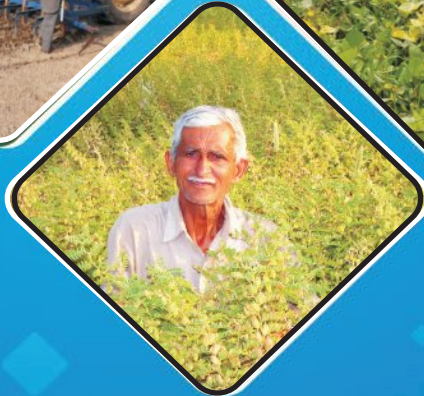


PROJECT REPORT

Cluster Frontline Demonstrations on Rabi Pulses 2015-16



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

PROJECT REPORT (2015-16)

Cluster Frontline Demonstrations on Rabi Pulses



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

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0161-2410896, 09888021624 (Cell)



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क्षेत्र-१, पं.कृ.वि. परिसर, लुधियाना - १४१००४

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Preface

Pulses are important source of dietary protein for Indian population and they are rich source of amino acids, essential minerals, vitamin and fibers. Being the cost-effective and nutritionally balanced source of protein, pulses are special constituent of the majority low-income households' food basket. In spite being the largest producer, consumer and exporter of pulses; India imports a larger part of pulses to meet the domestic demand. There is a huge gap between demand and supply of pulses as the pulses production has lagged behind the consumption needs during past few decades. Pulses are mainly grown on marginal soils and the Total Factor Productivity (TFP) is low and sluggish leading to huge but realizable yield gaps. Indian pulses demand is projected to reach 24 million tons by 2020 and 39 million tons by 2050; and, considering volume of imports and volatile prices, India ought to become self-sufficient in pulse production.

Low pulses yield in India is attributed to poor spread of improved varieties and technologies, abrupt climatic changes, vulnerability to pest and diseases. In order to boost the pulses production in India, government has included pulses in National Food Security Mission (NFSM) along with wheat and rice during October 2007. To give an impetus to pulses production, Department of Agriculture, Cooperation & Farmers Welfare has entrusted KVKs with responsibility to spread improved technologies of pulses production, generated by State Agricultural Universities (SAUs) and ICAR Institutes, among the farmers and increase pulses productivity and production. Thus, under NFSM, Cluster Frontline Demonstrations on Rabi Pulses 2015-16 Project was implemented through Krishi Vigyan Kendras (KVK) for giving boost to pulse production in the country.

In this regard, I am very thankful to the Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) for providing funds for this project. I also thank Dr. A.K.

Singh, Deputy Director General (Agricultural Extension) and Dr. V.P. Chahal, ADG (Agricultural Extension) for providing necessary guidance and support. I am also thankful to the Programme Coordinators of KVKs and farmers for successful implementation of the project and necessary help in preparation of this document.

I also congratulate all the staff members of ICAR-ATARI, Ludhiana who participated and successfully implemented the project.



(RAJBIR SINGH)

Ludhiana

Date:

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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

Executive Summary

Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) initiated the project “Cluster Frontline Demonstrations on *Rabi* Pulses 2015-16” to demonstrate the best practices of pulses for higher productivity and profitability. Since, there is a huge gap in demand and supply a lot of money is being wasted in importing of pulses. DAC&FW has initiated KVKs network to popularize the pulses production in the country. The total 42 KVKs has been involved in FLDs of best practices of pulses. In Zone-I, major crops of pulses are gram, lentil and summer moong.

During *Rabi* 2015-16, total 4115 Frontline demonstrations (FLDs) were allotted for 1651.00 ha to 42 Krishi Vigyan Kendras (KVKs) in Haryana, Punjab, Himachal Pradesh and Jammu and Kashmir states. For laying demonstrations of major pulses in region chickpea, lentil, field pea and summer moong, Rs., 3000 per acre were given to respective KVKs for providing seed as a basic input. Out of total planned area of 1111.00 ha, *Rabi* season FLDs were conducted on 779 ha whereas 332 ha area was converted to FLDs on summer moong; thus, FLDs on summer moong were conducted on total 832.55.

In chickpea, 25.49, 25.68, 34.28 and 21.51 per cent higher yield was recorded as compared to local check, from FLDs of chickpea respectively in Punjab, Haryana, Himachal Pradesh, and Jammu and Kashmir. In lentil, 72.61, 34.55 and 105.0 per cent higher yield was observed in Punjab, Haryana and Himachal Pradesh respectively. Whereas in field pea, 40.59 per cent higher yield was recorded in Jammu & Kashmir. Major technologies demonstrated at the farmer's field were improved varieties, seed treatment, microbial inoculation, line sowing, different intercropping systems, integrated pest management (IPM) technologies, pheromone traps, etc.

Across the states of Zone-I, a total of 167 extension activities were conducted, to popularize the pulses cultivation, in which as many as 8695 farmers and 93 extension personelles actively participated. The extension activities conducted were farmers-scientists inter-face, method demonstrations on scientific practices, *kisan goshthis*, trainings, etc. Similarly, under the project, monitoring was an important component to keep watch on the progress of FLDs. Thus, different monitoring teams were formulated include officers from

Directorate of Wheat Development, Ghaziabad (Uttar Pradesh); ICAR-ATARI, Ludhiana; and, DEE offices of SAUs. Monitoring teams also visited the demonstrations at different sites.

Zonal Workshop cum Training Program on Cluster FLDs on Pulses of KVKs of ICAR-ATARI, Zone-I was held on December 1-2, 2015 at the Directorate of HRD, CCS HAU, Hisar. The inaugural session was chaired by Dr. KS Khokhar, Hon'ble Vice Chancellor, CCSHAU Hisar and presided over by Dr. BB Singh, ADG (O&P), ICAR. Other dignitaries present on the occasion were Dr. Rajbir Singh, Director ATARI (Zone-1), ICAR and Dr. A.S. Antil, DEE, CCS HAU, Hisar. The meeting was attended by 42 Program Coordinators and SMSs of KVKs of Zone-I, where the cluster FLD program is being implemented. Various issues related to effective demonstration and large scale adoption strategies were debated and finalized. A comprehensive strategies and road map was planned to reach at the interior areas and disadvantaged the farmers.

कार्यकारी सारांश

दलहनों की उत्पादकता और लाभप्रदता बढ़ाने के लिए कृषि सहकारिता एवं किसान कल्याण विभाग (DAC&FW) द्वारा रबी दलहन 2015-16 पर समूह अग्रिम पंक्ति प्रदर्शन परियोजना को अनुमोदित किया गया। इस परियोजना का मुख्य उद्देश्य उत्पादन में बढ़ोतरी कर दालों की घरेलू जरूरत को पूरा करना है। क्यों कि दाल की घरेलू जरूरत को पूरा करने के लिए बहुत सारा आयात किया जाता है। जिससे बहुत पैसा खराब हो रहा है। इस परियोजना को लोकप्रिय करने के लिए 42 कृषि विज्ञान केंद्रों के साथ मिलकर पंक्ति प्रदर्शन लगाई गई। जोन 1 में चना, मसूर, ग्रीषम श्रुत मूंग मुख्य दालें हैं।

रबी 2015-16 के दौरान कुल 4115 समूह अग्रिम पंक्ति प्रदर्शन (FLDs) को हरियाणा, पंजाब, हिमाचल प्रदेश और जम्मू एवं कश्मीर राज्यों में 42 कृषि विज्ञान केंद्रों द्वारा 1651.00 हेक्टेयर पर आयोजित किया गया। दालों (चना, मसूर, मटर और ग्रीषम ऋतु मूंग) के प्रदर्शनों को करने के लिए रु 3000 प्रति एकड़ एक बुनियादी निवेश के रूप में बीज उपलब्ध कराने के लिए संबंधित कृषि विज्ञान केंद्रों को दिए गए। रबी मौसम में कुल 1111.00 हेक्टेयर क्षेत्र में योजना बनाई गई, परंतु 779 हेक्टेयर पर समूह अग्रिम पंक्ति प्रदर्शन किया गया जबकि 332 हेक्टेयर में ग्रीषम ऋतु मूंग पर समूह अग्रिम पंक्ति प्रदर्शन करने के लिए परिवर्तित कर दिया गया। इस प्रकार ग्रीषम ऋतु मूंग पर कुल 832.55 हेक्टेयर क्षेत्र पर समूह अग्रिम पंक्ति प्रदर्शन आयोजित की गई।

चना की समूह अग्रिम पंक्ति प्रदर्शन में स्थानीय उपज की तुलना में 25.49, 25.68, 34.28 और 21.51 फीसदी ज्यादा उपज क्रमशः पंजाब, हरियाणा, हिमाचल प्रदेश और जम्मू-कश्मीर में दर्ज की गई। मसूर में 72.61, 34.55 और 105.0 फीसदी अधिक उपज क्रमशः पंजाब, हरियाणा और जम्मू-कश्मीर में पाई गई। जम्मू-कश्मीर में मटर में 40.59 प्रतिशत अधिक उपज दर्ज की गई। प्रमुख प्रौद्योगिकियों का उदाहरण के लिए बेहतर किस्म, बीज उपचार, माइक्रोबियल टीका, लाइन में बुवाई करना, विभिन्न आंतर फसल प्रणाली, एकीकृत कीट प्रबंधन प्रौद्योगिकी (IPM), फेरोमोन जाल, आदि किसानों के खेत पर प्रदर्शन किया गया।

भा.कृ.अ. क्षेत्र-1 के राज्यों में कुल 167 विस्तार गतिविधिया आयोजित की गई, जिसमें 8695 किसानों और 93 विस्तार कर्मियों ने सक्रिय रूप से भाग लिया। आयोजित विस्तार गतिविधिया, उदाहरण के लिए किसान-वैज्ञानिक अंतर-वार्ता, वैज्ञानिक क्रियाओं का विधि प्रदर्शन, किसान गोष्ठी, प्रशिक्षण, आदि आयोजित की गई। परियोजना के तहत समूह अग्रिम पंक्ति प्रदर्शन की प्रगति जांच करने के लिए निगरानी भी की गई। इस प्रकार, निगरानी संघ में Directorate of Wheat Development, गाजियाबाद (उत्तर प्रदेश) के अधिकारी, आई.सी.ए.आर.-अटारी, लुधियाना और राज्य कृषि विश्वविद्यालयों के डीईई कार्यालयों को शामिल किया गया। निगरानी अधिकारियों में अलग-अलग स्थानों पर प्रदर्शनी का दौरा किया।

भा.कृ.अ.प.-क्षेत्र-1 कृषि विज्ञान केन्द्र के दलहन समूह अग्रिम पंक्ति प्रदर्शन की क्षेत्रीय कार्यशाला-सह-प्रशिक्षण कार्यक्रम को मानव संसाधन विकास निदेशालय, CCSHAU हिसार में 1-2 दिसंबर, 2015 को आयोजित किया गया। उद्घाटन सत्र में डॉ.के.एस. खोखर, माननीय कुलपित, CCSHAU और डॉ.बी.बी. सिंह, ADG (O&P), भारतीय कृषि अनुसंधान परिषद उपस्थित थे। इस अवसर पर अन्य गणमान्य व्यक्ति जैसे डॉ. राजबीर सिंह, निदेशक भा.कृ.अ.प.-अटारी, लुधियाना, डॉ. ए.एस. अंनिल, निदेशक कृषि विस्तार, CCSHAU, हिसार आदि उपस्थित थे। जहां समूह अग्रिम पंक्ति प्रदर्शन परियोजना लागू की जा रही है उन जिलों के कृषि विज्ञान केन्द्र के 42 कार्यक्रम समन्वयक तथा वैज्ञानिकों ने इस सभा में भाग लिया। विभिन्न रणनीतियों से संबंधित मुद्दों पर चर्चा की गई और अंतिम रूप दिया गया। इन रणनीतियों को वंचित किसानों तक पहुंचाने के लिए रोड़ मैप तथा योजना बनाई गई।

1. Introduction

Pulses occupy a unique position in the world of agriculture by virtue of their high protein content, which is almost double than that of wheat and thrice than that of rice. They have a special role in meeting the protein requirement of predominantly vegetarian populations, specially in a country like India. Pulses contain good quality lysine, tryptophan, ascorbic acid, riboflavin, iron, folate, potassium and fibre; at the same time, they are low in fat, sodium and glycemic index and are gluten free. Therefore, they are suitable for diabetes patients and people with coronary heart disease and anemia. Moreover, the presence of bioactive compounds in pulses like phytochemicals and antioxidants, build up anti-cancer properties. In addition to their significance to human health, pulses have positive influence on soil and environmental health. They are considered as the wonderful gift of nature as they have an ability to fix the atmospheric nitrogen (N_2) in soil; which is, according to an estimate, five to seven million tonnes of nitrogen globally over 190 million hectares (FAO, 2016). This biological nitrogen fixation results in lesser dependence on artificial/chemical fertilizers and reduction in the extent of nitrate leaching losses; thereby, reducing the greenhouse gas emissions and chances of soil erosion and depletion. Likewise, cropping systems with pulse as a component have better soil carbon sequestration potential and incorporation of pulse crop residue improves soil biological and chemical properties, thus providing sustainability in crop production system. More than 90 per cent of pulses are grown in moisture deficit conditions, thus because of limited input requirements and suitability to rain-fed/dry-land areas pulses have an additional advantage for sustainable agriculture. Short duration pulses, as an intercrop or rotation crop, provide for sustainable crop intensification and diversification. Intercropping with pulses results in efficient utilization of resources (light, water and nutrients) and higher output; further, they minimize the risk of crop failure by acting as a Biological Insurance Provider.

The most important pulses, in the world in terms of production, are dry beans (29.4%), dry peas (24.5%), chickpeas (13.7%), dry cow peas (8.5%), pulses (nes) (7.2%) and broad beans (5.7%). These together contributed 89% to the total global output of 70 million tonnes in 2012 (Anonymous 2012). In world's pulses production, dry bean is the most important crop in terms of area and production, followed by chickpea and pea.

India is the largest producer of pulses (25% of global production); at the same time, owing to its huge vegetarian population, it is also the largest consumer (27% of world consumption) and largest importer (14% of world import) of pulses.

Pulses occupy 20 per cent of area under total food grains in India, however, they contribute merely 7 to 10 per cent to the total food grains production. These are sown under mono cropping, mixed cropping and intercropping conditions in various parts of India. Globally, India ranks first in terms of area and production of pulses viz. Tur (Pigeon pea), Gram (Chickpea), Urad (Black gram), Moong (Green gram), Masoor (Lentils) and Peas; where, major pulses producing states are Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, Andhra Pradesh, Gujarat, Jharkhand, Bihar and Tamilnadu.

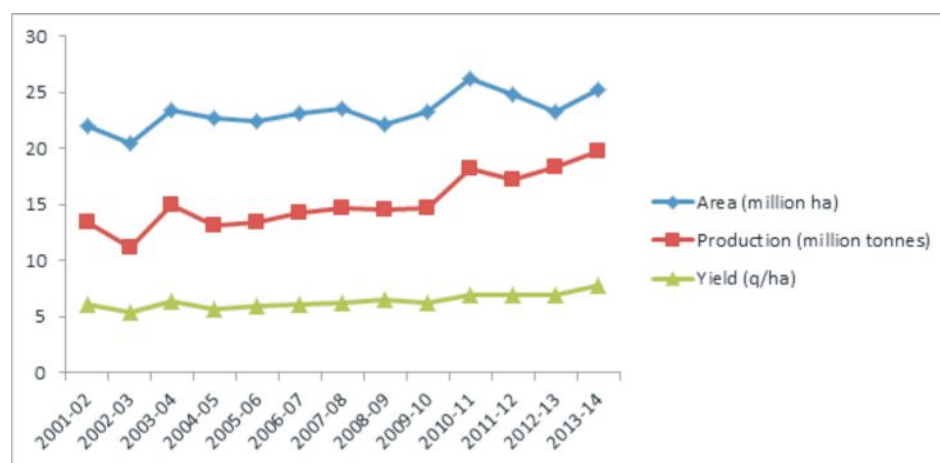


Fig. 1.1 Area, production and productivity of pulses in India from 2001-14

During 2014-15, production of pulses decreased to 17.38 million tonnes which was 19.25 million tonnes during 2013-14. Due to decreasing level of productions, India has banned export of all pulses since 2006 except chickpea (*Kabuli Chana*). During 2013-14, 343.49 thousand tones of pulses had been exported of worth Rs. 1737.00 crore, while their export was 201.70 thousand tones during 2012-13. To meet the domestic need, 3049.29 thousand tones of pulses were imported during 2013-14; however, this was less than the previous year 2012-13 (3839.30 thousand tones) (Anonymous 2015a).

Against the World Health Organization's (WHO) recommendation of 80g/day/capita, in India, per capita net availability of pulses is 41.6 g day⁻¹ (Anonymous 2015b). This low availability causes protein undernourishment among the vegetarian inhabitants. Therefore, there is a dire need of increasing area under pulses cultivation in order to meet the dietary requirements of growing vegetarian population.

