

Baseline Insights, Technology Excellence & Impact of Cluster Demonstrations in Oilseeds

Annual Report 2024-25



ICAR-Agricultural Technology Application Research Institute (ATARI)
Zone -1, Ludhiana, Punjab -141 004

Baseline Insights, Technology Excellence & Impact of Cluster Demonstrations in Oilseeds

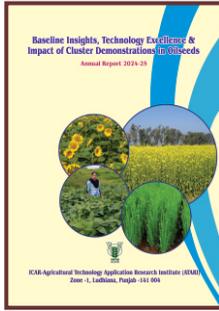
Annual Report
2024-25



Sponsored by:
Department of Agriculture & Farmers Welfare (DA&FW)
under National Food Security Mission-Oilseeds



ICAR-Agricultural Technology Application Research Institute (ATARI)
Zone -1, Ludhiana, Punjab -141 004



(Scan QR Code to Download PDF)



Citation:

Mangai P., Kaur G., Murai, A.S. and Sheoran P. (2026). Baseline Insights, Technology Excellence and Impact of Cluster Demonstrations in Oilseed. ICAR-Agricultural Technology Application Research Institute Zone-I, Ludhiana, Punjab. Page:

ICAR-ATARI-1 PME Ref. No.: ATARI-1/Annual Report/2026/06

Editors:

Preeti Mangai,
Gurleen Kaur
Ashish S Murai
Parvender Sheoran

Published by:

Director, ICAR-ATARI, Zone-I,
PAU Campus, Ludhiana, Punjab, India.
Tel.:0161-2401018 Fax: 0161-2412719
Email: zcu1ldh@gmail.com, atariludhiana@icar.org.in
Website: <http://atariz1.org.in/>

Year of publication: 2026

Graphics Design & Page Setting: Cheena Vyas

PREFACE

Oilseed cultivation is a critical component of India's agricultural economy, providing livelihood to millions of farmers and playing a key role in rural employment and income generation. To boost productivity and reduce dependence on imports, the government has launched targeted initiatives in collaboration with agricultural institutions.

A major step in this direction is the approval of the National Mission on Edible Oils - Oilseeds (NMEO-Oilseeds) by the Union Cabinet, chaired by Prime Minister Shri Narendra Modi. Implemented from 2024-25 to 2030-31, the mission has a financial outlay of ₹10,103 crore. It focuses on increasing the productivity of major oilseed crops such as Rapeseed-Mustard, Groundnut, Soybean, Sunflower, and Sesamum. The mission aims to raise primary oilseed production from 39 million tonnes in 2022-23 to 69.7 million tonnes by 2030-31, moving the country closer to self-reliance (Atmanirbhar Bharat) in edible oil production.

Under NMEO-Oilseeds, Cluster Frontline Demonstrations (CFLDs) on Oilseeds project was sanctioned for the year 2024-25. This initiative aimed to supply farmers with high-quality seeds of improved varieties, along with dissemination of advanced cultivation practices developed by State Agricultural Universities (SAUs) and ICAR Institutes. A total amount of 3.62 crore was allocated to ICAR-ATARI Zone-I, Ludhiana to conduct 7550 CFLDs over an area of 3020 hectares. These CFLDs were carried out by 53 Krishi Vigyan Kendras (KVKs), comprising 21 from Punjab, 9 from Himachal Pradesh, 10 from Uttarakhand, and 13 from Jammu & Kashmir.

I am sincerely thankful to the DA&FW for funding this project. I extend my gratitude to Dr. U.S. Gautam Deputy Director General (Agricultural Extension) and Dr. R.K. Singh, Assistant Director General (Agricultural Extension), for their invaluable guidance and support. I extend sincere thanks to the Directors of Extension Education at State Agricultural Universities, Directors of ICAR Institutes, and Programme Coordinators of KVKs for their vital support in the effective implementation of the project. Above all, my heartfelt gratitude goes to the farmers, whose enthusiastic participation in the Cluster Frontline Demonstrations was key to the project's success. Congratulations to all stakeholders for their outstanding contributions to this collective achievement.

Parvender Sheoran

EXECUTIVE SUMMARY

Oilseeds are crucial for ensuring a steady domestic supply of edible oils and improving farm incomes. To enhance their area, production, and yield, the Department of Agriculture & Farmers' Welfare, in collaboration with the ICAR Division of Extension Education, launched the Cluster Frontline Demonstrations (CFLDs) on Oilseeds in 2015-16 under the National Food Security Mission. In the year 2024 National Mission on Edible Oils - Oilseeds (NMEO-Oilseeds) by the Union Cabinet, chaired by Prime Minister Shri Narendra Modi was approved. With a financial outlay of 10,103 crore, the mission will be implemented from 2024-25 to 2030-31. It aims to enhance the productivity of key oilseed crops like Rapeseed-Mustard, Groundnut, Soybean, Sunflower, and Sesamum, while improving oil extraction from secondary sources such as Cottonseed, Rice Bran, and Tree Borne Oilseeds. The goal is to increase primary oilseed production from 39 million tonnes (2022-23) to 69.7 million tonnes by 2030-31, advancing India's self-reliance (Atmanirbhar Bharat) in edible oil production.

Under this umbrella scheme ICAR-ATARI, Zone-I conducted cluster frontline demonstrations under the project CFLDs on Oilseeds in the states of Punjab, Himachal Pradesh, Uttarakhand and Jammu & Kashmir.

