-190	Resistant to wilt, Moderately resistant to root rot and collar rots, tolerant to ascochyta blight
	GPF 2	PAU, Ludhiana	1995	NWPZ	21-23	152	Resistant to wilt and tolerant to ascochyta blight
	Haryana Chana 5 (HC 5)	CCS HAU, Hisar	2004	NWPZ	24.00	155	Resistant to wilt and root diseases
	Aman 515 (CSJ-515)	RRS, Durgapur, RAU, Rajasthan	2013	NWPZ	24.00	135	Moderate resistant to dry root and tolerant to ascochyta to blight
	PG 186	GBPUA&T, Pantnagar	2006 **(doubt)**	NWPZ	18-20	135-140	Resistant to root rot and wilt
Field pea	Punjab 89	PAU, Ludhiana	2007	Punjab	15.00 (dry)	85-90	-------
	Shalimar pea 1	SKUAST, J&K	2013	J&K	13	220	Resistant to powdery mildew
	HFP 715	HAU, Hisar	2014	J&K, HP and Uttarakhand	15.31	215	Resistant to powdery mildew
	Rachna	CSAUAT, Kanpur	1982	All zones	20-25	120-125	Resistant to powdery mildew disease
	Prakash	IIPR, Kanpur	2006	Northern zone	21	180	Resistant to powdery mildew and tolerant to rust
Lentil	LL 931	PAU, Ludhiana	2009	Punjab	12.00	146	Fairly resistant to rust
	Vipasha	CSKHPKV, Palampur	1982	Himachal Pradesh	17.00	170-180	Rust resistant
	PL 8	CVRC Institute, GBPUAT, Pantnagar	2010	Uttarakhand hilly areas	20-22	165-175	Resistant to rust
	VL Masoor 514	ICAR-VPKAS, Almora	2011	Uttarakhand hilly areas	10-16	145-150	Moderate resistance against wilt and rust disease

Annexure VII

List of contributors

State: - Punjab

Sr. No.	Name of KVK	Name of the Programme Coordinator	Name of the Project In-charge
1	Faridkot	Dr. Jagdish Grover	Mr. Sukhwinder Singh
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6	Patiala	Dr. Jasvinder Singh	Dr. Rajni Goel and Dr. Rachna Singla
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Sr. No.	Name of KVK	Name of the Programme Coordinator	Name of the Project In-charge
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10	Dehradun	Dr. S S Singh	Dr. Sanjay Kumar
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12	Bageshwar	Dr. Nawal Kishor Singh	Mr. H C Joshi

Annexure VIII

Project Team at ICAR-ATARI, Ludhiana

CFLD on Pulses 2017-18	
Nodal Officer/ PI	Ashish Santosh Murai
Co-Nodal Officer / Co-PI	Preeti Mamgai
Senior Research Fellow	Narinder Singh
Data Entry Operator	Daljeet Kaur Suraj Devgan

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