Moreover, the gap between demand and supply of pulses can overcomes by increasing the productivity of pulses. Thus, there is a need to increase the production and productivity of pulse crops to meet the nutritional security and subsequently get rid of malnourishment. In India, to improve the production and productivity of pulses, many programmes like National

Food Security Mission (NFSM) and National Pulses Development Project (NPDP) had already been implemented. On the other hand, many institutes such as ICAR-Indian Institute of Pulses Research (IIPR) and Directorate of Pulses Development are working in this field to improve the production of pulses. Since the last decade, globally, the area under pulses has declined. Considering which in 2013, the United Nations declared 2016 as the “**International Year of Pulses**” realizing the potential of pulses as the primary source of protein and other essential nutrients.

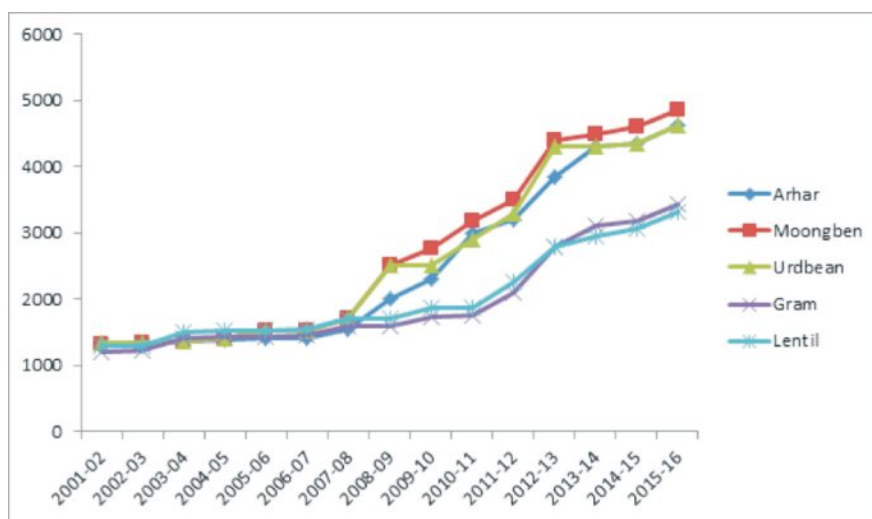


Fig. 1.2 MSP (Rs. per quintal) of identified pulses crops declared by the Govt. of India. (Rs. per quintal)

In India, NFSM has given major boost to the increase in area under pulses cultivation. The National Food Security Mission (NFSM), a scheme sponsored by central government, was launched in October 2007. The main objective of the NFSM-Pulses is to increase the production of pulses by 4 million tons at the end of 12th Five Year Plan. Since *Rabi* 2007-08, this project is under implementation in 171 districts of 14 states. Initially the target of the NFSM-Pulses was to solve the problems mainly in NFSM-Pulses districts, constitute 80 per cent of the pulses area, through demonstrations, water carrying pipes and minikits (Anonymous 2016). With similar objectives, NFSM sanctioned Rs. 1198.94 lakh to the ICAR under cluster FLDs for *Rabi* 2015-16. This project was implemented through 787 KVKs of 8 ICAR-ATARI Zones with a target of 15381 ha area.

Realising the need to increase area under pulses cultivation and increase the production of pulses, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) sanctioned the project “**Cluster Frontline Demonstrations on *Rabi* Pulses 2015-16**”. Under the project, National Food Security Mission (NFSM) sponsored 129.12 lakh rupees to ICAR-ATARI, Zone-I, Ludhiana during September 2015 for conducting frontline

Table 1.1: State wise and crop wise details of planned, conducted and deficit FLDs during *Rabi* 2015-16

State/Crop	Demonstrations (No.)			Area (ha)		
	Planned	Conducted	Deficit	Planned	Conducted	Deficit
Punjab						
Chickpea	900	504	396	360.00	145.05	214.95
Lentil	300	252	48	120.00	84.00	36.00
Total (Punjab)	1200	756	444	480.00	229.05	250.95
Haryana						
Chickpea	800	800	--	320.00	320.00	--
Lentil	300	213	87	120.00	85.20	34.80
Total (Haryana)	1100	1013	87	440.00	405.20	34.80
H.P.						
Chickpea	215	534*	--	91.00	61.70	29.30
Lentil	50	33	17	20.00	3.04	16.96
Total (H.P.)	265	567	17	111.00	64.74	46.26
J&K						
Chickpea	150	440*	--	60.00	60.00	--
Field pea	50	106*	--	20.00	20.00	--
Total (J&K)	200	546	--	80.00	80.00	--
Total chickpea	2065	2278	396	831.00	586.75	244.25
Total lentil	650	498	152	260.00	172.24	87.76
Total field pea	50	106	--	20.00	20.00	--
Grand total	2765	2882	548	1111.00	778.99	332.01

* In Himachal Pradesh and Jammu and Kashmir, the number of FLDs conducted was more than the planned FLDs as the farmers have smaller plot sizes.

demonstrations (FLDs) in the states of Haryana, Punjab, Himachal Pradesh and Jammu and Kashmir. Thus, frontline demonstrations were laid by 42 Krishi Vigyan Kendras (KVKs) during *Rabi* 2015-16 and they were provided with Rs. 3000 per acre for laying demonstrations on pulses viz. chickpea, lentil, field pea and summer moong. A total of 4115 FLDs were planned for an area of 1651 ha in the four states (Annexure III); however, some of the KVKs were not able to meet the targets in laying FLDs on chickpea and lentil due to shortage or unavailability of quality seed or varieties were older than 10 years, as per guidelines for conducting FLDs. Moreover, the farmers were not ready to deviate from traditional rice-wheat cropping pattern in Punjab and Haryana. Therefore, many of the planned FLDs of chickpea and lentil were converted to FLDs on summer moong (Table 1.2).

Out of total planned area of 831 ha, chickpea was demonstrated in an area of 586.75 ha and 244.25 ha area was deficit. While lentil crop was demonstrated only in 172.24 ha out of total 260 ha planned area. Similarly, field pea was demonstrated on 20.00 ha area in J&K. The deficit area under *Rabi* FLDs, to compensate, was converted to FLDs on summer moong. Thus, out of

total deficit FLD area of 332.01 ha, the area converted to FLDs on summer moong was 250.95 ha in Punjab, 34.80 ha in Haryana and 6.08 ha in Himachal Pradesh.

FLDs on summer moong

In Punjab, summer moong was demonstrated in an area of 450.95 ha, which includes 200.00 ha planned area as well as 250.95 ha additional area to compensate deficit FLDs from *Rabi* season (Table 1.2). In Haryana, 320.00 ha area was planned for conducting FLDs on summer moong while additional 34.80 ha was reallocated for FLDs on summer moong as a compensation to meet deficit from *Rabi* season; thus summer moong was demonstrated in an area of 354.80 ha. KVK Una of Himachal Pradesh demonstrated FLDs on summer moong on 20.00 ha, while 6.80 ha area was reallocated to be demonstrated during *kharif* 2016-17.

Table 1.2: State wise details of FLDs conducted on summer moong

State/Crop	Demonstration (No.)			Area (ha)			Deficit area (ha)
	Planned	Additional	Total conducted (Planned+ Additional)	Planned	Additional	Total conducted (Planned+ Additional)	
Punjab	500	444	--	200.00	250.95	450.95	--
Haryana	800	87	--	320.00	34.80	354.80	--
H.P.*	50	---	122	20.00	46.26	20.00+6.80	39.46
Grand Total	1350	531	122	540	332.01	832.55	39.46

* KVK Una conducted FLDs on summer moong in 20.00 ha and will conduct additional FLDs on 6.80 ha area in *Kharif* 2016-17, however, other KVKs of Himachal Pradesh were not able to meet the target (deficit 39.46 ha area) under the FLD project.

Details of FLDs of chickpea and lentil by KVKs of Punjab

In Punjab, chickpea varieties namely PBG-7, GPF-2 and GNG-1581 were demonstrated by the nine KVKs on an area of 145.05 ha through 504 FLDs. While, three KVKs conducted 252 demonstrations on lentil variety LL-699 on an area of 84 ha. Major technologies demonstrated at the farmer's field were improved variety, seed treatment with *Rhizobium* culture, Chloropyriphos and Bavistin and weed control in chickpea; while, microbial inoculants [*Rhizobium* (LLR-12) & *Rhizobactrium* (RB2)], integrated crop management and improved variety, weed control and plant protection were demonstrated in lentil (Table 1.3).

Details of FLDs on *Rabi* Pulses by KVKs of Haryana

A total of 800 FLDs on chickpea varieties i.e. HC-1, HC-5 and GNG-663 were demonstrated by 8 KVKs of Haryana on an area of 320 ha (Table 1.4). Three KVKs conducted 213 demonstrations on lentil varieties i.e. DPL-62 and L-4594 in an area of 85.20

Table 1.3: Details of FLDs conducted on of chickpea and lentil by KVKs of Punjab

Crop	KVKs	Conducted		Crop variety	Demonstrated technology
		Demo. (No.)	Area (ha)		
Chickpea	Amritsar	38	8.00	PBG -7	Improved variety
	Bathinda	93	28.25	PBG -7	Seed treatment with <i>Rhizobium</i> , Chloropyriphos & Bavistin
	Faridkot	100	33.35	PBG -7, GPF -2	Complete package of practices
	Kapurthala	66	8.00	PBG -7	Improved variety
	Mohali	65	29.60	GNG -1581	Seed treatment with Bavistin, <i>Rhizobium</i> and <i>Rhizobium</i>
	Nawanshar	24	11.20	PBG -7	Seed treatment with <i>Rhizobium</i>
	Patiala	31	8.40	PBG -7	Improved variety
	Ropar	52	10.25	PBG -7	Improved variety
	Tarn Taran	35	8.00	PBG -7	Seed treatment with Bavistin
	Total	504	145.05		
Lentil	Gurdaspur	100	30.00	LL-699	Microbial Inoculants [<i>Rhizobium</i> (LLR -12) & <i>Rhizobactrium</i> (RB2)]
	Hoshiarpur	80	30.00	LL-699	Integrated crop management
	Jalandhar	72	24.00	LL-699	Improved variety, Weed control and Plant protection
	Total	252	84.00		
Grand total		756	229.05		

ha. The technologies demonstrated in the farmer's field were integrated crop management, improved variety HC-1 for rainfed conditions, seed treatment with Chloropyriphos and *Rhizobium* culture in chickpea; however, in lentil it was improved cultivation practices, seed variety and full package of practices. For cultivation of lentil complete package of practices was followed (Table 1.4).

Details of FLDs on *Rabi* Pulses by KVKs of Himachal Pradesh

In Himachal Pradesh, 534 FLDs were conducted by five KVKs in an area of 61.70 ha. Chickpea varieties i.e. Himachal channa-1, Himachal channa-2, GPF-2, HC-1, DKG-986, HC-2 and GNG-1581 were used for conducting demonstrations (Table 1.5). The major

Table 1.4: Details of FLDs conducted on of chickpea and lentil by KVKs of Haryana

Crop	KVKs	Conducted		Crop variety	Demonstrated technology
		Demo. (No.)	Area (ha)		
Chickpea	Bhiwani	100	40.00	HC -1	Integrated crop management
	Fatehabad	100	40.00	HC -1	Seed treatment with Chloropyriphos and <i>Rhizobium</i>
	Gurgaon	100	40.00	HC -1	Improved variety
	Hisar	100	40.00	HC -1	Improved variety
	Jhajjar	100	40.00	HC -1, HC -5	Improved variety HC-1 under Rainfed conditions
	Karnal	100	40.00	HC -1	Integrated crop management
	Mahend ergarh	100	40.00	HC -1	Improved Package of practices
	Rewari	100	40.00	HC -1	Seed Treatment with <i>Rhizobium</i>
	Total	800	320.00		
Lentil	Ambala	33	13.20	DPL -62	Improved cultivation Practices
	Kurukshetra	80	32.00	L-4594	Seed variety
	Yamunanagar	100	40.00	L-4594	Full Package of Practices
	Total	213	85.20		
Grand Total		1013	405.20		

Table 1.5: Details of FLDs conducted on of chickpea and lentil by KVKs of Himachal Praesh

Crop	KVKs	Conducted		Crop variety	Demonstrated technology
		Demon. (No.)	Area (ha)		
Chickpea	Bilaspur	114	10.00	Himachal channa -1, Himachal channa -2, GPF -2 and HPG -17	Improved variety, Seed treatment with PSB
	Hamirpur	149	8.22	GPF -2, DKG 986, HC 2	-Integrated crop p management
	Mandi	101	5.28	GNG -1581, GPF2, HC -2	Seed treatment with fungicide, <i>Rhizobium</i> & PSB
	Shimla	100	25.00	HC -1, GPF -2, DKG 986, HC -2	Integrated crop management
	Una	70	13.20	HC -1, GNG1581	Improved variety, Seed treatment with PSB
	Total	534*	61.70		
Lentil	Bilaspur	33	3.04	Vipasa	
	Total	33	3.04		
Grand Total		567	64.74		

*conducted FLDs were more than the planned as farmers of H.P. have smaller plot sizes

technologies demonstrated in chickpea were integrated crop management, seed treatment with fungicide, phosphorus solubilizing bacteria (PSB) and *Rhizobium*, and improved variety. In Bilaspur, Vipasa cultivar of lentil was demonstrated in an area of 3.04 ha at 33 farmer's field.

Details of FLDs conducted on Pulses by KVKs of J&K

Chickpea variety GNG-1581 was demonstrated on an area of 60.00 ha through 440 demonstrations by three KVKs of Jammu. The technologies demonstrated were i.e. high yielding variety and full package of practices recommended by SKUAST-Jammu were followed at the farmers' fields (Table 1.6). Similarly, recommended package of practices of SKUAST-Srinagar were followed to demonstrate the Rachna and Shalimar pea- 1 varieties of field pea on an area of 20.00 ha through 106 FLDs in Pulwama district of Srinagar.

Table 1.6: Details of FLDs conducted on of chickpea and lentil by KVKs of Jammu & Kashmir

Crop	KVKs	Conducted		Crop variety	Demonstrated technology
		Demo. (No.)	Area (ha)		
Chickpea	Jammu	200	20.00	GNG -1581	High Yielding Variety
	Kathua	120	20.00	GNG -158 1	Variety and Package of Practices of SKUAST -J
	Rajouri	120	20.00	GNG -1581	High Yielding Variety
	Total	440*	60.00		
Field pea	Pulwama	106	20.00	Rachna and Shalimar pea 1	Variety and Package of Practices of SKUAST -K
	Total	106*	20.00		
Total		546*	80.00		

*conducted FLDs were more than the planned as farmers of J&K have smaller plot sizes

Release of budget to KVKs for FLDs

ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-I, Ludhiana has sanctioned Rs. 1,23,82,500/- (One crore twenty three lakh eighty two thousand five hundred rupees only) to conduct FLDs on *Rabi* season pulses to KVKs through respective SAUs/NGOs/ICAR Institutes (Table 1.7). KVK wise and crop wise detail of budget is presented in Annexure V

Table 1.7: Details of released budget for conducting FLDs on pulses 2015-16

University	Demonstration (No.)	Area (ha)	Budget (Rs.)
PAU, Ludhiana	1400	560	4200000
GADVASU, Ludhiana	300	120	900000
CCSHAU, Hisar	1250	500	3750000
Ambala (NGO)	150	60	450000
Rewari (NGO)	100	40	300000
Gurgaon (ICAR)	200	80	600000
Karnal (ICAR)	200	80	600000
CSKHPKV, Palampur	265	106	795000
Dr. YSPUH&F, Solan	50	25	187500
SKUAST-Jammu	150	60	450000
SKUAST-Srinagar	50	20	150000
Grand Total	4115	1651	12382500

2. Technologies Demonstrated

Many technologies such as improved variety, biofertilizers, line sowing, intercropping etc. were followed while laying FLDs. Such technologies help to obtain better yields under different situations.

Biofertilizers

Biofertilizers are the microorganisms (i.e. bacteria and fungi) that are used to improve the quality and health of the soil and plant species by increasing the nutrient availability for the soil and plants (Abbasniyazare *et al*, 2012). One packet of (@500g/ha) biofertilizers i.e. *Rhizobium ciceri* in chickpea and *Rhizobium leguminosarum* in lentil are used for seed treatment. Biofertilizers have an ability to stimulate the plant growth and yield by direct and indirect mechanisms. Direct promotion of plant productivity by biofertilizers occurs when they improve the supply of nutrients i.e. nitrogen, production of metabolites such as auxins, cytokinins and gibberellins as well as through the solubilization of phosphate and other minerals. Under indirect plant growth promotion, biofertilizers eliminate the pathogens by the production of cyanide, siderophores, chitinase etc. However, these days dual inoculations of *Rhizobium* and phosphorus solubilising bacteria (PSB) are used to boost the production and productivity of pulses. Seed treatment with microbial inoculants is presented in Fig. 2.1.