For the year 2024-25, ICAR-ATARI Zone-I, Ludhiana, was allocated a budget of ₹3.62 crore to conduct 7550 CFLDs on different oilseed crops covering 3020 ha area. The CFLDs were organized by 57 KVKs of four states, Punjab (22), Himachal Pradesh (9), Jammu & Kashmir (14) and Uttarakhand (12). The budget allocation per hectare was ₹15,000 for soybean and 8,000 for sesame during the *Kharif* season, and ₹9,000 for Rapeseed Mustard and ₹8,000 for linseed during the *Rabi* season and ₹11,000 for sunflower during summer season. Additionally, provisions were made to hire a Senior Research Fellow (₹42,000+HRA/month) and a Data Entry Operator (₹25,000/month) for smooth implementation of the project.

During the *Kharif* season, 1171 CFLDs were conducted covering 263.70 ha on sesame and soybean. In the *Rabi* season, 8302 CFLDs were conducted on 2,521 ha for rapeseed mustard, and 65 demonstrations were held on 17 ha for linseed. During the summer season, 10 demonstrations were conducted on an area of 4 ha. In total, 9548 CFLDs were successfully conducted across 2805.70 ha in 2024-25, covering various oilseed crops throughout Zone-I states.

During the *Rabi* and *Kharif* season of 2024-25, a total of 425 various extension activities were conducted by the KVKs of Punjab, Himachal Pradesh, Uttarakhand and Jammu & Kashmir under the project. A total of 13,886 farmers participated in various extension programs viz. field days, awareness camps, kisan goshtis, field visits and training programs.

CONTENTS

Sr No	Title	Page
	Preface	
	Executive Summary	
	कार्यकारी सारांश	
1.	Introduction	1-3
2.	Baseline Survey	5-21
3.	<i>Kharif</i> Oilseeds	23-29
4.	<i>Rabi</i> & Summer Oilseeds	31-73
5.	Extension activities	74-77
6.	Annexure I – Contributors List	78-79

INTRODUCTION

Oilseeds are a vital component of global agriculture, forming the backbone of edible oil production while also serving diverse roles in animal feed, biofuels, and industrial products. Their importance extends beyond nutrition, playing a critical role in food security, sustainable development, and economic growth. From household cooking to industrial applications, oilseeds represent a crucial link between agriculture and industry-impacting both daily life and broader economic systems. In the Indian context, oilseeds are central to agricultural livelihoods, rural economies, and the nation's food security framework. India is among the world's top producers and consumers of oilseeds, thanks to its rich agro-climatic diversity that supports the cultivation of a wide range of oilseed crops. The country accounts for 20.8% of the global area under oilseed cultivation and contributes nearly 10% to global oilseed production, making it the fourth-largest producer globally.

India's oilseed sector encompasses nine major annual crops, including seven edible oilseeds-groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower, and niger-and two non-edible oilseeds-castor and linseed. These crops are not only essential for meeting domestic edible oil demand but also supply protein-rich by-products used in livestock feed, supporting key allied sectors like dairy and poultry.

Despite its strategic importance and diverse crop base, the Indian oilseed sector faces persistent challenges. Productivity remains inconsistent due to factors such as yield gaps, post-harvest losses, and market fluctuations. Nearly 72% of oilseed cultivation is rainfed, and much of it is carried out by small and marginal farmers who often lack access to irrigation, quality inputs, and resilient technologies. Additionally, the limited availability of high-yielding and climate-resilient oilseed varieties has constrained the sector's growth, making India heavily reliant on edible oil imports to meet domestic demand.

While challenges remain, the ongoing investment in research and development, crop diversification and

Table 1: Area, Production and Productivity of major oilseed crops from 2018-19 to 2022-23.

Crop	Particulars	2018-19	2019-20	2020-21	2021-22	2022-23
Sesame	Area (m ha)	1.42	1.62	1.72	1.63	1.52
	Production (m ton)	0.69	0.66	0.82	0.79	0.80
	Productivity (q/ha)	4.85	4.05	4.74	4.85	5.27
Soybean	Area (m ha)	11.1	12.2	12.9	12.2	13.1
	Production (m ton)	13.3	11.2	12.6	13.7	15.0
	Productivity (q/ha)	11.9	9.2	9.76	10.7	11.5
Groundnut	Area (m ha)	4.7	4.8	6.0	5.7	5.0
	Production (m ton)	6.7	9.9	10.2	10.1	10.3
	Productivity (q/ha)	14.2	20.6	17.0	17.8	20.8
Linseed	Area (m ha)	0.17	0.18	0.17	0.19	0.24
	Production (m ton)	0.10	0.12	0.11	0.12	0.17
	Productivity (q/ha)	5.74	6.71	6.37	6.42	6.98
R&M	Area (m ha)	6.1	6.9	6.7	8.0	8.8
	Production (m ton)	9.3	9.1	10.2	12.0	12.6
	Productivity (q/ha)	15.1	13.3	15.2	15.0	14.3

Source: Indiastat.com

market interventions signal a hopeful future for India's oilseed sector. By empowering smallholder farmers and improving access to modern agricultural inputs, India is poised to further strengthen its domestic oilseed production, enhancing food security and reducing its reliance on imports. The details of area, production and yield of major oilseeds from 20218-19 to 2022-23 are given in Table 1.

Given these challenges, there is an urgent need to intensify efforts toward increasing oilseed productivity, improving resource access for farmers, and adopting advanced technologies-objectives that are now being addressed through various national-level interventions. To address the growing demand for edible oils and reduce import dependence, the Government of India has launched the National Mission on Edible Oils - Oilseeds (NMEO-Oilseeds), a seven-year initiative (2024-25 to 2030-31) with a financial outlay of ₹10,103 crore. The Mission aims to boost domestic oilseed production from 39 million tonnes to 69.7 million tonnes, and, along with the Oil Palm component (NMEO-OP), meet 72% of India's projected edible oil requirement by 2030-31. Key strategies include the adoption of high-yielding varieties, use of advanced technologies like genome editing, expansion into fallow lands, intercropping, and the creation of 600 Value Chain Clusters across 347 districts. The Mission will also strengthen seed infrastructure through the SATHI Portal, with the establishment of new seed hubs and storage units to ensure timely access to quality seeds.