Fig 2.1 Inoculation of biofertilizers in lentil in Ropar and chickpea in Mandi (Left to right)

Seed treatment with fungicides

Wilt is an important disease of chickpea which heavily damages the crop and leads to reduction in the yield. Being a seed borne disease, seed treatment with Bavistin (@3g/kg of

seed) is very necessary to reduce the incidence of wilt. Bavistin fungicide was provided to the farmers by the KVKs (Fig 2.2) which protects the seeds or seedlings from early season disease occurrence and also protects from insect pests attack. Fungicidal treatment also ensures uniform seedling emergence, optimum plant population and gives higher production.



Fig 2.2 Distribution of Bavistin fungicide

Line sowing

Line sowing is an important practice to raise the crop. As compared to broadcasting, line sowing of a crop provides better crop stand, ease in intercultural operations and results into higher yield and returns. In Punjab and Haryana, mostly line sowing method was followed to raise the crop due to availability of machinery; however, crop was broadcasted in some pockets of HP and J&K. Line sowing method of chickpea in Mohali, lentil in Gurdaspur and field pea in Pulwama is presented in Fig 2.3 & 2.4.



Fig 2.3 Line sowing of chickpea in Mohali and lentil in Gurdaspur (Left to right)



Fig 2.4 Line sowing of field pea in Pulwama and chickpea in Shimla (Left to right)

Sowing of chickpea on broad bed and furrows (BBF)

Broad-bed and furrow system is an improved technology that helps in in-situ soil and water conservation and provides appropriate drainage as well. The system consists a bed approximately 100 cm wide and a shallow furrow of about 50 cm width with a slope of 0.4 to 0.8 per cent. BBF system helps in disposal of excess water through furrows under high intensity rainfall conditions. This technique was followed to raise the chickpea in Mohali, Punjab (Fig 2.5).



Fig 2.5 Chickpea on BBF in Mohali, Punjab

Lentil in agro forestry system

Now-a-days, agro-forestry systems are followed to meet the requirement of food as well as timber. Lentil was sown in Poplar based agro forestry system in Yamunanagar and in eucalyptus based agro-forestry system in Hoshiarpur (Fig 2.6). The system helps to control rain water runoff and soil erosion, thus helps to reduce water and nutrients losses. It also improves the soil fertility and health by maintaining soil organic matter and biological activities by adding plant litter into the soil. Thus, agro forestry system helps in economic gain and increased biodiversity



Fig 2.6 Lentil in agro-forestry systems of Poplar in Yamunanagar (a) and in eucalyptus in Hoshiarpur (b)

Intercropping of mustard and vegetables in chickpea

Intercropping system provides insurance against crop failure under aberrant weather conditions and also helps to utilize the resources such as land, labour and inputs efficiently. Thus, increases the productivity per unit land area by providing additional income. Intercropping of mustard in chickpea was followed in Kathua and Jammu (Fig 2.7). Similarly, cucurbits were grown in chickpea by using tunnel house technology in Faridkot (Fig 2.8).



Fig 2.7 Intercropping of chickpea with Mustard at Kathua and Jammu (Left to right)



Fig 2.8 Intercropping of vegetables in chickpea at KVK Faridkot

Use of pheromone traps

The production of chickpea can be increased by minimizing the losses caused by the insect pests. Among major insect pests, pod borer [*Helicoverpa armigera* (Hubner)] is an important one. To control the pod borer, pheromone traps were used in Rajouri (Fig 2.9) Pheromone traps are odorous chemicals that affect the behaviour of the adult male. They attract insects and disrupt their mating. Unlike pesticides, they don't have any effect on non-target organisms in particular and crop and environment in general. Chances of Pest resurgence and resistance in insects are also avoided by using these traps.



Fig 2.9 Use of pheromone traps at Rajouri

3. Extension Activities

During *Rabi* 2015, a total of 167 extension programmes were conducted across the states of Zone-1 in which as many as 8695 farmers and 93 extension personals actively participated (Table 3.1). The extension activities comprised farmers-scientists inter-face, method demonstrations on scientific practices, *kisan goshtis*, trainings, etc.

Table 3.1: Extension activities conducted during FLDs

Extension activities	No. of programmes	No. of farmer	Extension personnel (no.)
Visits of Scientists to farmers field	23	622	-
Method Demonstrations on seed treatment	8	124	-
Lectures delivered on scientific cultivation of chickpea and lentil	7	3902	-
Awareness programmes	25	839	9
<i>Kisan goshtis</i> on crop cultivation and plant protection practices for lentil	13	774	-
Field day on sowing technique of Chick pea and lentil	21	562	-
Trainings	70	1872	84
Total	167	8695	93

Scientists' visits to farmers' fields

KVK scientists usually visit farmers' fields, but especially to popularize pulses cultivation in the region KVK farm scientists have paid visits to specific farms where FLDs on pulses were laid. Thus, 23 such visits were organized by the scientists, in which they interacted with 622 farmers to discuss the conditions of crops, problems faced by the cultivators, pest and disease incidences and all those issues that concern farmers with regard to pulses cultivation. On-spot instructions/suggestions were given to the farmers in their fields regarding various problems. Further, all the issues of concern were taken back to the research system as feedback. These visits provided moral and technical support to the farmers while growing pulses as FLDs.



Fig 3.1 Visit of scientists to farmers field's in Gurdaspur and Ambala (Left to right)

Field days

During the field days, the KVK experts explained how to reap maximum benefits of FLDs and other supports provided by the government for the farmers to boost the production and productivity of pulses. The main purpose of the field days was to disseminate the technologies i.e. biofertilizers, newly released variety etc. through the demonstrations following the principle of “Seeing is believing” (Fig 3.2). The KVKs organized 21 such field days on chickpea and lentil crops along with 562 farmers as participants.



Fig 3.2 Field day in Faridkot and Mahindergarh (Left to right)

Kisan goshi

In *Kisan Goshthi*, scientists gave detailed information regarding the FLDs like ways to manage the soil and water for increasing crop productivity. Scientists discussed farmer's problems and tried to provide them with technical solutions to those problems. KVK experts have also made farmers aware about latest technologies in pulses cultivation and guided farmers to plan their further activities in advance to harvest maximum returns. Experts also created awareness among the farmers about new technologies and guided them for use of

improved technologies. Such activities were found to be highly fruitful for both farmers and scientists, as farmers could get valuable practical information and scientists got feedback for better delivery of their services in future.

Trainings

Different training programmes were organized on pulses cultivation technologies for both farmers as well as extension personnel (Fig 3.3). The farmers could immediately apply their acquired knowledge in their fields to obtain maximum output from the unit land; whereas, the extension personnel could brush up and update their knowledge for effective delivery of their services to the farming community. This way, KVKs act as a knowledge centre of agricultural technologies in general and pulses cultivation technologies in particular.



Fig 3.3 Training on successful cultivation of chickpea in and lentil in Gurdaspur (Left to right)

4. Monitoring

Monitoring was an in-built component of Cluster FLDs project, thus to assess the progress of FLDs on *Rabi* pulses, different monitoring teams were constituted. These teams included officers from Directorate of Wheat Development, Ghaziabad (Uttar Pradesh); ICAR-ATARI, Ludhiana and DEE offices of SAUs. The list of monitoring team members in different states is given in annexure.

Monitoring in Jammu & Kashmir

A committee comprising of team members Dr. Amrish Vaid, Programme Coordinator (PC), KVK Kathua; Dr. Sanjay Khar, PC, KVK Jammu; Dr. Preeti Mamgai, Senior Scientist, ICAR-ATARI Zone-I; Dr. Puneet Choudhary, SMS KVK Jammu; Dr. Brejesh Ajrawat, SMS KVK Kathua visited various sites in Jammu district for monitoring FLDs of pulses on 5th February 2016.

The committee visited Sungal, wherein FLDs on chickpea variety GNG-1581 had been laid on an area of 17.5 ha covering 146 beneficiaries. The committee interacted with around 25 farmers of the cluster. The general crop stand and germination of the crop was good in all the plots visited by the committee. The beneficiaries were happy with the performance of demonstrated chickpea variety as compared to the other varieties they were sowing prior to the introduction of the said variety. They further informed that the variety could not performed better, owing to no rainfall received after the sowing of the crop. There was no pest or disease incidence reported by the farmers. The demonstrations were laid in rainfed areas; therefore, farmers were practicing intercropping system with mustard for assured returns (Fig 4.1).



Fig 4.1 Monitoring team in Jammu

Monitoring in Punjab

The monitoring team comprising of Dr. Mahesh Kumar, Assistant Director, DWD, Ghaziabad; Dr. GS Buttar, ADE, PAU, Ludhiana; Dr. V Sardana, Agronomist, AICRP Oilseeds, PAU, Ludhiana and Dr. Ashish Santosh Murai, Scientist, ICAR-ATARI, Ludhiana visited the FLDs in Faridkot (Fig 4.2). The team was accompanied by the scientists of KVK Fardikot.

At first, the team visited a cluster of farms in village Waradaraka and discussed in detail about various issues related to pulses production with the farmers namely Sh. Nirmal Singh, Sh. Jagjit Singh, Sh. Sukhchain Singh, Sh. Angrej Singh, Sh. Gurjant Singh and many other farmers from the vicinity. The demonstrations were laid on leased land in cluster approach. PBG-7 and GPF-2 were the two varieties of Chickpea being demonstrated in those plots; moreover, full package of practices were being demonstrated at farmer's field.

Then the team went to Bhathala Kalan village where they visited farms of Sh. Agiakar Singh and Sh. Nachattar Singh. It was followed by visiting the farms of Sh. Sukhchain Singh and Gurwinder Singh of village Bhagathala Kalan. At last, the team visited the farm of Sh. Karnail Singh, Bholuwala village who had sown chickpea as an intercrop with bottle gourd. After harvesting chickpea, he intends to utilize the farm area for spreading branches of bottle gourd; which is presently growing under plastic tunnels. Farmers were also provided with inputs such as seed of recommended varieties @18kg/acre, SSP @50kg/acre, *Rhizobium* culture @250gm/acre and fungicide for seed treatment.



Fig 4.2 Monitoring team visit in Faridkot

Monitoring in Punjab

In Jalandhar, the monitoring team members Dr. Mahesh Kumar, Assistant Director, DWD, Ghaziabad; Dr. GS Buttar, ADE, PAU, Ludhiana; Dr. V Sardana, Agronomist, AICRP Oilseeds, PAU, Ludhiana and Mr. Narinder Singh, SRF, ICAR-ATARI, Ludhiana visited the demonstrations on pulses (Fig 4.3).

The team visited the fields of S. Balwinder Singh Bassi and S. Ravinder Singh of Cheema Khurd village and discussed the problems faced while conducting the FLDs on lentil. They had sown lentil variety LL-699 with the seed treatment with *Rhizobium*. They followed the package of practices as recommended by PAU, Ludhiana. In village Sharin, the team visited the fields of S. Balwinder Singh and S. Jaswant Singh. They had sown same variety of lentil. The team interacted with farmers and discussed about the problems/constraints being faced while conducting the FLD on lentil variety. The problems of marketing pulse crop were discussed with the team and the team suggested value addition and packaging of pulses at farm level.

In village Divay Gram, the team visited a cluster of fields (S. Kulwinder Singh, Chain Lal, Jinder and Naveen Kumar) having crop sown on one acre each. The variety LL-699 was being introduced for the first time in the area and one of the farmer was practicing intercropping of lentil with *sarson* for better returns.



Fig 4.3 Monitoring team visit in Jalandhar

Monitoring in Himachal Pradesh

The monitoring team comprised Dr. Mahesh Kumar, Assistant Director, DWD, Ghaziabad; Dr. AK Chaubey, Professor, Extension Education, CSK HPKV, Palampur; Dr. DR Choudhery, Professor Vegetables, CSK HPKV, Palampur and Narinder Singh, SRF, ICAR-ATARI, Ludhiana; the team visited Una, Shimla and Bilaspur districts of HP.

In Kuthar Beet village of Una, the team visited the fields of Sh. Surinder Singh and Sh. Neel Prakash; they had sown HC-1 variety of chickpea and told that wild animals were damaging the crop. In Ghungrala village, Sh. Raj Kumar used HC-1 variety of chickpea for demonstration. In village Sapori, Sh. Ravinder Singh had grown GNG-1581 variety of chickpea. On 15/03/2016 team visited the field of Suresh Saini in Lal Singhi village where he had sown HC-1 variety of chickpea.



Fig 4.4 Monitoring team visit to FLDs on chickpea in Una



Fig 4.5 Monitoring team visit to FLDs on chickpea in Shimla



Fig 4.6 Monitoring team visit to FLDs on chickpea in Bilaspur

On 16/03/2016 the team visited the FLDs in Shimla district. In Dogri village, Smt.Minakshi Devi had grown HC-1 variety of chickpea by seed treatment with chloropyriphos. During interaction, they demanded the FLDs on Rajmash and Mash. In Nandla village, the team visited fields of Smt. Shishma Sharma, who was practising organic farming. In Karalash village, Smt. Banita Thakur and Smt. Richa had sown HC-1 variety of chickpea under demonstration. Further, the team visited FLDs in Bilaspur district on 18/03/2016. In Badgaon village, Sh. Parkash Chand and Sh. Hans Raj cultivated HPG-17 variety and while discussion they shared the constraints about marketing being the major problem in cultivation of chickpea. In Gheelan village, team visited the farm of Sh. Hoshiar Singh.

5. Results and Discussion

Performance of FLDs on Chickpea in Punjab

In Punjab, as compared to the local check, an overall 25.49 per cent higher yield was recorded from the FLDs on chickpea (Table 5.1). The maximum yield was recorded in Nawanshahar (16.30 q/ha), while the lowest was recorded in Ropar (5.35 q/ha). Major rotations followed in the state were kharif fallow-Chickpea, kharif fallow-Chickpea+Wheat/Barley/Raya, Sorghum (fodder)-Chickpea, Pearl millet-Chickpea, Paddy-Chickpea-Summer Moong. The results are explained according to the agro-climatic zones as per the classified by National Agricultural Research Project (NARP) (refer Annexure XII) and are explained below:

PB-II (Undulating Plain Zone)

In Nawanshahar, PBG-7 variety was demonstrated in Saroya, Balachour Aur, Nawanshahr, Garhshankar, Banga and Balachour blocks of the district. The farmers were encouraged to follow the package of practices recommended by PAU, Ludhiana. Thus, the seed of the crop was treated with *Rhizobium* inoculum and was sown by drilling. Recommended fertilizer dose (N@15 kg/ha and P₂O₅@20 kg/ha) was applied and an pre-emergence application of pendimethalin 30 EC @ 2.5l/ha was done for controlling weeds. Similarly, as a measure of plant protection, Indoxacarb 14.5 EC @ 200 ml in 80-100 liter water was applied for controlling insects and Indofil M45 @360 g per acre in 100 liter of water was applied for controlling disease were applied. The yield recorded from the FLDs was reported to be 63.00 per cent higher than the local check, which can be attributed to the



Fig 5.1 Input distribution at Mohali and Amritsar

use of improved technologies like high yielding variety (PBG-7), seed treatment with nitrogen fixing bacteria and other recommended practices.

In Anandpur Sahib block of Ropar district, PBG-7 variety of chickpea was demonstrated and other recommended practices were followed like line sowing, application of N @15 kg/ha, 20 kg/ha P₂O₅ and application of pre-emergence herbicide stomp 30EC @ 2.5 liter/ha for controlling weeds. Whereas, in Mohali district, GNG 1581 variety was demonstrated in Majri, Kharar and Dera Bassi blocks. The practices followed were seed treatment with Bavistin and *Rhizobium* culture, and spraying the crop with cypermethrin @ 80 ml in 80-100 litre water against blight disease. As compared to local checks, 11.5 per cent and 11.54 per cent higher yields were observed in Ropar and Mohali district respectively. The region received no rainfall during rabi 2015; moreover, as the districts are located at the foothills of Sivalik Hills, the nuisance caused by wild animals (Blue bull and Peacock) led to severe crop damage.

Table 5.1: Performance of chickpea in Punjab

Zone	KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/decrease
					Demo	Local check	
PB-II	Nawanshahar	PBG-7	24	11.20	16.30	10.00	63.00
	Ropar	PBG-7	52	10.25	5.35	4.8	11.5
	Mohali	GNG 1581	65	29.60	7.25	6.5	11.54
PB-III	Amritsar	PBG-7	38	8.00	15.30	12.50	22.40
	Tarn Taran	PBG-7	35	8.00	15.27	12.50	22.16
	Kapurthala	PBG-7	66	8.00	12.00	10.50	14.29
	Patiala	PBG-7	31	8.40	15.50	11.80	31.36
PB-IV	Faridkot	PBG-7, GPF -2	100	33.34	11.70	9.75	20.00
PB-V	Bathinda	PBG-7	93	28.25	14.50	11.00	31.82
Total			504	145.05	11.88	9.46	25.49

PB-III (Central plain zone)

Chickpea variety PBG-7 was demonstrated in Ajnala, Majitha, Verka, Tarsikka, Harsha Chinna and Chogawan blocks of Amritsar; Patti, Valtoha, Naushara Pannuan and Cohala Sahib blocks of Tarn Taran; and, Nadala, Sultanpur lodhi and Dhilwan blocks of Kapurthala

and Nabha, Bhunerheri and Rajpura blocks of Patiala. In FLDs, in Amritsar, seed was treated with Bavistin @ 3g/kg and crop was sown by *pora* method with plant to plant spacing of 30 cm. Thus, compared to the local check, 22.40 per cent higher yield was obtained from the demonstration plots. In Tarn Taran, along with other recommended practices, an additional practice of application of Indoxacarb 14.5 SC @200 ml/acre and Indofil M-45 @360 gm/acre was followed for controlling the wilt. As a result, as compared to local check, 22.16 per cent higher grain yield was obtained. While, in Patiala 31.36 per cent higher yield was recorded over the local check.