Under this umbrella scheme '**Cluster Frontline Demonstrations (CFLDs) on Oilseeds**' project was initiated by the Department of Agriculture and Farmer's Welfare (DA&FW) with cooperation of Division of Agricultural Extension, ICAR, New Delhi. The project was executed by ICAR-ATARI, Zone-I through 57 KVKs of Punjab, Himachal Pradesh, Uttarakhand and Jammu & Kashmir.

'CFLDs on Oilseeds' project was implemented with the following key objectives:

1. To demonstrate improved high yielding varieties in the farmer's field
2. To increase the area, production and yield of oilseeds to satisfy the demand of nations 'edible oils and encourage the crop diversification in agriculture
3. To demonstrate newly released crop production and protection technologies (IPM, INM etc.) and management practices in the farmer's field under different agro-climatic conditions and farming situations.

For the year 2024-25, ICAR-ATARI Zone-I, Ludhiana, was allocated a budget of ₹3.62 crore to conduct 7550 CFLDs on different oilseed crops covering 3020 ha area. The CFLDs were organized by 57 KVKs of four states, Punjab (22), Himachal Pradesh (9), Jammu & Kashmir (14) and Uttarakhand (12). To conduct the CFLDs during *Kharif* season on soybean ₹15000/ha and for sesame ₹8000/ha were allocated. Similarly, during *Rabi* season to conduct the CFLDs on rapeseed mustard ₹9000/ha and for linseed an amount of ₹8000/ha were allocated. During summer season an amount ₹11000/ha was allotted for sunflower under the CFLDs on oilseed project. Additionally, provision for recruiting a Senior Research Fellow @ ₹42000+HRA/month and a Data Entry Operator (DEO) @ ₹25000/month for twelve months was included for the smooth execution of the project.

During *Kharif* season of 2024-25, a total of 1171 CFLDs were conducted covering 263.70 ha area on sesame and soybean. Out of these 687 CFLDs were conducted on soybean covering 136.70 ha area while 127 ha area was covered by 484 demonstrations on sesame crop. In the *Rabi* season, 6625 CFLDs were allocated to conduct on 2650 ha area for Rapeseed and Mustard, 75 demonstrations were allocated to conduct on 30 ha area for linseed crop and 100 demonstrations were allocated on an area of 40 ha for sunflower. A total of 8302 CFLDs were conducted on 2521 ha area for Rapeseed Mustard and 65 demonstrations were conducted on 17 ha area for linseed crop and 10 demonstrations on an area of 4 ha were conducted for sunflower crop. Overall, in 2024-25, ICAR-ATARI, Ludhiana, Zone - I was allocated with 7550 demonstrations on 3020 ha area for

various Oilseed crops and a total of 9548 CFLDs were successfully conducted over 2805.70 ha area by the KVKs across the states of the zone. The state wise and crop wise details of CFLDs allocated and conducted on various crops during the year 2024-25 are given in Table 2.

Table 2: State-wise and crop wise details of allocated and conducted CFLDs on Oilseeds during *Kharif & Rabi* season 2024-25

State/Crop	Allocated		Conducted	
	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)
<i>Kharif</i> Season				
Punjab				
Sesame	80	200	68	170
Soybean	20	50	20	50
Sub-Total (Punjab)	100	250	88	220
Himachal Pradesh				
Sesame	40	100	35	209
Soybean	40	100	31.70	162
Sub-Total (Himachal Pradesh)	80	200	66.70	371
Uttarakhand				
Soybean	40	100	35	222
Sub-Total (Uttarakhand)	40	100	35	222
Jammu & Kashmir				
Sesame	30	75	24	105
Soybean	50	125	50	253
Sub-Total (Jammu & Kashmir)	80	200	74	358
Total Sesame	150	375	127	484
Total Soybean	150	375	136.70	687
<i>Rabi</i> + Summer Season				
Punjab				
Rapeseed Mustard	1120	2800	1117	2726
Sunflower	30	75	4	10
Sub-Total (Punjab)	1150	2875	1121	2736
Himachal Pradesh				
Linseed	30	75	17	65
Rapeseed Mustard	350	875	350	1332
Sub-Total (Himachal Pradesh)	380	950	367	1397
Uttarakhand				
Rapeseed Mustard	440	1100	399	1746
Sub-Total (Uttarakhand)	440	1100	399	1746
Jammu & Kashmir				
Rapeseed Mustard	740	1850	655	2498
Sunflower	10	25	0	0
Sub-Total (Jammu & Kashmir)	750	1875	655	2498
Total Rapeseed Mustard	2650	6625	2542	8302
Total Linseed	30	75	17	65
Total Sunflower	40	100	4	10
Total (<i>Kharif</i> Season)	300	750	263.70	1171
Total (<i>Rabi</i> + Summer Season)	2720	6800	2542	8377
Total (<i>Kharif & Rabi</i> Season)	3020	7550	2805.70	9548

Problem Identification and Prioritization

The baseline survey served as the initial reference point for evaluation, facilitating the collection of primary data which was subsequently analyzed and compared to delineate the major constraints in the cultivation of oilseed crops. The survey encompassed soybean and sesame during the *Kharif* season, and rapeseed-mustard, linseed, and sunflower during the *Rabi* season, across the states of Punjab, Himachal Pradesh, Jammu & Kashmir, and Uttarakhand. The implementation of Cluster Frontline Demonstrations (CFLDs) on oilseed crops adopts a systematic framework aimed at diagnosing the key challenges encountered by farmers and introducing appropriate technological interventions. The work plan is structured around the following core steps:

1. Baseline survey:

- A comprehensive field survey was conducted to assess existing agronomic practices, input-use patterns, and the key constraints affecting oilseed cultivation across the CFLD implementing states. The selection of respondents for each crop was proportionate to the area covered under CFLDs during both the *Kharif* and *Rabi* seasons. During the *Kharif* season, respondent selection included 15 farmers for soybean in Punjab, 55 in Himachal Pradesh, 20 in Uttarakhand, and 69 in Jammu & Kashmir. For sesame, 65 respondents were selected in Punjab, 30 in Himachal Pradesh, and 56 in Jammu & Kashmir. In the *Rabi* season, for rapeseed-mustard, 406 respondents were selected from Punjab, 140 from Himachal Pradesh, 288 from Uttarakhand, and 278 from Jammu & Kashmir.
- Agronomic data was systematically recorded from sowing to harvest, encompassing seed rate, sowing time, nutrient management, weed control, and pest management practices adopted by farmers.

2. Problem Identification and Prioritization:

- On the basis of survey outcomes, the principal constraints associated with oilseed production were systematically identified and prioritized.
- Constraints such as sub-optimal seed rates, imbalanced nutrient application, inadequate plant protection measures, and deviations from recommended agronomic practices were documented.

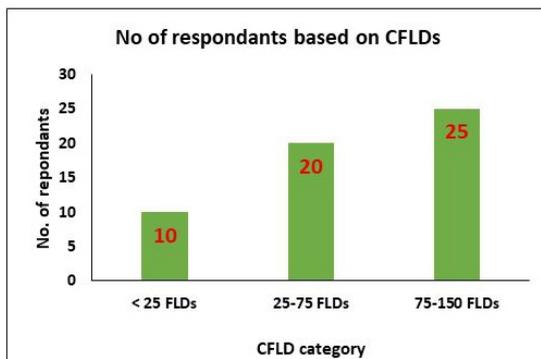
3. Technology assemblage:

- Relevant technological modules state wise and crop wise were identified, selected, and integrated to address the prioritized production constraints.
- Recommended agronomic practices integrated with optimum seed rates, balanced nutrient application with need-based plant protection measures were demonstrated in farmer fields to enhance the production and profitability.

Sampling of farmers for baseline survey

In order to ensure balanced representation across different farm size categories, farmer selection was proportionately aligned with the number of CFLDs implemented. The categorization was structured as follows where areas with fewer than 25 CFLDs had 10 respondents, those with 25-75 CFLDs had 20 respondents, and areas with 75-150 CFLDs had the highest number with 25 respondents.

The data obtained from the baseline survey was systematically analyzed to delineate the key challenges in soybean and sesame cultivation during the *Kharif* season, and rapeseed-mustard, cultivation during the *Rabi* season across the surveyed regions. The analysis revealed major constraints, including sub-optimal seed rates, imbalanced nutrient management, ineffective pest and disease control, and deviations from recommended agronomic practices. To mitigate these issues, state wise and crop wise technological modules were developed and refined, thereby facilitating regionally tailored recommendations aimed at enhancing oilseed productivity. A comprehensive state and union territory-wise discussion of the findings under this project is presented in the subsequent sections.



Kharif Season

SOYBEAN (N=15)

PUNJAB

Varietal adoption: 80 percent of farmers in Punjab were cultivating local varieties, while only 20 percent had adopted the improved variety SL 958. Despite the availability of the recommended variety SL 958, a significant proportion of the cultivated area continued to be occupied by non-recommended local varieties, highlighting limited adoption of improved cultivars in the region.

Varieties adopted	Farmers (%)
Local	80
SL 958	20

Time of sowing: Farmers were significantly sowing their crops during 2nd fortnight of June (86.66 %) while 13.33 percent were sowing during 1st fortnight of June. In the Punjab region, the optimum sowing window for soybean is the first fortnight of June.

Time of sowing	Farmers (%)
1 st fortnight of June	86.66
2 nd fortnight of June	13.33

Delayed sowing often coincided with the onset of the monsoon, where heavy post-sowing rainfall adversely affects seed germination and subsequent crop establishment.

Sowing technique: The results of the survey indicated that in soybean cultivation, the 80 percent of farmers practiced broadcasting as the method of sowing, while only 20 percent adopted line or drill sowing techniques. The recommended method of sowing is line sowing with a row-to-row spacing of 45 cm. However, the predominance of broadcasting observed in the survey reflects a clear deviation from the prescribed agronomic practices.

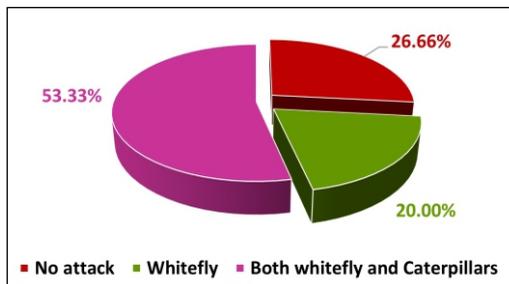
Sowing technique	Farmers (%)
Broadcasting	80
Line/Drill sowing	20

Nutrient management: The survey revealed considerable variation in nitrogen (N) application practices among farmers. Detailed analysis indicated that 46.66 percent of farmers applied N doses ranging between 30-50 kg/ha, with an average application @48.60 kg/ha. The recommended dose of nitrogen (N) is 31.25 kg/ha; however, a significantly higher proportion of farmers were found to apply N well above this recommended level, indicating a considerable deviation from the suggested dosage. Notably, the survey further revealed that none of the farmers applied phosphorus fertilizer (P₂O₅). In

contrast, none of the farmers reported the application of phosphorus (P_2O_5), despite the recommended dose being 80 kg/ha. These findings highlight an imbalance in fertilizer management practices, where excess application of nitrogen coupled with complete omission of phosphorus may lead to nutrient inefficiency, soil fertility depletion, and potential decline in crop productivity.