Application of urea @32.5 kg/ha, superphosphate @125 kg/ha and Decis @160 ml in 200 litre of water for controlling chickpea caterpillar along with other recommended practices was practiced for better crop yield in Kapurthala; which has resulted in increase the yield by 14.29 per cent over the local check.



Fig 5.2 Visit of monitoring team in Faridkot and intercropping of mustard in chickpea in Ropar

PB-IV (Western plain zone)

In Faridkot, PBG-7 and GPF-2 varieties of chickpea were demonstrated in Faridkot and Kotkapura blocks. The seed was treated with Captain @3gm/kg of seed against blight and the crop was sprayed with Decis 2.8 EC@ 400ml/ha for controlling the chickpea caterpillar. As a result, as compared to the local check, 20.00 per cent higher yield was obtained from FLDs conducted at farmer's field.

PB-V (Western zone)

High yielding variety PBG-7 of chickpea was demonstrated in Talwandi Sabo, Bathinda and Maur Mandi blocks of Bathinda district; where, as compared to the local check, 31.82 per cent higher grain yield was obtained in FLDs.



Fig 5.3 Glimpse of chickpea field and farmers holding the harvest

Performance of FLDs on Chickpea in Haryana

The data in Table 5.2 indicated that, in demonstration plots, 25.68 per cent higher yield was obtained over the local check. From demonstrations, maximum yield recorded was in Karnal (18.00 q/ha); whereas, the lowest yield was recorded in Hisar (9.9 q/ha).

HR-I (Eastern zone)

In Karnal district, Nilokheri, Nissing, Gharaunda and Assandh blocks were selected to demonstrate HC-1 variety of chickpea. As compared to the local check, 2.86 per cent higher yield was obtained from FLDs due to adoption of major practices like drill sowing, application of DAP @85 kg/ha and zinc sulphate @25kg/ha as basal dose, and spray of Cypermethrin 25 EC @200 ml per acre for the control of cut worm and pod borer. Similarly, Chickpea variety HC-1 was demonstrated in Behal and Siwani blocks of Bhiwani; where, 168.04 per cent higher yield was recorded. This improvement in the yield can be attributed to application of N:P:K @ 15:15:25 kg/ha, seed treatment with Chlorpyriphos 20EC



Fig 5.4 Farmer-Scientist interaction in Karnal and Rewari

@15ml/kg seed for controlling termites, seed treatment with Carbendazim 50 WP @2.5g/kg seed against root rot and spray of Quinolphos 25EC@400ml in 100 litre of water against pod borer. Likewise, in Jhajjar, HC-1 variety was demonstrated at Salhawas, Jhajjar, Beri, Bahadurgarh and Matenhail blocks where 39.08 per cent higher grain yield was obtained from FLDs over the local check.

HR-II (Western zone)

Satnali and Nangal Chaudhary blocks of Mahendergarh district were chosen for conducting the demonstrations of GNG 663 variety of chickpea. An overall 18.60 per cent higher yield was recorded from the demonstration plot over the local check. The increment in yield might be due to application of fertilizers namely Di-ammonium phosphate (DAP)@90 kg/ha and ZnSO₄@25 kg/ha, and spray of Novaluron 10 EC@150 ml/acre for controlling Helicoverpa. In Rewari, HC-1 variety was demonstrated in Jatusana, Nahar, Rewari, Ahir, Khol and Bawal blocks. From demonstrations, 32.50 per cent higher grain yield was obtained over the local check, which was due to improved practices like seed treatment with chloropyriphos and biofertilizers (*Rhizobium* + phosphorus solubilizing bacteria), drill sowing and application of DAP @88 kg/ha.

Table 5.2: Performance of chickpea in Haryana

Zone	KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/decrease
					Demo	Local check	
HR-I	Karnal	HC-1	100	40	18.00	17.50	2.86
	Bhiwani	HC-1	100	40	16.94	6.32	168.04
	Jhajjar	HC-1, HC-5	100	40	12.10	8.70	39.08
HR-II	Mahendergarh	GNG 663	100	40	15.30	12.90	18.60
	Hisar	HC-1	100	40	9.9	9.1	8.8
	Gurgaon	HC-1	100	40	14.6	13.75	6.18
	Rewari	HC-1	100	40	10.60	8.00	32.50
	Fatehabad	HC-1	100	40	9.98	9.2	8.47
Total			800	320	13.43	10.68	25.68

In Hisar, the FLDs were conducted in Hisar-I, Hisar-II, Uklana, Agroha and Barwala blocks, where more than 90 per cent of the FLDs were conducted in rainfed areas. About 50 per cent of them were conducted on sandy soil. Thus, on an average 8.8 per cent higher yield

was recorded from demonstrated plot than that of local check. This percept increase in the yield was because of less rainfall received during *Rabi* season, which lead to moisture deficit during growth period. Additionally, at the physiological maturity stage occurrence of hail-storm resulted in losses up to 60 per cent. Similarly, chickpea variety HC-1 was demonstrated in Pataudi, Farrukhnagar, Gurgaon and Sohna blocks of Gurgaon. As compared to the local check, only 6.18 per cent higher yield was recorded from FLDs, as 20-50 per cent of crop was damaged by blue-bull attack. Likewise, in Fatehabad, chickpea was demonstrated in Bhattu Kalan, Ratia, Fatehabad and Bhuna blocks. As compared to the local check, only 8.47 per cent higher yield was recorded from FLDs which can be attributed to the thundershower and hailstorm that occurred at the crop maturity stage in the district in the month of March 2016



Fig 5.5 Farmers training and diagnostic visit of chickpea in Gurgaon

Performance of FLDs on Chickpea in Himachal Pradesh

In HP, 34.28 per cent higher yield was recorded from FLDs of chickpea over the local check (Table 5.3). The maximum yield was recorded in Una (9.57 q/ha); whereas the lowest yield was recorded in Mandi (7.28 q/ha).

HP-I (Mid-Hill Sub-Humid Zone)

Amb, Una and Haroli blocks of Una district were selected to demonstrate HC-1 and GNG-1581 varieties of chickpea. Line sowing method was followed to raise the crop and Cypermethrin 25EC @1.5 ml/litre was applied for controlling the pod borer. Over the local check, 59.50 per cent higher yield was recorded from the demonstrations conducted at farmers' field.

The demonstrations on chickpea varieties namely DKG-986, HC-2 and GPF-2 were laid in Bhoranj, Nadaun, Sujampur, Hamirpur and Tauni Devi blocks of Hamirpur district. Line sowing method was followed to raise the crop under rainfed areas. Over the local check

55.09 per cent higher yield was obtained from the FLDs. This increase in yield might be due to application of FYM@5q/acre, seed treatment with Bavistin to manage chickpea wilt disease. However, prolonged drought affected the crop in some areas of the district during the months of December and January 2015-16. In Shimla, chickpea variety HC-1 was grown on an area of 25.00 ha. The line sowing and integrated crop management practices were followed. Thus, 6.75 per cent higher yield was recorded than the local check. However, dry spell in November delayed the sowing of chickpea.

In Bilaspur district, chickpea varieties namely Himachal channa-1, Himachal channa-2, HPG-17 and GPF-2 were demonstrated in Jhandutta and Ghumarwin blocks. The *kera* method of sowing, N:P:K in the ratio of 30:60:30 and pre-emergence herbicide pendimethalin @ 1.5 litre/ha were followed while conducting the demonstrations. As a result, 67.60 per cent higher yield was recorded compared to the local check.

Table 5.3: Result of FLDs of chickpea in Himachal Pradesh during 2015-16

Zone	KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/decrease
					Demo	Local check	
HP-I	Una	HC1, GNG 1581	70	13.20	9.57	6.00	59.50
	Hamirpur	DKG 986, HC2, GPF2,	149	8.22	8.84	5.70	55.09
	Bilaspur	HPG 17, Himachal channa -1, GPF2, Himachal channa -2	114	10.00	8.38	5.00	67.60
HP-II	Mandi	HC2, GNG 158 1, GPF2	101	5.28	7.28	4.20	73.33
	Shimla	HC-1	100	25	8.54	8.00	6.75
Total			534	61.70	8.67	6.45	34.28

HP-II (High Hill Temperate Wet Zone)

In Mandi, FLDs on chickpea varieties i.e. HC-2, GNG-1581 and GPF-2 were laid out in Sundernagar, Gopalpur, Drang and Balh blocks. The followed practices were seed broadcasting, hand weeding and application of lambdacyhalothrin @ 0.004 % against blight. As a result, 73.33 per cent higher yield was recorded over the local check.



Fig 5.6 Exposure visit of farmers at KVK Bilaspur and diagnosing symptoms in Una

Performance of FLDs on Chickpea in Jammu & Kashmir

In J&K, as compared to the local check, an overall 21.51 per cent higher yield was recorded from the FLDs conducted on chickpea (Table 5.4). The maximum yield was recorded 6.42 q/ha in Kathua, while the lowest was in Rajouri (3.7 q/ha).

JK-I (Low altitude Sub-Tropical Zone)

In rainfed areas of Jammu, GNG-1581 variety of chickpea was demonstrated in Akhnoor and Bhalwal blocks. DAP @88 kg/ha was applied followed by broadcasting of the seed. Pheromone traps were used to control the pod borer. Thus, 5.92 per cent higher yield was recorded in demonstrations over the local check and this less improvement in yield might be due to lack of rainfall received by the crop at the critical stage.

Nagri, Kerian, Barnoti, Kathua, Hiranagar, Marheen, Billawar and Dinga Amb blocks of the Kathua district were selected to demonstrate the GNG-1581 cultivar of chickpea. A yield over the local check, 42.67 per cent higher was obtained from FLDs and this might be due to application of DAP @90 kg/ha and spray of Cypermethrin for the control of pod borer.

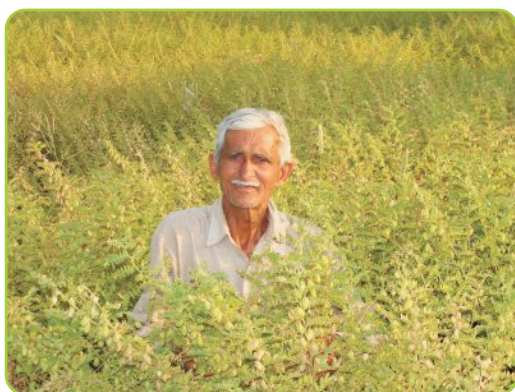


Fig 5.7 View of chickpea crop in Kathua and hand weeding in Rajouri

Table 5.4: Results of FLDs of chickpea in J&K during 2015-16

Zone	KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/decrease
					Demo	Local check	
JK -I	Jammu	GNG -1581	200	20.00	5.19	4.90	5.92
	Kathua	GNG -1581	120	20.00	6.42	4.50	42.67
JK -II	Rajouri	GNG -1581	120	20.00	3.7	3.20	15.62
Total Jammu			440	60.0	5.1	4.2	21.51

JK-II (Mid to high altitude Intermediate Zone)

FLDs on GNG-1581 variety of chickpea were laid out in rainfed areas of Sunderbani and Nowshera blocks of Rajouri district. As compared to the local check, 15.62 per cent higher yield was recorded from FLDs. The practices followed were seed broadcasting, application of DAP@90kg/ha and pheromone traps for the control of pod borer.



Fig 5.8 Farmers interaction with monitoring team in Jammu and distribution of pheromone traps in Rajouri

LENTIL

Performance of Lentil in Punjab

In Punjab, 72.61 per cent higher yield was recorded over the local check. The maximum yield was recorded in Jalandhar (9.70 q/ha), the crop was introduced for the first time in the district and lowest yield was recorded in Hoshiarpur (3.69 q/ha).

PB-I (Sub-mountain undulating zone)

The demonstrations on lentil variety LL-699 were laid out in Mahilpur, Garhshnagar, Bhunga, Dasuya, Mukerian and Hoshiarpur-I and Hoshiarpur-II blocks of Hoshiarpur district. The inputs provided were Captain @2 gm/kg seed and biofertilizers (*Rhizobium* and *Rhizobacterium*) for the seed treatment. The recorded yield was 28.12 per cent higher than the local check inspite of the incidence of blight, insufficient rainfall and nuisance caused by wild animal blue-bull.

In FLDs of lentil variety LL-699, application of urea @28kg/ha, SSP @250 kg/ha and pre-emergence herbicide stomp30 EC@ 1litre/ha resulted in increase the yield by 56.79 per cent than the local check in Kahnoowan, Dinanagar, Gurdaspur, Batala, Kahnoowan, Qadian, Dhariwal, Dera BABA Nanak and Sri Hargobindpur blocks of Gurdaspur district.

PB-III (Central plain zone)

Lentil variety LL-699 was demonstrated in Nakodar, Nurmahal, Mehatpur, Lohian, Rudka Kalan, Jalandhar and East Shahkot blocks of Jalandhar. In Jalandhar, lentil was introduced for the first time, thus there was no data on local check available.

Table 5.5: Results of FLDs of lentil in Zone-I during 201-16

Zone	KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/decrease in yield
					FLD	Local check	
Punjab							
PB-I	Hoshiarpur	LL-699	100	30	3.69	2.88	28.12
	Gurdaspur	LL-699	80	30	8.31	5.30	56.79
PB-III	Jalandhar	LL-699	72	24	9.70	0	0.00
Total (Punjab)			252	84.00	7.06	4.09	72.61
Haryana							
HR-I	Ambala	DPL-62	33	13.2	7.43	7.00	6.14
	Kurukshetra	L-4594	80	32	9.00	7.50	20.00
	Yamunanagar	L-4594	100	40	11.62	7.5	54.93
Total (Haryana)			213.00	85.20	9.99	7.42	34.55
Himachal Pradesh							
HP-I	Bilaspur	Vipasa	33	3.0	8.2	4.00	105.00

Performance of Lentil in Haryana

HR-I (Eastern zone)

Saha, Barara, Ambala-II and Sadhaura blocks of Ambala were selected to demonstrate DPL-62 variety of lentil. A yield of, 6.14 per cent higher was recorded from demonstration than the local check. This improvement in yield might be due to seed inoculation with *Rhizobium* and application of 15 kg N/ha and 40 kg P₂O₅/ha.

To demonstrate the lentil cultivar L-4594, Pehowa, Thanesar, Ladwa and Babain blocks of Kurukshetra; Radaur, Jagadhri and Mustafabad blocks of Yamunanagar were selected. In Kurukshetra, the recorded yield was 20.00 per cent higher than the local check, and demonstrated technologies were application of SSP @50kg/ha and stomp @1liter/ha for weed control. In FLDs of Yamunanagar, SSP@ 100 kg/ha, urea@ 25 kg/ha and ZnSO₄@ 5 kg/ha was applied. Thus, 54.93 per cent higher yield was recorded as compared to local check.



Fig 5.9 Lentil crop and threshing

Performance of Lentil in Himachal Pradesh

HP-I (Mid-Hill Sub-Humid Zone)

In Bilaspur district, Vipasha variety of lentil was demonstrated in Jhandutta and Ghumarwin blocks. Crop was sown by *Kera* method and full dose of N and P was applied at the time of sowing. Stomp 30 EC@4.5 litres/ha was sprayed within 48 hours of sowing to control the weeds. As a result of use of improved practices 105.00 per cent higher yield was recorded over the local check in lentil crop (Table 5.5).

Performance of Field Pea in Pulwama, J&k

In Pulwama, Shalimar pea-1 and Rachna cultivars of field pea were demonstrated. As compared to local check, 40.59 per cent higher yield was recorded. Pea as vegetable is highly acceptable to the consumers that is why farmers are more interested to grow pea in Srinagar (Table 5.6).