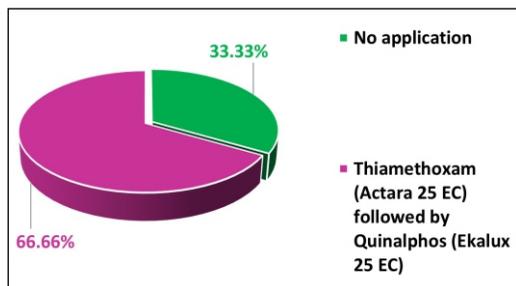
Nutrient management	N	P_2O_5
Applied (Farmers)	100 %	–
Not applied	--	100%
N application	Farmers (%)	Average dose (kg/ha)
<30 kg/ha	27.25	
30-50 kg/ha	48.60	46.66
>50 kg/ha	33.33	
Recommended dose of N (31.25 kg/ha)		
Recommended dose of P_2O_5 (80 kg/ha)		

Plant Protection: Insect-Pests: Baseline survey results indicated that 26.66 percent of the fields were free from insect-pest infestation. Among the reported pest occurrences, a combined infestation of whitefly and hairy caterpillar (*Spilosoma obliqua*) was recorded in 53.33 percent of the farmers.



Measures: According to the survey conducted, that a significant number of farmers (73.33%) adopted

chemical control measures to manage pest infestations, whereas the remaining 26.67 percent did not implement any preventive strategies. Sequential application of insecticide was followed for the management of hairy caterpillar (*Spilosoma obliqua*) where insecticide Thiamethoxam (Actara 25 WG) was followed by Quinalphos (Ekalux 25 EC) by 33.33 percent and among 66.66 percent of farmers, application of insecticide was not done. The farmers using the insecticide have not followed the recommended dosage i.e. spray 1250 ml of Quinalphos (Ekalux 25 EC) in 200-250 L of water per ha.



[Recommended dose: 1250 ml Quinalphos (Ekalux 25 EC) in 200-250 L water per ha]

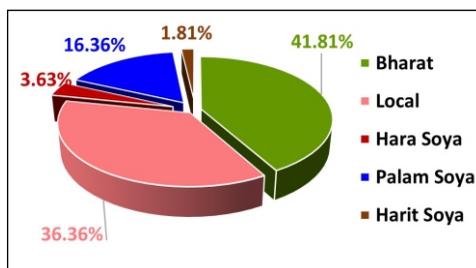
Table 3: Technological modules developed for addressing the major key constraints for soybean cultivation in Punjab

Problems Identification	Technological Module
Farmers predominantly cultivate local varieties, employing delayed sowing time and broadcasting as the primary method of sowing	Recommended varieties (SL 958) along with line sowing (45 cm) during the 1 st fortnight of June
Farmers are opting for higher dose of N application and omission of P_2O_5	Application of 32.5 kg/ha of N with 80 kg/ha of P_2O_5
Unrecommended use of plant protection measures (hairy caterpillar)	Sole application of Quinalphos (Ekalux 25 EC) @ 1250 ml in 200-250 L of water per ha

HIMACHAL PRADESH (N=55)

Varietal adoption: A mix of varieties were cultivated by farmers namely Bharat (41.81%), Local (36.36%), Palam Soya (16.36%), Hara Soya (3.63%) and Harit Soya (1.81%). This varietal

distribution represents a significant deviation from the recommended varieties that are better suited for the specific agro-climatic conditions of the region and have the higher potential to deliver higher productivity. The survey deduced a limited adoption of recommended varieties such as Palam Soya, Hara Soya, and Harit Soya, which have been specifically developed to suit the diverse agro-ecological conditions of the region.



Sowing technique: The results of the survey revealed that 100 percent of farmers predominantly practiced broadcasting as the method of sowing. In contrast, the recommended practice emphasizes line sowing with a row spacing of 45 cm, which facilitates optimum plant population, better crop management, and enhanced yield potential. However, the survey revealed that farmers deviate from this recommendation by predominantly adopting broadcasting, which results in uneven seed placement and sub-optimal yield outcomes.

Sowing technique	Farmers (%)
Broadcasting	100
Line sowing	—

Seed rate: The survey indicated variability in seed rate adoption among farmers. A 78.18 percent farmers were found to use seed rates exceeding the recommended level (>75 kg/ha), However, the optimum seed rate is 75 kg/ha, these findings highlight a significant deviation from the recommendation, with most farmers applying higher seed rates that may lead to increased seed costs and sub-optimal crop stand establishment.

Seed Rate (kg/ha)	Farmers (%)
Less than recommended	—
Recommended (60-75 kg/ha)	21.81
More than recommended (> 75 kg/ha)	78.18

Nutrient management: The survey findings revealed that 60 percent of farmers did not apply N to the crop, while 40 percent reported its application. Among the farmers applying N, the majority (77.27%) applied doses within the recommended range of 10-20 kg/ha, whereas 13.63 percent applied sub-optimal doses (<10 kg/ha) and 9.09 percent exceeded the recommended level (>20 kg/ha).

Nutrient management	N
Applied (Farmers)	60%
Not applied	40%
N application	Farmers (%)
<10 kg/ha	13.63
10-20 kg/ha	77.27
>20 kg/ha	9.09
Recommended dose - 20 kg/ha	

Table 4: Technological modules developed for addressing the major key constraints for soybean cultivation in Himachal Pradesh

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (Palam Soya/ Harit Soya)
Broadcasting	Line sowing (45 cm)
Non- recommended seed rate	Optimum seed rate (75 kg/ha)

UTTARAKHAND (N=20)

Varietal adoption: The results indicated that the majority of farmers (100%) predominantly relied on local varieties for crop sowing. The recommended

Variety	Farmers (%)
Local	100
Recommended	-

varieties, such as PS 25 and VL Soy 89, were not adopted by the farmers, indicating a marked deviation from improved varieties.

Sowing technique: A significant deviation from the recommended practices was observed in soybean cultivation across the region. All farmers (100%) relied on broadcasting as the method of sowing, whereas the recommended practice involves line sowing with an optimum row spacing of 45 cm.

Sowing technique	Farmers (%)
Broadcasting	100
Line sowing	—

Seed rate: The optimum seed rate for soybean ranges between 65-75 kg/ha; however, only 15 percent of farmers adhered to this recommendation. In contrast, the majority (85%) applied seed rates exceeding the recommended level (>75 kg/ha), reflecting a considerable deviation from the prescribed practice.

Seed Rate (kg/ha)	Farmers (%)
Less than recommended	—
Recommended (60-75 kg/ha)	15
More than recommended (> 75 kg/ha)	85

Nutrient management: The results indicate that all (100%) of the farmers cultivating soybean omitted nutrient application.

Table 5: Technological modules developed for addressing the major key constraints for soybean cultivation in Uttarakhand

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (PS 25/ VL-89 Soya)
Broadcasting	Line sowing (45 cm)
Non- recommended seed rate	Optimum seed rate (65-75 kg/ha)
No nutrient application practices were observed among the farmers.	Application of 20 kg N/ha and 60 kg P ₂ O ₅ /ha

JAMMU & KASHMIR (N=69)

Varietal adoption: It was observed that 100 percent of the farmers have been adopting the local varieties, instead of the recommended varieties (Shalimar Soybean 1 and Shalimar Soybean 2).

Variety	Farmers (%)
Local	100
Recommended	-

Method of sowing: The results deduced that 100 percent of the farmers are adopting broadcasting as the method of sowing, thus indicating a significant deviation from the recommended line sowing method with a row to row spacing of 45 cm.

Sowing technique	Farmers (%)
Broadcasting	100
Line sowing	—

Time of sowing: The survey of farmer practices revealed that 85.50 percent of farmers sowed their crop during the first week of June, in accordance with the recommended sowing period.

Time of sowing	Farmers (%)
2 nd fortnight of May*	15.49
1 st fortnight of June	85.50
*Recommended sowing period	

Seed rate: It was observed that only 7.24 percent of farmers adhered to the seed rate range of 50-75 kg/ha (70 kg/ha), which is close to the recommended level of 62.5 kg/ha. In contrast, the majority of farmers (88.40%) adopted a higher-than-recommended seed

Seed Rate (kg/ha)	Farmers (%)
<50 kg/ha	4.34
50-75 kg/ha	7.24
>75 kg/ha	88.40
Recommended seed rate - 62.5 kg/ha	

rate (>75 kg/ha), with an average of 87.5 kg/ha. Such deviations from the recommended seed rate are likely to affect plant population dynamics, resource-use efficiency, and ultimately crop productivity, as excessive seed rates may lead to overcrowding, inter-plant competition, and reduced yield efficiency.

Nutrient management: Application of both N and P₂O₅ was reported among the farmers. The 85.50 percent of farmers applied N at levels higher than the recommended dose, averaging 42.20 kg/ha, while 14.49 percent did not apply N at all. In the case of P₂O₅, all farmers applied quantities lower than the recommended dose (40 kg/ha), with an average application of 32.55 kg/ha. These findings highlight a considerable deviation from the recommended nutrient management practices, which may lead to imbalanced fertilization, reduced nutrient-use efficiency, and potential adverse effects on crop productivity and soil fertility.

Nutrient management	N	P ₂ O ₅
Applied (Farmers)	100%	85.5%
Not applied	--	14.5%
N application	Farmers (%)	
Less than recommended	14.49	100
Recommended*	---	---
More than recommended	85.50	---
Recommended dose - 20 kg/ha N and 40 kg/ha P ₂ O ₅		

These findings highlight a considerable deviation from the recommended nutrient management practices, which may lead to imbalanced fertilization, reduced nutrient-use efficiency, and potential adverse effects on crop productivity and soil fertility.

Plant protection: The results of the survey revealed that majority of the farmers have not been applying any kind of plant protection measures for the control of insect pest and diseases.

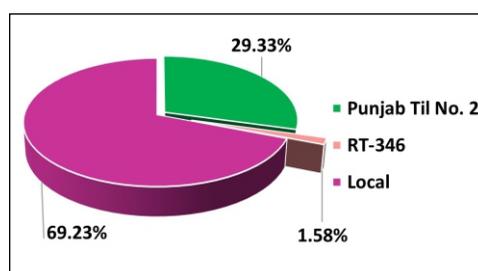
Table 6: Technological modules developed for addressing the major key constraints for soybean cultivation in Jammu and Kashmir

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (Shalimar soybean 1 and Shalimar soybean 2)
Broadcasting	Line sowing (45 cm)
Non- recommended seed rate	Optimum seed rate (62.5 kg/ha)
No nutrient application	Application of 20 kg N/ha and 40 kg P ₂ O ₅ /ha
Plant Protection	Dimethoate 30 EC @ 1L/ha in 750 L of water

SESAME

PUNJAB (N = 65)

Varietal adoption: The analysis of data revealed that local varieties were cultivated by 69.23 percent of farmers, whereas adoption of recommended variety Punjab Til No. 2 was limited to 29.33 percent. The predominance of local varieties thus indicates a significant deviation from the recommended varietal adoption, which may limit the potential for higher yield, disease resistance, and overall productivity.