Table 5.6: Details of conducted FLDs in field pea by KVK Pulwama, Srinagar

KVK	Variety	FLDs (No.)	Area (ha)	Average yield (q/ha)		% increase/ decrease in yield
				FLD	Local check	
Pulwama	Shalimar pea-1 and Rachna	106	20.00	12.47	8.87	40.59

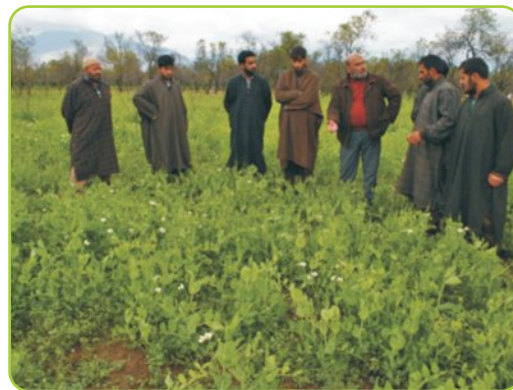


Fig 5.10 Line sowing of field pea and visit at farmer's field

Success Stories

Sh. Angrej Singh is a resident of Kamalpura village of Amritsar district; who has laid FLDs on chickpea. The chickpea seed variety PBG-7 was sown by pora method by keeping the row to row distance 22.5 cm and treated with chloropyriphos 20EC @ 10 ml/kg of seed then inoculated with Mesorhizobium. Farmer was advised for 1st hand weeding at 5- 6 weeks after sowing and 2nd hand weeding at 2 months after sowing. In addition to this time to time monitoring for insect-pest and diseases were conducted. With the appearance of pod borer *Helicoverpa armigera* in the farmer fields during the month of March the critical inputs in the form of insecticide, cypermerthrin 10 EC@0.75 ml/ litre was demonstrated in the farmer's fields at 15 days interval. He got a yield of 8.0 quintals/acre. He was able to get higher market price @ Rs. 3844 per qt. His gross income was Rs 30,752. The total cost of cultivation, transportation and marketing of gram was calculated as Rs. 11123. Thus, he earned a net profit of Rs 19629 from an acre. Angrej Singh is one of the cheerful farmers in the region. He is inspiring other farmers in his village to grow Gram in the *Rabi* season.



In Gurdaspur, **Sh. Gurdial Singh** of Sallopur village conducted the FLDs on lentil. Lentil variety LL-699 was treated with captan @2 g per kg of seed and then inoculated with *Rhizobium* (LLR-12) and *Rhizobacterium* (RB2). Time to time monitoring was done by the KVK and farmer followed the practice of weeding first at 30 DAS and second at 60 DAS. SSP@50 kg per acre was applied to the crop. As compared to local check 19.76% higher yield was recorded with net return Rs. 107925/ha and B:C was 6.21. Farmer is satisfied and happy with the crop yield.



In Haryana, **Sh. Rajesh Kumar** of Badarpur village laid the FLDs on chickpea variety HC-1. Seed was treated with captan@3 gram/kg of seed. DAP@85 kg and Zinc sulphate (21%) @25 kg/ha was applied as a basal dose. To control cutworm and podborer, cypermethrin 25 EC @ 250ml/ha was applied. Indofil M-45 was applied for control of leaf spot diseases. Farmer could get better yield of channa from variety HC-1.



Sh. Partap Singh is a resident of Khajuri village of Yamunanagr district; who has had FLDs on L4594 variety of lentil. Farmers were supplied with short duration lentil variety which fits well in paddy/sorghum fodder/lentil-sugarcane cropping sequence. There is problem of wilt and root rot in lentil which was taken care of with use of resistant variety and seed treatment with carbendazim. To improve the nitrogen fixation and availability of fixed phosphorus seed was treated with Phoshotika (phosphorus solubilizing bacteria). Labour is major constraint as the its availability is meager and costs are escalating, to have economic weed management pre-emergence application of Pendimethalin was suggested and applied by farmer under moist situation to avoid crop weed competition and to get higher productivity. Combination of all the crop management practices resulted in higher productivity and profitability from lentil crop. Lentil crop in demonstration plot recorded grain yield 1500kg/ha which was 450kg/ha higher over farmer practice (use of traditional variety, no seed treatment, less/no use of phosphatic fertilizers and untimely weed management). Net returns obtained in demonstration plot were to the tune Rs.74000/ha which are remarkably higher than the check and traditionally grown wheat crop as this year lentil crop fetched good prices (Rs. 68/kg) in market. Farmer is very much happy with the technology, he narrated his happiness as it fits very well in sugarcane based cropping sequence as it matures in 130 days , earlier we were growing wheat crop which matures in 142-145 days and planting our next sugarcane get delayed. Due to high temperature and peak harvesting/ threshing of rabi crops labour availability is very less that too at very high rates which results in poor crop stand and ultimately poor cane yield of sugarcane planted after wheat. Whereas sugarcane can be planted timely after lentil which resulted in better crop stand and is also economical. Performance of sugarcane crop is always better when preceding crop is lentil as it improves soil health. Net profits from lentil crop was also higher compared to wheat crop as it fetched good price (Rs. 68/Kg) in market this year, moreover lentil crop requires less energy, water, improves soil health and environment friendly. Farmer was of the view that pulse production can only be enhanced provided farmers get remunerative prices of pulses and some policy may be framed to check the menace of blue bulls.



In Hamirpur, **Sh. Manohar Lal** of Jhinkari village demonstrate the FLDs on chickpea. The treated chickpea seed variety HC-2 was demonstrated at their field and advised to use balanced application of FYM@ 5 tonnes ha⁻¹ and NPK nutrients @ 30:60:30 kg ha⁻¹ at their own level as per package of practice. Farmer did 1st hand weeding at 5- 6 weeks after sowing and 2nd hand weeding at 2 months after sowing. In addition to this time to time monitoring for

insect-pest and diseases were conducted. These diagnostic visits initiated from first fortnight of January. With the appearance of pod borer *Helicoverpa armigera* in the field during the month of March the critical inputs in the form of insecticide, cypermerthrin 10 EC @0.75 ml/litre was demonstrated in the farmer field at 15 days interval. The incidence of root rot wilt was observed

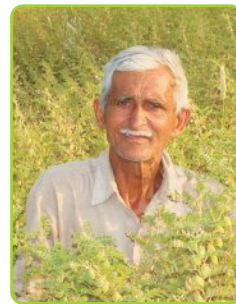


only in few patches in all the demonstrations as the seed was already treated with Bavistin @ 2.5 g/kg. Integrated nutrient management (INM) and Integrated pest management (IPM) technologies demonstrated at farmers fields resulted in higher chickpea grain yield as compared to no management practices adopted by the farmers. The highest crop yield of 12.55 q ha⁻¹ was recorded in Jhinkari village. The overall average yield of variety HC-2 was recorded 8.55 q ha⁻¹ with improvement of 2.85 q ha⁻¹ and 50 per cent increase in yield over farmers variety i.e. 5.7 q ha⁻¹ (HC-I). The demonstrations plots of variety HC-2 recorded net returns of Rs. 21,600 per hectare and B: C ratio of 1.72. Whereas, in farmer's variety net returns of Rs. 10,500 per hectare and B: C ratio of 1.58 was recorded. The farmer was happy with the performance of chickpea variety and crop yield and appreciated the time to time diagnostic visits conducted by KVK scientists to their field and other activities conducted during the programme.

In Himachal Pradesh, **Sh. Budhi Ram** of Bilaspur laid the FLDs on lentil variety Vipasha. Full package of practices were followed to raise the crop. Increase in production & productivity was 44.64 per cent. Net return increase was 141 per cent over check. Farmer was satisfied with the performance of lentil crop and variety Vipasha.



Sh. Vijay Singh from Kathua lay the demonstrate on chickpea. GNG-1581 variety was sown at 50 kg/ha after seed treatment with carendezium 50WP. Fertilizer DAP@ 90 kg per/ha was applied and pheromone traps were used to control the insect pests. Over the local check, 42.66 per cent increase in yield was recorded and B:C ratio was 2.01. The Variety GNG-1581 of gram along with technology demonstrated is suitable for rainfed conditions of Kathua; however moisture stress during the crop season due to long dry spells and heavy rains at later stage during mid to end March resulted in its poor yield.



6. Zonal Workshop-cum-Training Program on Cluster FLDs on *Rabi* Pulses 2015-16

Zonal Workshop cum Training Program on Cluster FLDs on *Rabi* Pulses of KVKs of ICAR-ATARI, Zone-I was held on December 1-2, 2015 in the Directorate of HRD, CCS HAU Hisar. The inaugural session was chaired by Dr. K.S. Khokhar, Hon'ble Vice Chancellor CCS HAU Hisar and presided over by Dr. B.B. Singh, ADG (O&P), ICAR. The other dignitaries on the occasion were Dr. Rajbir Singh, Director ATARI (Zone-1), ICAR and Dr. A.S. Antil, Director Extension Education, CCS HAU Hisar. The meeting was attended by 42 Program Coordinators and SMSs of KVKs of Zone-1 where the cluster FLDs program was being implemented.

At the very outset, Dr. (Mrs.) N Khetarpaul welcomed the chief guest Dr. Khokhar, Dr. BB Singh and other dignitaries on the dais and participants. She highlighted the scenario of pulses in the country and the need for formulating future strategies to enhance pulse production and productivity. Dr. R.S. Antil, Director Extension Education, CCSHAU, Hisar, in his address, thanked Dr. K.S. Khokhar for his keen interest especially in policy formulation and programs on pulses of the university and regular guidance for the improvement of KVK activities. He said that despite of India being the largest producer of consumer of pulses in the world; the demand is more than the production. He told that the area under pulses in the country is 26.8 m ha and the production is 18.3 million tones only. He emphasized upon close coordination among the research, extension agencies and farmers for increasing the productivity of pulses in the country.

Dr. Rajbir Singh, Director, ICAR-ATARI highlighted the role of KVKs in National Agriculture Extension system and told the house that everyone is looking after the KVKs for agriculture related activities. The KVKs have been involved in many activities like Soil health cards, *Swatch Bharat*, *Adarsh Gaon*, *Mera Gaon Mera Gaurav* programs and the targets for KVKs are time bound and result oriented. He emphasized upon the need to develop agri-business model for pulses to attract more farmers in pulse production. Regarding progress of cluster FLDs on pulses, he told the house that KVKs of Haryana have achieved 100 percent targets, which is commendable; however, some KVKs of Punjab could not achieve the target due to non availability of seed but the targets will be achieved in summer moong. He told the house that KVKs are doing commendable job in spite of all

odds and work pressure and even in the cluster FLD program KVKs of the zone will show their worth.

Dr. B.B Singh, in his presidential remark, highlighted the current scenario of pulse and oilseed consumption in the country. He made aware the house that pulse consumption in the country has come down while that of oilseeds has increased. He also emphasized that DAC&FW has to play a major role in making available the requisite seed requirement of pulses. KVKs will not only help in quality seed production but also have to demonstrate the pulse production technologies for enhancing pulse productivity. He desired that we should start planning for summer and Rabi pulses in advance so that the quality of demonstration during the ensuing seasons is up to the desired levels.

The chairman of the session, Dr. KS Khokhar, in his concluding remark, said that it is most timely to deliberate on a national issue as huge amount is being spent on import of edible oils and pulses. PAU Ludhiana and CCSHAU Hisar have been recognized for their contribution in green revolution; however, both the states have paid a huge price for feeding the countrymen. Depleting soil health, fertility, and water table are some of the critical issues these states are facing. He told that pulses are like girl child who are cultivated in rainfed, neglected and unfertile lands resulting in low productivity. He told that the cluster approach in pulses and oilseeds involving KVKs is the need of the hour to bridge the productivity gaps. He though acclaimed the efforts of researchers & extension agencies in promoting summer moong in Haryana and Punjab which has fit well in cropping rotation, but lentil and other pulse crops are still neglected a lot. He asked for concerted breeding efforts to develop pulse varieties to fit well in specific crop situations and proper planning and effective execution of pulse & oilseed demonstrations.

Dr. Neelam S Khetarpaul presented formal vote of thanks to the chairman, Dr. Khokhar, Dr. BB Singh, Dr. Rajbir and other dignitaries for their valuable suggestions and guidance.

Technical Session I

Technical session I was chaired by Dr. B.B. Singh, ADG (P&O), ICAR and co-chaired by Dr. Rajbir Singh, Director, ICAR-ATARI. The session was convened by Dr. Neelam Khetarpaul, Assoc. Director, O/o DEE, CCSHAU Hisar and Dr. P.K. Chahal, AD(EE), CCSHAU and Dr. Ashish Santosh Murai, Scientist, ICAR-ATARI were the rapporteurs.

In this session, presentations were made by the representatives of the KVKs of Punjab, where cluster FLDs were being implemented.



Fig 6.1 Zonal Workshop cum Training Program at CCS HAU, Hisar

Dr. Butter, ADG (Extn), PAU; presented status of pulses and oilseeds production and productivity in Punjab and Haryana. He also mentioned about the problems of convincing farmers to grow pulses and non-availability of seeds. He expressed, as pulses production is more risky, farmers are not ready to replace rice-wheat system with pulses. He mentioned various constraints in pulses production in Punjab as non-availability of varieties for diverse growing conditions; pulses are being grown majorly on marginal lands; various biotic and abiotic stresses leading to as much as 30 percent loss; sensitivity of pulses to excess soil moisture, salinity, alkalinity and acidity; inadequate seed replacement rate; low risk bearing capacity of farmers; poor plant stand in pulses; poor response to high inputs and better management; mainly grown as mixed crops; etc.

Program Coordinators (PCs) and other representatives from KVKs informed the house about their planning and execution of FLDs at their district levels. KVKs, through FLDs, have been demonstrating different varieties of pulses and oilseeds; seed treatment (bio-fertilizers); soil fertility improvement through pulses; etc. Few KVKs have conducted training programs on laying and guidelines of FLDs and distributed relevant literature as well. KVKs have also expressed the problems they are facing with respect to cluster FLDs such as problems in marketing of the produce; non-availability of desired variety of crops; paucity of seeds; reluctance of farmers to grow pulses; pests and diseases attack on crops; bindings on fertilizers applications; and absence of buy-back mechanism. Few requests were also made like establishing a buy-back mechanism in the Cluster FLDs program itself; helping farmers in marketing of the produce; allowing few of the fertilizers for application in FLD crops.

Technical Session II:

Session II was chaired by Dr. R.S. Antil, DEE, CCSHAU, Hisar and co-chaired by Dr.

G.S. Butter, ADE, PAU and Dr. R.S. Hooda, AD (FAS), CCSHAU, Hisar. The session was convened by Dr. Neelam Ketarpaul. Dr. H.S. Saharan, JD (PP) and Dr. K.K. Yadav, AD (MC) were the rapporteurs.

There were two deliberations in this session. First deliberation was given by Dr. Ashwani Kumar, Professor of Plant Pathology, CSKHPKV, Palampur on 'Integrated Diseases Management in Rabi pulses. He discussed the symptoms and integrated diseases management of wilt, root rot, grey mold and ascochyta blight of chickpea; powdery mildew, rust, and white rot of field pea and lentil crop.

In the second deliberation, Dr. Roshan Lal, (Pulses) Entomologist; discussed the '*Integrated Pest Management in Kharif pulses*'. He discussed the IPM practices of Moong, Urd and Pigeon pea. He discussed about important pests like *Helicoverpa armigera*, *Moruca vitrata*, Blister beetle, Pod fly and Tur Pod Borer. He also discussed and emphasized the summer ploughing, timely irrigation and inter-cropping of moong bean and pigeon pea for IPM in pigeon pea. In a query raised by the participant, he emphasized not to spray the synthetic parathyroid for the control of white fly in Kharif pulses; rather spray the NSKE (Neem Seed Kernel Extract) which is effective up to 7 days.

This session also included the presentations by KVKs of state of Haryana, Himachal Pradesh and Jammu & Kashmir.

Programme Coordinator of KVK, Ambala conducted 34 FLD on lentil out of 100 allotted and rest it will conduct the FLDs on summer moong. Dr. R.S. Antil, DEE and Chairman of the session suggested ensuring the supply of seed of summer moong in advance. Dr. Rajbir Singh suggested that KVK, Ambala should take seed from CCSHAU, Hisar. Dr. R.K. Yadav, Consultant pulse breeder; informed the whole house that the seed rate of summer moong should be taken according to seed size. More seed will be required for bold seeded varieties (14kg/acre for SML668) and less seed rate for small seeded varieties (MH421- 6kg/acre).

Programme Coordinators of KVK, Bhiwani, Fatehabad and Hisar demonstrated 100 acre each of chick pea and 50 acre each of Raya crop. They have demonstrated HC-1 of Gram and RH-749 variety of Raya. Besides this technological demonstrations will include the fungicide, insecticide and bio-fertilizer seed treatment.

Dr. R.K. Yadav suggested that summer moong should not be grown for green manuring and he also emphasized not to grow after harvesting of wheat. PC of KVK, Jhajjar observed that stem rot is the limiting factor and varieties of chick pea used for demonstrations were

HC-1 and HC-5; and mustard was R4. KVK, Karnal has demonstrated 100 demonstration of chick pea and will demonstrate 50 on MH421 (summer moong). Dr.R.K. Yadav suggested that summer moong can also be grown after field pea. PC of KVK, Mahendergarh informed the house about the major problems as orobanche and stem not in mustard and pod borer in gram. Dr. R.K. Yadav emphasized that farmers awareness should be made regarding the types of nozzle for weedicide, insecticide and spray volume. Dr. R.S. Antil chairman of the session and Director of Extension Education informed that Haryana KVKs have been conducting trainings on spray techniques.