Time of sowing: The 53.33 percent of farmers sowed their crop during the first fortnight of July, which corresponds to the optimum sowing window. In contrast, 28.89 percent of farmers sowed during the second fortnight of June and 17.78 percent during the second fortnight of July. These results indicate that most farmers are adhering to the recommended sowing time, as early sown crop is more prone to the attack of the disease.

Time of sowing	Farmers (%)
2 nd fortnight of June	28.89
1 st fortnight of July*	53.33
2 nd fortnight of July	17.78
*Recommended time of sowing	

Sowing technique: The data revealed that 88.88 percent of farmers practiced broadcasting as the method of sowing, whereas only 11.11 percent adopted line sowing. However, the recommended practice for sesame emphasizes line sowing with a row-to-row spacing of 30 cm to ensure optimum crop growth and enhanced yield.

Sowing technique	Farmers (%)
Broadcasting	88.88
Line sowing	11.11

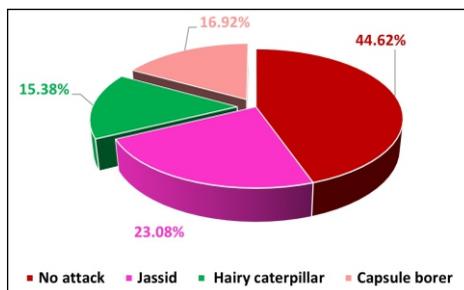
Seed rate: It was observed that 80 percent of farmers adhered to the recommended seed rate of 2.5 kg/ha, while 10.79 percent adopted sub-optimal seed rates.

Seed Rate (kg/ha)	Farmers (%)
<2 kg/ha	10.79
2-3 kg/ha	80.00
>3 kg/ha	9.23
Recommended Seed rate - 2.5 kg/ha	

Nutrient management: According to the baseline survey, it was observed that 35.38 percent of the farmers have not been applying any nutrient to the crop. However, the rest of them are applying N with the varied dosage. Among them 7.69 percent of the farmers are applying nitrogen which is >70 kg/ha, 21.53 percent are applying N <50 kg/ha and rest 35.38 percent are applying the N within the range of 50-70 kg/ha.

Nutrient management	N
Applied (Farmers)	64.62%
Not applied	35.38%
N application	Farmers (%)
<50 kg/ha	21.53
50-70 kg/ha	35.38
>70 kg/ha	7.69
Recommended dose of N - 54 kg/ha	

Plant protection: Insect Pests: According to the survey, 44.62 percent of the farmers reported no incidence of insect pest infestation. Among the affected fields, 23.08 percent were infested with jassid (*Orosius albicinctus*). In terms of management practices, 36.92 percent of farmers applied Thiamethoxam (Actara 25 WG), 27.69 percent used Chlorpyrifos, and 10.76 percent relied on Indoxacarb 15.8 EC, whereas 64.61 percent of farmers reported not adopting any control measures against insect pests.



Dosage: Survey results indicated that 70.83 percent of farmers applied Thiamethoxam (25 EC) at a dose of 0.4-0.6 g/L (0.42). In the case of Chlorpyrifos, 66.66 percent of farmers reported application @ 2-5 ml/L (3.7 ml), whereas 33.33 percent used a relatively higher dose of 5-8 ml/L (7.5 ml). All farmers using Indoxacarb 15.8 EC (100%) uniformly applied @ 0.5 ml/L.

Insecticide	Thiamethoxam (Actara 25 WG)	Chlorpyrifos	Indoxacarb 15.8 EC		
Farmers (%)	36.92%	27.69%	10.76%		
Dose	Farmer (%)	Dose	Farmer (%)	Dose	Farmer (%)
0.4-0.6 g/L (0.42 g)	29.16%	2-5 ml/L (3.7 ml)	66.66%	0.5 ml/L	100 %
0.6-0.8 g/L (0.72 g)	70.83%	5-8 ml/L (7.5 ml)	33.33%		

Diseases: According to the survey, 43.04 percent of farmers reported no incidence of crop diseases. Among the affected fields, 40 percent of farmers reported phyllody, while 16.92 percent observed cercospora blight (*Cercospora sesami*). Recommended practices include managing jassid populations to control phyllody transmission and, for cercospora blight, avoiding excessive nitrogen application and maintaining fields free of weeds and crop debris.

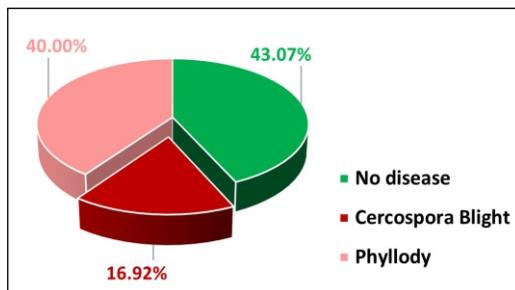
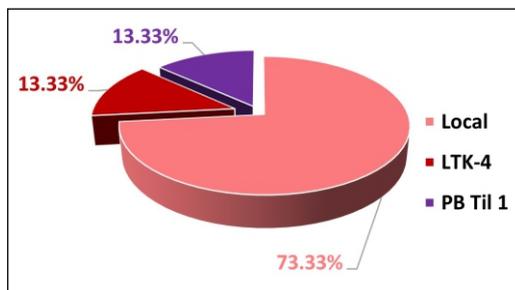


Table 7: Technological modules developed for addressing the major key constraints for sesame cultivation in Punjab

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (Punjab Til No. 2)
Time of sowing	1 st fortnight of July
Method of sowing	Line sowing (30 cm)
Seed rate	Optimum seed rate (2.5 kg/ha)
Nutrient management	Recommended N application (52.5 kg/ha)

HIMACHAL PRADESH (N=30)

Varietal adoption: Survey results revealed that farmers predominantly cultivated local varieties (73.33%), followed by LTK-4 (13.33%) and Punjab Til No. 1 (13.33%). The limited adoption of the recommended variety Punjab Til No. 2 indicates a strong reliance on local cultivars, which is likely contributing to reduced crop productivity.