Dr. B.R. Kamboj, PC of KVK, Yamunanagar also discussed some of the issues regarding use of hybrid seeds of sunflower of private companies are in demand among the farmers as no public sector hybrid is available. He also emphasized to relax the binding on not to supply fertilizers as critical impact while conducting the FLD on sunflower. Binding on supply of SSP should be relaxed as surplus is limiting factor for the productivity of oilseeds.

Dr. Narender Kumar, Director of DWD and Dr. B.B. Singh suggested that private companies' hybrids can be used in FLD if it is listed by SAU for three years. Dr. Kapur Singh told the house that gram in Rewari district can be successful if salt tolerant varieties of CSSRI, Karnal Chana-1 performs better. He also informed that Gujia weevil is an emerging pest problem in mustard for which no control measures is suggested in package of KVKs of Haryana.

PC of KVK, Una of Himachal Pradesh conducted 13 ha FLD on chick pea .They also requested that instead of FLD on summer moong they should be allotted for Kharif season as no field is available in summer due to wheat and other vegetable crops. KVK, Hamirpur could conduct 8ha FLD on Chickpea out of 20 ha allotted. KVK, Mandi has conducted 35ha FLD on Chickpea as compared to 40 ha allotted.KVK, Bilaspur has conducted 10 ha allotted FLD on chickpea and 3 ha on lentil out of 20 ha allotted. KVK, Shimla has conducted 21 ha FLD out of 25 ha allotment of FLD on Chickpea. KVK, Rajouri and Jammu have conducted 20 ha each FLD on chickpea. The variety demonstrated is GNG 1581. KVK, Pulwama has demonstrated 20 ha allotted FLD on Field pea variety Shalimar P-1 and in the last but not the least KVK, Anantnag demonstrated FLD on *Brassica campestris* variety of Brown sarson.

Technical Session III:

Technical session III was chaired by Dr. B.B. Singh and co-chaired by Dr. R.K. Yadav. Dr. Neelam Khetarpaul was the convener and Dr. Ashish Santosh Murai was the rapporteur of the session.

The session began with a presentation on 'Prospects of pulses in Haryana' by Dr. R.K. Yadav, consultant, NFSM. It was followed by presentations on 'State wise high yielding varieties of Rabi pulses' by Dr. S.C. Chaturvedi, HoD, Crop Improvement, ICAR-Indian Institute of Pulses Research; 'Integrated Pest Management in Rabi pulses' by Dr. Rabindra Singh, Professor (Entomology), PAU, Ludhiana; and 'Prospects and Opportunities in pulse processing' by Dr. Sandeep Mann, ICAR-CIPHET, Ludhiana. All the presentations were followed by discussion among the experts and participants.

Plenary session was conducted under the chairmanship of Dr. B.B. Singh. It was followed by general discussion among the participants and the dignitaries.

The concluding remarks were given by Dr. Narender Singh, Directorate of Wheat Development, DAC&FW, Ministry of Agriculture, Govt. of India; Dr. B.B. Singh, ADG (P&O), ICAR; and Dr. Rajbir Singh, Director, ICAR-ATARI.

Major issues emerged:

- 1) Farmers were reluctant grow Pulses as they benefit more from existing paddy-wheat cropping system.
- 2) KVKs did not get budget on time for effective delivery of services and proper functioning.
- 3) At present, as per guidelines, any chemical fertilizer to the crops under FLDs shall not be applied. But, few critical inputs like 'Sulphur' in oilseed crop like sunflower production become a limiting factor.
- 4) Hybrid seed of sunflower of private companies are more in demand among farmers as there are few hybrids from public sector are available. Thus, it is difficult to convince farmers for growing recommended varieties/hybrids released by SAU.
- 5) KVKs of hill districts face a lot of problem in convincing farmers to grow summer moong as they prefer vegetable crops instead. Therefore, they have requested to allow FLDs in the Kharif season.

Instructions to the KVKs:

- 1) Spray foliar application of Urea (2%) on the pulse crops for better yields.
- 2) KVKs should save and utilize some part of crop produce from the existing FLDs as seed for next year.
- 3) Pulses should be encouraged as intercrop with sugarcane.

- 4) Only pre-sowing irrigation should be given to the pulses and there should not be any more irrigation application before 25 DAS; withholding irrigation is necessary for good root development and good crop stand.
- 5) Insecticides at 30-35 DAS can be applied for controlling Thrips infestation, if required.
- 6) Seeds for sowing summer moong should ensure well in advance.
- 7) Crop varieties and package of practices followed in FLDs should be preferably adopted from respective State Agricultural Universities (SAUs). Similarly, SAUs should be preferred for procuring seeds for FLDs.
- 8) The seed rate of summer moong should be decided according to the seed size. More seed will be required for bold seeded varieties (14kg/acre for SML668) and less seed rate for small seeded varieties (MH421- 6kg/acre).
- 9) Summer moong should not be grown for green manuring. It should also not be grown after harvesting of wheat; whereas, it can be grown after harvesting field pea/potato.
- 10) Farmers should also be made aware about different types of nozzles for spraying weedicide and insecticide as well as about spraying volume.
- 11) In salt affected districts, like Rewari, salt tolerant varieties from CSSRI, Karnal like Chana-1 shall be preferred for FLDs.

General Recommendations:

- 1) Higher MSPs to pulses shall be given to lure farmers towards pulses production.
- 2) Diversification must be promoted with parallel policy support.
- 3) Some of the KVKs shall be developed as seed hubs for pulses.
- 4) A buy back mechanism should be established with Cluster FLDs scheme.
- 5) A literature, preferably leaflet or folder, should be distributed by all the KVKs and to the farmers containing recommendations and package of practices on pulses from ICAR, PAU as well as CCSHAU.
- 6) Few critical fertilizer applications like SSP for oilseeds should be allowed.
- 7) Kharif Rajmash should be allowed under FLDs in high terrains such as Anantnag.
- 8) The budget should be timely allocated to the respective KVKs

7. Constraints Observed while implementing the Project

The project was initiated to increase the production of pulses; however, some constraints were reported while implementing the project. The districtwise constraints are given in Table 7.1

1) Difficulty in convincing farmers for diversification

In North-Western states of India, the soil of Indo-Gangetic plains is so fertile that rice and wheat crops give higher yield than pulses. Availability of good quality ground water motivated farmers to go for cultivation of rice, wheat and other cash crops. After green revolution, in cereals and other cash crops, the availability of inputs i.e. fertilizers, better machinery and high yielding varieties (HYV) started giving more income to farmers and diminished the area under pulses. Secondly, assured price of rice and wheat had replaced the area under pulses in Punjab and Haryana. Therefore, farmer had opted the Rice-wheat cropping system and farmers are treating the pulses as a secondary crop.

2) Pulses cultivation does not offer lucrative income

The yield potential of pulses is very low; secondly, existing crop varieties of pulses are susceptible to diseases and insect-pest attack. The non-availability of good quality seeds in the desired quantities is one of the major constraints in the production of pulses. On the other hand, poor seed replacement is also responsible for poor yield in pulses. Storage losses, no involvement of private and cooperative companies in seed production, non interest of centre and state government in seed production is responsible for non-availability of quality inputs.

3) Growing pulses involves higher risks

There is instability in the pulses production system as these crops are sensitive to environment fluctuations i.e. hailstorm and rainfall etc and fail in case of adverse weather conditions. As compared to other crops, pulses are more sensitive to biotic stress (temperature, excessive moisture and salinity) and also prone to insect pest attack. In case of chick pea *Ascochyta* blight is highly epidemic disease. Unpredictable environment with temperature fluctuation damage the crop at reproductive and at grain filling stage.

4) Threat from wild animals

The wild animal like wild boar, blue bull (*nilgai*) and peacock are creating nuisance in

agriculture production. Nil gai feeds on crop in the evenings and at night, is naturally diurnal, prefers to eat gram, moong and wheat seedlings.

5) No assured market

Minimum Support Price (MSP) have not been announced by the government in pulses and this is considered as the major constraints. Even with no MSP farmers may grow the pulses; however, price fluctuation is very high in the market which demoralizes farmers to grow pulses in future. The factors like unorganized market, no policy on assured procurement and poor holding capacity of produce by farmers are need to be analyzed to eliminate the wide fluctuation in prices on priority basis. So, over the cereal crops the pulses have less economic viability.

Table 7.1: Constraints observed during FLDs on Pulses

State	KVK	Remarks/Constrains
Haryana	Ambala	Non availability of improved variety seed No willingness among farmers for pulses cultivation
	Hisar	Late release of funds for purchase of inputs
	Fatehabad	Seed treatment with Chlorophripho s and <i>Rhizobium</i> in Chickpea
	Karnal	Farmers are not interested in growing chickpea due to nuisance of <i>Nil Gai</i> and low MSP.
Punjab	Faridkot	Issue of MSP is major hindrance in convincing farmers to opt for chickpea cultivation.
	Jalandhar	Farmers are worried about marketing of the produce Farmers lack experience in cultivating lentil
	Amritsar	Lesser adoption due to less returns compared to existing cropping pattern Crop is risky in case of heavy rains during maturity stage
	Ropar	Need of mechani zation in villages
	Mohali	Problem of wild boar, <i>Nil gai</i> and peacock
Himachal Pradesh	Mandi	Prolonged drought during December 2015 resulted in delayed sowing and poor germination
	Shimla	Delayed sowing due to continuous dry spell
	Una	Poor germ ination due to late onset of rains
Jammu & Kashmir	Jammu	Delayed availability of recommended variety

6) Crop damage due to unseasonal rainfall and hailstorms during Feb-March 2016

During Feb-March 2016, unseasonal rainfall had adversely affected the pulse crops in Punjab, Haryana and Himachal Pradesh; as pulse crops in general and lentil and chickpea in particular are sensitive to water stagnation and strong winds.

Punjab

In Punjab, the rainfall received during 10-14 March was 20-30 mm with strong winds. In Faridkot, during the period of rainfall, chickpea was at pod formation stage and was damaged up to 10 per cent. While in Jalandhar, 20-25 mm rainfall occurred from 11-13 March 2016 and lentil was damaged up to 20 per cent due to stagnation of water; further, the leaves turned yellow and crop was lodged by the storm. In Gurdaspur, 42.6 mm rainfall was received and it resulted in shattering causing damage up to 8-12 per cent. Low to medium rainfall occurred in different districts of Moga, Tarn Taran, Mohali and Ropar; but, it was found to be beneficial for the sowing of summer moong. However, chickpea was damaged up to 25-30 per cent in Tarn Tarn and Amritsar districts due to stagnation of water. In Mohali, there was 12.8 mm rainfall on 14th March accompanied with strong winds, therefore chickpea was damaged up to 10-15 per cent.

In Bathinda, 15-20 mm rainfall was recorded from 11-14 March and there was negligible loss to chickpea i.e. 1-2 per cent. In Mohali and Jalandhar, Kisan Mobile Advisory (KMA) was issued for the welfare of farmers. In Amritsar, farmers were advised not to irrigate their crops keeping in view the rainfall utilizing KMA and print media.

Haryana

In Haryana, there was 19-25 mm of rainfall in the districts of Hisar, Fatehabad and Kaithal on 10-14 March 2016. About 45-50 per cent loss had been reported in chickpea from Bhiwani, Fatehabad and Hisar due to hailstorm. In Faridabad, 25-30 per cent loss has been reported due to lodging of chickpea. In Gurgaon, Rewari, Jhajjar, Ambala and Yamunanagar districts there was no damage reported due to less rainfall; moreover, in Yamunanagar sowing of summer moong had been completed. KVKs of Bhiwani, Rewari and Gurgaon used the KMA to provide the information to farmers; similarly, print media advisories were also issued for benefit of farmers in Rewari.

Himachal Pradesh

The rainfall received by the districts of Himachal Pradesh was 20-60 mm during 12-14 March, but the damage was less since the crops were sown mainly in rainfed areas thus the vegetative growth of the crop was slow and there was no lodging reported by the farmers.



Fig 7.1 Damage in lentil crop due to unseasonal rainfall in Jalandhar, Punjab



Fig 7.2 Damage in chickpea crop due to unseasonal rainfall and hailstorm



Fig 7.3 Hailstorm in Haryana



Fig 7.4 Local Media coverage of unseasonal rain and hailstorm

Annexure I

Administrative Approval of ICAR-Cluster Frontline Demonstrations of Rabi Pulses on 09-09-2015

**F.No. CPS 3-3/2015-NFSM
Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation and Farmers Welfare
(NFSM-Cell)**

Krishi Bhawan, New Delhi,
Dated: 09.09.2015

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

Sub: Administrative Approval of ICAR Project entitled **“Cluster Frontline Demonstrations of Rabi Pulses- 2015-16”** funded under NFSM-reg.

Sir,

I am directed to refer to your D.O. No. 10-33/2015-AE-II dated 26th August, 2015 and to convey that the competent authority of this Department has approved the Project entitled “Cluster Frontline Demonstrations of Rabi Pulses- 2015-16” funding under NFSM under Centrally Sponsored Scheme of National Food Security Mission (NFSM) for the financial year 2015-16 with a total outlay of **Rs. 1198.94604 Lakhs (Rupees eleven hundred ninety eight lakh and ninety four thousand six hundred four only)** .

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

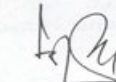
Implementing agency	No. of KVKs	No. of FLDs (Area in ha)	Budget (Rs. in lakhs)	*Contractual staff (Rs. in lakhs)	Zonal workshop-cum training	Group meeting	Miscellaneous expenditure	(Rs. in lakhs)
								Total
ATARI, Zone-I, Ludhiana	51	1651	123.825	3.402	1.0	0.50	0.40188	129.12888
ATARI, Zone-II, Kolkata	234	4486	336.450	3.598	1.0	0.50	0.40188	341.94988
ATARI, Zone-III, Umiam Meghalaya	116	1254	94.050	3.206	1.0	0.50	0.40188	99.15788
ATARI, Zone-IV, Kanpur	129	2704	202.800	5.950	1.0	0.50	0.40188	210.65188
ATARI, Zone-V, Hyderabad	69	1092	81.900	3.598	1.0	0.50	0.40188	87.39988
ATARI, Zone-VI, Jodhpur	59	1130	84.750	3.402	1.0	0.50	0.40188	90.05388
ATARI, Zone-VII, Jabalpur	68	2392	179.400	3.402	1.0	0.50	0.40188	184.70388
ATARI, Zone-VIII, Bengaluru	61	672	50.400	3.598	1.0	0.50	0.40188	55.89988
Total		15381	1153.575	30.156	8.0	4.0	3.21504	1198.94604

* Contractual staff including one SRF and one data for each ATARI and one SRF for ICAR headquarter. One workshop cum training and one group meeting for each ATARI.

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

- The demonstrations of each pulse crop should be organized in cluster approach (at least 10 ha. for each cluster)

Contd..2/-


9/9/15

Guidelines for conducting the FLDs:

The Demonstrations of each pulses crop should be organized in cluster approach (at least 10 ha for each cluster).

The 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 of pulses in rice fallow areas in eastern India.

10% of FLD fund earmarked (Rs.7500/ha) is allowed to utilized for monitoring, distribution of literature and organization of field day.

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.

Farmers should be trained for seed production, primary processing etc.

For individual farmer, FLDs should not exceed than 0.80 ha.

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 is allowed at ICAR, headquarter, New Delhi.

Travelling Allowance and Daily Allowance is admissible as per norms of Govt. of India.

The organizational of workshop cum training and group meeting 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.

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.

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 Department of Agricultural Extension-ICAR, New Delhi.

Engagements of KVK will broad base area coverage, particularly uncovered areas and helps transfer of technology in interior areas.

The accessibility over the recent details is much better. KVK should try to choose interior area; farmers have generally been deprived of demonstrations by extension agencies.

The KVK should promote INM and IPM so as to reduce the cost of cultivation and help farmers realize better return. The KVK should advise the farmers on marketing of this produce.

Annexure II

Proposal for conducting cluster demonstration of *Rabi* pulses by KVKs during 2015-16 in ICAR-ATARI, Zone-I, Ludhiana

S.N.	Name of KVK	Name of District	State	Name of crop	No. of Demo	Area (ha)	Budget (in Rs.)
1	Ludhiana	Ludhiana	Punjab	Greengram	100	40	300000
2	Moga	Moga	Punjab	Greengram	100	40	300000
3	Muktsar	Muktsar	Punjab	Greengram	100	40	300000
4	Ferozepur	Ferozepur	Punjab	Greengram	100	40	300000
5	Barnala	Barnala	Punjab	Greengram	100	40	300000
6	Jind	Jind	Haryana	Greengram	100	40	300000
7	Sirsa	Sirsa	Haryana	Greengram	100	40	300000
8	Una	Una	Himachal Pradesh	Greengram	50	20	150000
9	Yamunanagar	Yamunanagar	Haryana	Greengram	50	20	150000
10	Ambala	Ambala	Haryana	Greengram	50	20	150000
11	Kaithal	Kaithal	Haryana	Greengram	50	20	150000
12	Bhiwani	Bhiwani	Haryana	Greengram	75	30	225000
13	Hisar	Hisar	Haryana	Greengram	75	30	225000
14	Karnal	Karnal	Haryana	Greengram	100	40	300000
15	Fatehabad	Fatehabad	Haryana	Greengram	50	20	150000
16	Gurgaon	Gurgaon	Haryana	Greengram	100	40	300000
17	Rohtak	Rohtak	Haryana	Greengram	50	20	150000
	Total				1350	540	4050000
19	Faridkot	Faridkot	Punjab	Chick Pea	100	40	300000
20	Amritsar	Amritsar	Punjab	Chick Pea	100	40	300000
21	Bathinda	Bathinda	Punjab	Chick Pea	100	40	300000
22	Patiala	Patiala	Punjab	Chick Pea	100	40	300000
23	Nawanshahar	Nawanshahar	Punjab	Chick Pea	100	40	300000
24	Ropar	Ropar	Punjab	Chick Pea	100	40	300000
25	Kapurthala	Kapurthala	Punjab	Chick Pea	100	40	300000
26	TaranTaran	TaranTaran	Punjab	Chick Pea	100	40	300000
27	Mohali	Mohali	Punjab	Chick Pea	100	40	300000
28	Bhiwani	Bhiwani	Haryana	Chick Pea	100	40	300000
29	Hisar	Hisar	Haryana	Chick Pea	100	40	300000
30	Rewari	Rewari	Haryana	Chick Pea	100	40	300000
31	Jhajjar	Jhajjar	Haryana	Chick Pea	100	40	300000
32	Karnal	Karnal	Haryana	Chick Pea	100	40	300000
33	Fatehabad	Fatehabad	Haryana	Chick Pea	100	40	300000
34	Mahendergarh	Mahendergarh	Haryana	Chick Pea	100	40	300000
35	Gurgaon	Gurgaon	Haryana	Chick Pea	100	40	300000
36	Shimla	Shimla	Himachal Pradesh	Chick Pea	50	25	187500
37	Hamirpur	Hamirpur	Himachal Pradesh	Chick Pea	50	20	150000
38	Kathua	Kathua	Jammu & Kashmir	Chick Pea	50	20	150000

S.N.	Name of KVK	Name of District	State	Name of crop	No. of Demo	Area (ha)	Budget (in Rs.)
39	Rajouri	Rajouri	Jammu & Kashmir	Chick Pea	50	20	150000
40	Jammu	Jammu	Jammu & Kashmir	Chick Pea	50	20	150000
41	Una	Una	Himachal Pradesh	Chick Pea	50	20	150000
42	Mandi	Mandi	Himachal Pradesh	Chick Pea	40	16	120000
43	Bilaspur	Bilaspur	Himachal Pradesh	Chick Pea	25	10	75000
Total					2065	831	6232500
44	Hoshiarpur	Hoshiarpur	Punjab	Lentil	100	40	300000
45	Gurdaspur	Gurdaspur	Punjab	Lentil	100	40	300000
46	Jalandhar	Jalandhar	Punjab	Lentil	100	40	300000
47	Yamunanagar	Yamunanagar	Haryana	Lentil	100	40	300000
48	Ambala	Ambala	Haryana	Lentil	100	40	300000
49	Kaithal	Kaithal	Haryana	Lentil	100	40	300000
50	Bilaspur	Bilaspur	Himachal Pradesh	Lentil	50	20	150000
Total					650	260	1950000
51	Srinagar	Srinagar	Jammu & Kashmir	Field pea	50	20	150000
Total					50	20	150000
Total Zone-I					4115	1651	12382500

Crop-wise summary for conducting cluster demonstration of pulses in ATARI, Zone-I, Ludhiana

S.No	Crops	No of KVKs	No. of Demo	Area (ha)	Budget (in Rs.)
1	Green gram (Summer)	17	1350	540	4050000
2	Chick pea	26	2065	831	6232500
3	Lentil	7	650	260	1950000
4	Field Pea	1	50	20	150000
	Total of Zone -I	51	4115	1651	12382500
	Provision of one SRF at ATARI Ludhiana @ Rs 28000/-per month + HRA @20% for seven months.				235200
	Provision of one Data Entry Operator (DEO) at ATARIs @ Rs 15000(Consolidated)/per month				105000
	Organization of Zonal workshops cum training @ Rs 100000/-				100000
	Organization of one Group Meeting @ Rs 50000/				50000
	Miscellaneous expenditure on account of printing of reports and Extension literatures etc @ of Rs. 40188/-for each ATARI.				40188
	GRAND TOTAL				12912888

Annexure III

State wise and crop wise allotted FLDs in Zone-I

State/Crop	FLDs (No.)	Planned Area (ha)	Area (acre)
Punjab			
Chickpea	900	360.00	900.00
Lentil	300	120.00	300.00
Summer moong	500	200.00	500.00
Total	1700	680	1700.00
Haryana			
Chickpea	800	320.00	800.00
Lentil	300	120.00	300.00
Summer moong	800	320.00	800.00
Total	1900	760	1900.00
Himachal Pradesh			
Chickpea	215	91.00	227.50
Lentil	50	20.00	50.00
Summer moong	50	20.00	50.00
Total	315	131.00	327.50
Jammu & Kashmir			
Chickpea	150	60.00	150.00
Fieldpea	50	20.00	50.00
Total	200	80.00	200.00
Grand total	4115	1651.00	4127.50

Annexure IV

KVK wise detail of planned and deficit FLDs in Punjab

Crop	KVKs	Demonstrations (No.)		Area (ha)	
		Planned	Deficit	Planned	Deficit
Chickpea	Amritsar	100	62	40.00	32.00
	Batinda	100	7	40.00	11.75
	Faridkot	100	0	40.00	6.65
	Kapurthala	100	34	40.00	32.00
	Mohali	100	35	40.00	10.40
	Nawanshar	100	76	40.00	28.80
	Patiala	100	69	40.00	31.60
	Ropar	100	48	40.00	29.75
	Taran Taran	100	65	40.00	32.00
	Total	900	396	360.00	214.95
Lentil	Gurdaspur	100	0	40.00	10.00
	Hoshiarpur	100	20	40.00	10.00
	Jalandhar	100	28	40.00	16.00
	Total	300	48	120.00	36.00
Grand Total		1200	444	480.00	250.95

Annexure V

KVK wise detail of planned and deficit FLDs in Haryana

Crop	KVKs	Demonstrations (No.)		Area (ha)	
		Planned	Deficit	Planned	Deficit
Chickpea	Bhiwani	100	0	40.00	0.00
	Fatehabad	100	0	40.00	0.00
	Gurgaon	100	0	40.00	0.00
	Hisar	100	0	40.00	0.00
	Jhajjar	100	0	40.00	0.00
	Karnal	100	0	40.00	0.00
	Mahendergarh	100	0	40.00	0.00
	Rewari	100	0	40.00	0.00
	Total	800	0	320.00	0.00
Lentil	Ambala	100	67	40.00	26.80
	Kurukshetra	100	20	40.00	8.00
	Yamunanagar	100	0	40.00	0.00
	Total	300	87	120.00	34.80
Grand Total		1100	87	34.80	34.80

Annexure VI

KVK wise detail of planned and deficit FLDs in Himachal Pradesh

Crop	KVK	Demonstrations (No.)		Area (ha)	
		Planned	Deficient	Planned	Deficient
Chickpea	Bilaspur	25		10.00	0.00
	Hamirpur	50		20.00	11.78
	Mandi	40		16.00	10.72
	Shimla	50		25.00	0.00
	Una	50		20.00	6.80
	Total	215		91.00	29.30
Lentil	Bilaspur	50		20.00	16.96
	Total	50		20.00	16.96
Grand Total		265		111.00	46.26

Annexure VII

KVK wise detail of planned and deficit FLDs in Jammu & Kashmir

Crop	KVKs	Demonstrations (No.)	Area (ha)	
		Planned	Planned	Deficit
Chickpea	Jammu	50	20.00	0.00
	Kathua	50	20.00	0.00
	Rajouri	50	20.00	0.00
	Total	150	60.00	0.00
Field pea	Pulwama	50	20.00	0.00
	Total	50	20.00	0.00
Total		200	80.00	0.00

Annexure VIII

KVK wise and crop wise details of budget

S.No.	KVK	Crop	Demonstration (No.)	Area (ha)	Budget (Rs.)
PAU, Ludhiana					
1.	Ludhiana	Greengram	100	40	300000
2.	Moga	Greengram	100	40	300000
3.	Muktsar	Greengram	100	40	300000
4.	Ferozepur	Greengram	100	40	300000
5.	Faridkot	Chick Pea	100	40	300000
6.	Amritsar	Chick Pea	100	40	300000
7.	Bathinda	Chick Pea	100	40	300000
8.	Patiala	Chick Pea	100	40	300000
9.	Nawanshahar	Chick Pea	100	40	300000
10.	Ropar	Chick Pea	100	40	300000
11.	Kapurthala	Chick Pea	100	40	300000
12.	Hoshiarpur	Lentil	100	40	300000
13.	Gurdaspur	Lentil	100	40	300000
14.	Jalandhar	Lentil	100	40	300000
Total (PAU, Ludhiana)			1400	560	4200000
GADVASU, Ludhiana					
15.	Barnala	Greengram	100	40	300000
16.	TaranTaran	Chick Pea	100	40	300000
17.	Mohali	Chick Pea	100	40	300000
Total (GADVASU, Ludhiana)			300	120	900000
CCSHAU, Hisar					
18.	Jind	Greengram	100	40	300000
19.	Sirsa	Greengram	100	40	300000
20.	Yamunanagar	Greengram	50	20	150000
	Yamunanagar	Lentil	100	40	300000
21.	Kaithal	Greengram	50	20	150000
22.	Kurukshetra	Lentil	100	40	300000
	Bhiwani	Greengram	75	30	225000

S.No.	KVK	Crop	Demonstration (No.)	Area (ha)	Budget (Rs.)
23.	Bhiwani	Chick Pea	100	40	300000
24.	Hisar	Greengram	75	30	225000
	Hisar	Chick Pea	100	40	300000
25.	Fatehabad	Greengram	50	20	150000
	Fatehabad	Chick Pea	100	40	300000
26.	Rohtak	Greengram	50	20	150000
27.	Jhajjar	Chick Pea	100	40	300000
28.	Mahendergarh	Chick Pea	100	40	300000
Total (CCSHAU, Hisar)			1250	500	3750000
29.	Ambala	Greengram	50	20	150000
	Ambala	Lentil	100	40	300000
Total (Ambala)			150	60	450000
30.	Gurgaon	Greengram	100	40	300000
	Gurgaon	Chick Pea	100	40	300000
Total (Gurgaon)			200	80	600000
31.	Karnal	Greengram	100	40	300000
	Karnal	Chick Pea	100	40	300000
Total (Karnal)			200	80	600000
32.	Rewari	Chick Pea	100	40	300000
Total (Rewari)			100	40	300000
CSKHPKV, Palampur					
33.	Una	Greengram	50	20	150000
34.	Hamirpur	Chick Pea	50	20	150000
35.	Una	Chick Pea	50	20	150000
36.	Mandi	Chick Pea	40	16	120000
37.	Bilaspur	Chick Pea	25	10	75000
	Bilaspur	Lentil	50	20	150000
Total (CSKHPKV, Palampur)			265	106	795000
Dr. YSPUH&F, Solan					
38.	Shimla	Chick Pea	50	25	187500
Total (Dr. YSPUH&F, Solan)			50	25	187500
SKUAST -Jammu					
39.	Kathua	Chick Pea	50	20	150000
40.	Rajouri	Chick Pea	50	20	150000
41.	Jammu	Chick Pea	50	20	150000
Total (SKUAST -Jammu)			150	60	450000
SKUAST -Srinagar					
42.	Srinagar	Field pea	50	20	150000
Total (SKUAST -Srinagar)			50	20	150000
Grand Total			4115	1651	12382500

Annexure IX

Monitoring teams to different sites of FLDs on Pulses

State	Monitoring team members	Designation
Punjab	Dr. Mahesh Kumar	Assistant Director, DWD, Ghaziabad
	Dr. GS Buttar	ADE, PAU, Ludhiana
	Dr. V Sardana	Agronomist, AICRP Oilseeds, PAU
	Dr. Ashish Santosh Murai	Scientist, ICAR - ATARI, Ludhiana
	Mr. Narinder Singh	SRF, ICAR - ATARI, Ludhiana
Jammu & Kashmir	Dr. Amrish Vaid	Programme Coordinator
	Dr. Sanjay Khar	Programme Coordinator
	Dr. Preeti Mamgai	Senior Scientist ICAR-ATARI Zone-1
	Dr. Puneet Choudhary	SMS KVK Jammu
	Dr. Brejesh Ajrawat	SMS KVK Kathua
Himachal Pradesh	Dr. Mahesh Kumar	Assistant Director, DWD, Gaziabad,
	Dr. AK Chaubey	Professor Extension Education, CSKHPKV, Palampur
	Dr. DR Choudhery	Professor Vegetables, CSKHPKV, Palampur
	Mr. Narinder Singh	SRF, ICAR-ATARI, Zone-1, Ludhiana

Annexure X

List of monitoring dates of FLDs pulses in different KVKs

State	KVK	Date of Monitoring	Name of the village visited	Crop
Jammu & Kashmir	Kathua	05/02/2016	Rajhani, Chainpura and Sunjawain	Rainfed chickpea
	Jammu	05/02/2016	Sungal and Nai Basti	
Punjab	Faridkot	18/02/2016	Waradaraka and Bhathala Kalan	Irrigated chickpea
	Jalandhar	19/02/2016	Cheema Khurd, Sharin and Divay Gram	Irrigated lentil
Himachal Pradesh	Una	14/03/2016	Kuthar Beet, Ghungrala, Saponi	Irrigated chickpea
	Shimla	16/03/2016	Dogri, Nandla, Karalash	Chickpea
	Bilaspur	18/03/2016	Badgaon and Gheelan	Rainfed chickpea and lentil

Annexure : Details of cultivar of Pulses used for conducting FLDs on Rabi Pulses

Annexure XI

Crop	Variety	Variety releasing organization	Year of releases	Areas of adaptation Zone/State	Potential yield (q/ha)	Days to maturity	Remarks
Chickpea	PBG-7	PAU, Ludhiana	2014	Punjab	20.00	159	Fairly resistant to wilt
	GPF 2	PAU, Ludhiana	1995	NWPZ	21-23	152	Resistant to wilt and tolerant to Ascochyta blight.
	GNG-1581	ARS, Sriganaganagar	2008	NWPZ	23.68	127-177	Tolerance against Ascochyta blight and root rot
	GNG 663	RAU, Sriganaganagar	1995	NWPZ	22.00	25 150	155 Resistant to wilt.
	Haryana channa (HC 1)	CCS HAU, Hisar	1990	NWPZ	22-23	145-150	For late sowing and wilt resistant
	Haryana channa (HC 5)	CCS HAU, Hisar	2004	Haryana	24.00	155	Resistant to wilt and root diseases
	DKG-986	CSK HPKV, Palampur	2013	Low hill zone of Himachal Pradesh	14.00	160-180	Resistant to wilt
	HPG-17	CSK HPKV Palampur	1996	Zone 1 of Himachal Pradesh	15.00	170-180	It possesses better resistance against gram blight and root diseases.
	Himachal channa-1	CSK HPKV Palampur	1999	All the chickpea growing areas of H.P.	11.00	190-200	It is resistant to gram blast disease.
	Himachal channa-2	CSKHPKV Palampur	2006	Himachal Pradesh	12.00	185-190	Resistant to wilt, Moderately resistant to root rot & collar rots, tolerant to ascochyta blight

Crop	Variety	Variety releasing organization	Year of releases	Areas of adaptation Zone/State	Potential yield (q/ha)	Days to maturity	Remarks
Lentil	LL-699	PAU, Ludhiana	2001	Punjab	14-15	145	Tolerant to rust and blight
	Vipasha (HPL-5)	CSK HPKV Palampur	1982	Himachal Pradesh	17.00	170-180	Rust resistant
	DPL-62	IIPR, Kanpur	1997	NWPZ	20-25	135	Rust resistant
Field pea	Rachna	CSAUAT, Kanpur	1982	All zones	20-25	120-125	Resistant to powdery mildew disease

Agro-climatic zones of Punjab, Haryana, Himachal Pradesh and J&K

An “Agro-climatic zone” is a land unit having climate which is suitable for a certain range of crops and cultivars. The National Agricultural Research Project (NARP), launched by ICAR for initiating agricultural research in the agro-climatic zones, has divided the country into 126 agro-climatic zones with 15 major Agro-climatic zones based on agro-ecological parameters i.e. physiography, soils, geological formation, climate, cropping patterns, and irrigation. The aim was to analyze agro-ecological conditions and cropping patterns, and to solve the problems on the basis of natural resources, major crops, farming systems, production constraints and socio-economic conditions of that zone. The states viz. Punjab, Haryana, Himachal Pradesh and J&K are majority classified under Trans-Gangetic Plains region and Western Himalayas Region; their Agro-climatic zone and major crops are given in annexure.

NARP Zone	Zonal Research Station	Districts	Suitable Crops
Punjab PB-1 (Sub Montane Undulating Zone)	Kandi	Stands along eastern border of the state and is 10-20 km in width where it is much wider.	Rice, Wheat, Maize, Sugarcane, Ground Nut, Mango.
PB-2 (Undulating Plain Zone)	Gurdaspur	Dinanagar, Gurdaspur, Kelanaour, Dhariwal, Kehnuwan and eastern Horgobindpur blocks of Gurdaspur district (excluding their flood plain areas), western parts of Mukerian and Dasuya, whole of Tanda, Western half of Bhunga, Hoshiarpur-I	Rice, Wheat, Maize, Sugarcane, Groundnut, Sesamum, Kharif Pulses, (Moong, Mash, Arhar), gram, Rapeseed-Mustard, Linseed, Lentil, Peas, Fruits, Vegetables.
PB-3 (Central Plain Zone)	Ludhiana	Whole of Amritsar district except the Bhikhiwind, Patti and valtocha blocks and flood plains of river Rabi and Beas, Batala, Fatehgarh Churian, Dera Baba Nanak and Western part of Hargobindpur block of Gurdaspur district.	Rice, Wheat, Maize, Groundnut, Cotton, Gram, Barley, Pear, Guava.
PB-4 (Western Plain Zone)	Faridkot	Patti, Bhikhiwind and Valtoha blocks of Amritsar district, Zira, Ferozepur and Ghall Khurd block of Ferozepur district, Faridkot, Moga I, Moga II, Nihal Singh wala and Bhaga Purana blocks of Faridkot district, Rampura Phul, Mansa	Rice, Wheat, Maize, Bajra, Barley, Sugarcane, Gram, Moong, Arhar, Oilseed, Vegetables.
PB-5 (Western Zone)	Bathinda	Bhatinda, Faridkot and Ferozepur	Rice, Wheat, Maize, Cotton, Rapeseed-Mustard, Gram, Moong, Bajra and Raya.
Haryana HR-1 (Eastern Zone)	Karnal	Ambala, Kurukshetra, Karnal and parts of districts of Jind, Sonapat, Rohtak, Gurgaon and Faridabad.	Rice, Wheat, Maize, Bajra, Jowar, Barley, Rapeseed - Mustard, Groundnut, Sugarcane, Gram, Other cereals.

NARP Zone	Zonal Research Station	Districts	Suitable Crops
HR-2 (Western Zone)	Bawal	Sirsa, Hisar, Bhiwani and some parts of Jind, Rhotak and Gurgaon districts.	Bajra, Jowar, Barley, Guar, Rapeseed-Mustard, Groundnut, Sugarcane, Gram, Cow pea, Moth bean, Til, Moong.
Himachal Pradesh			
HP-1 (Sub-Montane and Low Hills Sub-Tropical Zone)	Dhaulakaun	Una, Bilaspur, Hamirpur districts and parts of Sirmour, Kangra, Solan and Chamba districts.	Rice, Wheat, Sugarcane, Citrus, Mango, Litchi, Guava, deciduous forest, dry deciduous shrubs, Vegetables, Oilseeds, Barley.
HP-2 (Mid Hills Sub-Humid Zone)	Bajaaura	Palampur and Kangra Tehils of Kangra district, Rampur Tehsil of Shimla district and parts of Mandi, Solan, Kulu, Chamba, Bilaspur and Sirmur district.	Rice, Wheat, Arhar, Sesamum, Temperate fruits, Citrus, Vegetables, lower west Himalayan temperate forest and Himalayan chirpine forest.
HP-3 (High Hills Temperate Wet Zone)	Mashobra	North-western Himalayan region lying in the state	Maize, Rice, Oilseeds, Pulses, Rajmash, Soybean, Barley, Bee keeping, Apple, Pear, Plum, Peach, Apricot, Chestnut, Vegetables.
HP-4 (High Hills Temperate Dry Zone)	Kukumseri	Kinnaur, Lahaul and Spiti and part of Chamba district.	Barley, Maize, Pulses, Potatoes, Minor millets, Kutheris, Hopes, Kumin, Saffron, Apples, Nuts, Dry fruits, Neoza pine, Cabbage seed, Sugarbeet, Chicory, Agro-forestry Alnus, Ulmas, Cettis, Salix.

NARP Zone	Zonal Research Station	Districts	Suitable Crops
Jammu & Kashmir			
JK-1 (Low altitude Sub-Tropical Zone)	RS Pura	Kathua, footlands of Jaserata, Samba and Jammu. Plain land on either sides of Chinab near Akhnoor, lower soils of Billavar, Jaserata, Samba and Reasi, the lower elevation of longitudinal dune of Dansal and Udhampur, the lower hills of Akhnoor, Naushera, Bhimb including major part of the districts of Poonch, Rajouri and Doda.	Rice, Wheat, Maize, Other Crops & millets, oilseeds, Pulses.
JK-2 (Mid to high altitude Intermediate Zone)	Rajouri		Rice, Wheat, Maize, Other Crops & millets, Pulses.
JK-3 (Mid to high altitude Temperate Zone)	Manasbal	Anantnag, Pulwama, Srinagar, Budgam, Baramulla and Kupwara.	Rice, Maize, Pulses, Lentil, Green gram, Potato, Saffron, Hops, Mustard, Oats.
JK-4 (Cold-Arid Zone)	Leh	Ladakh.	Millets, Wheat, Pulses, oilseeds, Fruits, Barley, Fodder.

CLUSTER FRONLINE DEMONSTRATION OF RABI PULSES (2015-16)
PERFORMANCE DATA REPORTING FORMAT

Annexure XIV

FARMER WISE

1. Name of farmer:
2. Father Name:
3. Address:
(i) Village: (ii) Block: (iii) District: (iv) Mob. No:
(a) Longitude: (b) Latitude:
4. GPS Co-ordinates:
(a) Longitude: (b) Latitude:
5. Crop demonstrated:
6. Area (acre) under demo.:
7. Variety & Sowing details:
(i) Variety used & released date: (ii) Crop Duration:
(iii) Seed rate (Kg/acre): (iv) Sowing Method:
(v) Seed Treatment (Y/N): if yes then gives details (vi) Source of seed:
(vii) Small/Bold Seeded (viii) Date of Sowing: (ix) Benchmark Productivity: (x) Soil Testing (Y/N): if yes then gives detail status
8. Manure & Fertilizer management
(i) Dose (kg/ha.) (ii) Method & Time of application
9. Weed management:
(i) Intercultural Operation (Y/N): if yes then gives details
(a) Method & DAS (b) Major weed in field:
(ii) Weedicide used (Y/N): if yes then gives details
(a) Method & DAS (b) Ratio:
10. Irrigation Management:
(a) Irrigation applied (Y/N). (b) No. of Irrigation
Note: - Indicates rainfall received (mm) during crop period:
11. Plant Protection:
(a) Major Insect:
(c) Control Measures (in detail):
12. Harvesting Details:
(a) Date & Maturity (DAS)
13: Yield (q/ha.):
(a) Economic yield:
12. Note: - If any other information/ problem please specify:

**CLUSTER FRONTLINE DEMONSTRATION OF RABI PULSES (2015-16)
PERFORMANCE DATA REPORTING FORMAT KVK WISE**

Annexure XV

1. Name of KVK:
 2. Host Institution:
 5. District:
2. Year of establishment:
 4. Address:
 6. State:

1 Performance of the demonstration:

A. Technical Parameters:

Sl. No.	Crop demonstrated	Existing (Farmer's) variety name	Existing yield (q/ha)	Yield gap (Kg/ha) w.r.to			Name of Variety + Technology demonstrated	Number of farmers (Area in acre)	Yield obtained (q/ha)			Yield gap minimized (%)
				District yield (D)	State yield (S)	Potential yield (P)			Max.	Average.	Min.	

B. Economic parameters

Sl. No.	Variety demonstrated	Farmer's Existing plot			Demonstration plot			Farmers, feedback
		Gross Cost (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Gross Cost (Rs/ha)	Gross return (Rs/ha)	Net Return (Rs/ha)	

C. Socio-economic impact parameters

Sl. No.	Crop and variety Demonstrated	Total Produce Obtained (kg)	Produce sold (Kg/household)	Selling Rate (Rs/Kg)	Produce used for own sowing (Kg)	Produce distributed to other farmers (Kg)	Purpose for which income gained was utilized	Employment Generated (Mandays/house hold)

D. Pulse Farmer's preception of the intervention demonstrated

Sl. No.	Technologies demonstrated (with name)	Farmers' Perception parameters				Suggestions, for change/improvement, if any
		Suitability to their farming system	Likings (Preference)	Affordability	Any negative effect	
					Is Technology acceptable to all in the group/village	

E. Extension activities under FLD conducted till dates :

Sl. No.	Extension Activities organized	Date and place of activity	Number of farmer attended

7. Sequential good quality photographs (as per crop stages i.e. growth & development)

8. Farmers' training photographs

9. Photographs of field visits/field days

Annexure XVI

Action Plan 2016-17
State-wise and crop-wise summary of cluster demonstration of pulses by KVKs
along with area and approved budget for the year 2016-17

S. No.	Crops	State	No. of KVKs	No. of Demonstration	Area (in ha)	Budget (in Rs.)
<i>Kharif</i> season						
1	Black Gram	Punjab	1	50	20	150000
		Himachal Pradesh	5	200	80	600000
		Jammu&Kashmir	2	100	40	300000
2	Green Gram	Punjab	2	150	60	450000
		Haryana	2	100	40	300000
		Jammu&Kashmir	1	25	10	75000
3	Pigeonpea	Punjab	1	50	20	150000
4	Rajmash	Jammu&Kashmir	5	225	90	675000
Total Kharif Season				900	360	2700000
<i>Rabi</i> Season						
1	Chickpea	Punjab	11	575	230	1725000
		Haryana	5	325	130	975000
		Himachal Pradesh	2	100	40	300000
		Jammu&Kashmir	1	50	20	150000
2	Lentil	Punjab	1	50	20	150000
		Haryana	1	50	20	150000
3	Fieldpea	Jammu&Kashmir	2	75	30	225000
Total Rabi Season				1225	490	3675000
Summer Season						
1	Summer Moong	Punjab	10	550	220	1650000
		Haryana	14	850	340	2550000
2	Black Gram	Punjab	3	150	60	450000
3	Rajmash	Himachal Pradesh	1	25	10	75000
Total Summer				1575	630	4725000
Total (Kharif+Rabi+Summer)				3700	1480	11100000
1	Organization of one Zonal Workshop cum training @ Rs 100000/-					100000
2	Organization of Two Group Meeting @ Rs 500 00/-					100000
3	One Senior Research Fellow(SRF) @ Rs 25000 +HRA@20% for twelve months.					360000
4	One Data entry operator (DEO) at ATARI @ Rs 15000(consolidated)per month for twelve month.					180000
5	Miscellaneous expenditure on account of printing of reports etc @40000/for each ATARI.					40000
6	One Technology Agent at 8 KVKs @ Rs 10000(consolidated) for Six month					480000
Grand Total						1,23,60,000

Annexure XVII

**State-wise details of area proposed for FLDs on Pulses (*Kharif, Rabi and summer*)
2016-17 for ATARI, Zone-I, Ludhiana**

Punjab

S. No.	Name of KVK / District	Kharif Pulses			Rabi Pulses		Summer Pulses		Total Area
		(Area in ha)			(Area in ha)		(Area in ha)		
		Black Gram	Green Gram	Pigeon pea	Chick pea	Lentil	Summer moong/ Green gram	Black gram	
1	Amritsar				30			20	50
2	Barnala						20		20
3	Bathinda				20		30		50
4	Faridkot				20				20
5	Fatehgarh sahib				20		20		40
6	Ferozepur		20		20		30		70
7	Gurdaspur				20			20	40
8	Hoshiarpur				20	20			40
9	Ludhiana						20		20
10	Mansa			20			20		40
11	Moga						20		20
12	Muktsar						20		20
13	Nawanshahar	20			20				40
14	Patiala				20		20		40
15	Ropar							20	20
16	Sangrur				20		20		40
17	Tarn Taran		40		20				60
	Total	20	60	20	230	20	220	60	630

Haryana

S. No.	Name of KVK / District	Kharif Pulses			Rabi Pulses		Summer Pulses		Total Area
		(Area in ha)			(Area in ha)		(Area in ha)		
		Black Gram	Green Gram	Pigeon pea	Chick pea	Lentil	Summer moong /Greengram	Black gram	
1	Ambala				30		20		50
2	Bhiwani		20		30		20		70
3	Fatehabad						20		20
4	Hisar				30		20		50
5	Jind						20		20
6	Kaithal						20		20
7	Karnal				20		20		40
8	Kurukshetra						30		30

9	Mahendergarh		20		20				40
10	Panipat						20		20
11	Rewari						20		20
12	Rohtak						30		30
13	Sirsa						20		20
14	Yamunanagar					20	30		50
15	Sonipat						50		50
	Total	0	40	0	130	20	340	0	530

Himachal Pradesh

S. No.	Name of KVK/ District	Kharif Pulses (Area in ha)			Rabi Pulses (Area in ha)		Summer Pulses (Area in ha)		Total Area
		Black Gram	Green Gram	Pigeon pea	Chick pea	Lentil	Rajmash	Summer Blackgram	
1	Bilaspur	20			20				40
2	Hamirpur	10							10
3	Kinnaur	0					10		10
4	Kullu	20							20
5	Mandi	20			20				40
6	Shimla	10							10
	Total	80	0	0	40	0	10	0	130

Jammu & Kashmir

S. No.	Name of KVK / District	Kharif Pulses (Area in ha)			Rabi Pulses (Area in ha)		Summer Pulses (Area in ha)		Total Area
		Rajmash	Green Gram	Black gram	Chick pea	Field pea	Rajmash	Summer Blackgram	
1	Anantnag	20							20
2	Budgam		10						10
3	Jammu				20				20
4	Kathua			20					20
6	Kupwara	20							20
7	Leh (Additional)					10			10
8	Poonch	20							20
9	Pulwama	20				20			40
10	Rajouri			20					20
11	Reasi	10							10
	Total	90	10	40	20	30	0	0	190

PTA for ATARI, Zone-I, Ludhiana

S.No.	ATARIs/Zone	PTAs for 6 month (no.)	State	KVKs
1	ATARI, Zone -I, Ludhiana	8	Punjab	Amritsar, Bathinda, Ferozepur
			Haryana	Ambala, Bhiwani, Hisar, Yamunanagar, Sonipat

Annexure XVIII

List of contributors under the project "cluster FLDs on *Rabi* Pulses 2015-16"

Sl. no.	KVK/district	Name of the Programme coordinator	Name of the nodal officer
Punjab			
1.	Amritsar	Bhupinder Singh Dhillon	Raminder Kaur
2.	Bathinda	Jatinder Singh Brar	Angrej Singh
3.	Faridkot	Jagdish Grover	Sukhwinder Singh, Gurdarshan Singh and Rakesh Kumar
4.	Gurdaspur	PK Ghuman	Satwinderjit Kaur
5.	Hoshiarpur	Inderjit Singh Hundal	Maninder Singh
6.	Jalandhar	Kuldeep Singh	Jagot Singh Gill
7.	Kapurthala	Manoj Sharma	Jatinder Manan and Gobinder Singh
8.	Mohali	Yashwant Singh	Munish Sharma and Harmeet Kaur
9.	Nawashahar	Jugraj Singh	Jagroop Kaur
10.	Patiala	Jasvinder Singh	Rachna Singla
11.	Ropar	Harinder Singh	Ashok Kumar and Jagdish Singh
12.	Tarn Taran	Prahlad Singh	Navjot Singh Brar and Anil Kumar
Haryana			
13.	Ambala	Upasana Singh	Rakesh Choudhary
14.	Bhiwani	Attar Singh	Vinod Kumar
15.	Fatehabad	Rajesh Dahiya	Sandeep Arya
16.	Gurgaon	Anjani Kumar	Ram Sewak
17.	Hisar	Sunil Kumar Dhanda	Pawan Kumar
18.	Jhajjar	Shashi Vashisht	UKSharma
19.	Karnal	Dalip K Gosain	Mohar Singh
20.	Kurukshetra	P Bhatnagar	JN Bhatia
21.	Mohindergarh	SS Yadav	Ramesh Kumar and Jai Lal Yadav
22.	Rewari	Kapur Singh	Raj Kumar
23.	Yamunanagar	BR Kamboj	BR Kamboj
Himachal Pradesh			
24.	Mandi	Pankaj Sood	DS Yadav, Subash Kumar, LK Sharma
25.	Una	AR Khan	Sanjay Kumar Sharma
26.	Hamirpur	Pardeep Kumar	Dhanbir Singh
27.	Bilaspur	KS Verma	Sanjay Kuamr
28.	Shimla	Narender Singh Kaith	Sudhir Verma, Ms Neelam Kumari and Smt. Bandhna
Jammu and Kashmir			
29.	Kathua	Amrish Vaid	Berjesh Ajrawat and Anamika Jamwal
30.	Jammu	Sanjay Khar	Rakesh Sharma
31.	Srinagar		
32.	Rajouri	Vikas Tandon	RK Arora

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