Time of sowing: The survey revealed that a majority of farmers (56.67%) sow their crop during the first fortnight of July, while 43.33 percent prefer the second fortnight of June. Although the recommended sowing window is the first fortnight of July. However, farmers opting for earlier sowing during 2nd fortnight of June are more vulnerable to disease incidence.

Time of sowing	Farmers (%)
2 nd fortnight of June	43.33
1 st fortnight of July*	56.67

*Recommended time of sowing

Seed rate: The majority of the farmers (50%) practiced seed rates exceeding 4 kg/ha, which is above the recommended level. Conversely, 30 percent reported using less than 2 kg/ha, while only 20 percent adhered to a range of 2-4 kg/ha, approximating the recommended seed rate of 2.5 kg/ha. These findings indicate a substantial deviation of farmers' practices from the recommended seed rate.

Seed Rate (kg/ha)	Farmers (%)
<2 kg/ha	30
2-4 kg/ha	20
>4 kg/ha	50

Recommended seed rate - 2.5 kg/ha

Sowing technique: The majority of farmers (100%) practiced broadcasting as the method of sowing, representing a complete deviation from the recommended practice of line sowing with a row-to-row spacing of 30 cm.

Method of Sowing	Farmers (%)
Broadcasting	100
Line sowing	–

Nutrient management: The analysis indicated that majority of the farmers (90%) are not providing any kind of balanced fertilization to the crop. However, 10 percent of the farmers have only done N application to the crop.

Nutrient Application	Farmers (%)
No application	90%
N application	10
Recommended dose - 30 kg/ha N	

Table 8: Technological modules developed for addressing the major key constraints for sesame cultivation in Himachal Pradesh

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (Punjab Til No. 2)
Broadcasting	Line sowing (30 cm)
Non- recommended seed rate	Optimum seed rate (2.5 kg/ha)
No nutrient application	30 kg N/ha and 15 kg P ₂ O ₅ /ha

JAMMU AND KASHMIR (N=56)

Varietal adoption: The analysis of the data revealed that 80.35 percent of farmers cultivated local varieties, while 19.64 percent adopted Punjab Til No. 1. A marked deviation from the recommended high-yielding varieties such as RT 372 and GTJ 5 was observed. The limited adoption of these recommended cultivars is considered a major factor contributing to the decline in crop productivity.

Varieties	Farmers (%)
Local	80.35
Punjab Til No. 1	19.64

Sowing technique: The recommended sowing method is line sowing with a row-to-row spacing of 30 cm. However, all farmers (100%) reported practicing broadcasting, which often results in suboptimal crop growth due to uneven plant distribution and competition.

Sowing technique	Farmers (%)
Broadcasting	100
Line sowing	—

Seed rate: The baseline survey revealed that a majority of farmers (76.78%) adopted seed rates in the range of 2.5-3 kg/ha, which is close to the recommended rate of 2.5 kg/ha. In contrast, 23.21 percent of farmers reported using seed rates exceeding 3 kg/ha. Overall, no major deviation from the recommended practice was observed, although a subset of farmers applied seed rates above the optimum level.

Seed Rate	Farmers (%)
<2 kg/ha	---
2.5-3 kg/ha*	76.78
>3 kg/ha	23.21
*Recommended seed rate	

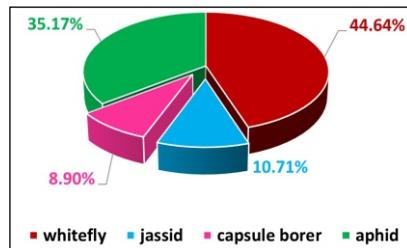
Nutrient management: The survey indicated that a majority of farmers applied both N (55.35%) and P₂O₅ (71.42%) for balanced fertilization, although the doses often deviated from the recommended levels. For nitrogen application, 80 percent of farmers applied between 5-15 kg/ha, while 20 percent reported doses exceeding 15 kg/ha. In the case of phosphorus, 28.57 percent of farmers did not apply any fertilizer, 35.75 percent applied less than the

Nutrient management	N
Applied	53.35
Not applied	44.64
Dose of N application	
<5 kg/ha	---
5- 15 kg/ha	80
>15 kg/ha	20
Recommended dose- 20 kg N/ha	

recommended dose (<5 kg/ha), and 14.29 percent applied an average of 9.2 kg/ha (5-10 kg/ha), which is close to the recommended 10 kg/ha. A smaller proportion applied rates above the recommendation (>10 kg/ha), averaging 12.69 kg/ha. These results highlight considerable variability in fertilizer use, with a large proportion of farmers under- or over-applying N and P₂O₅. Such imbalances may lead to nutrient inefficiency and reduced productivity.

P ₂ O ₅ application	Farmers (%)
Applied	71.42
Not applied	28.57
Dose of P ₂ O ₅ application	
< 5 kg/ha	35.71
5-10 kg/ha	14.29
>10 kg/ha	21.43
Recommended dose-10 kg P ₂ O ₅ /ha	

Plant protection: Insect-Pest: Based on the survey findings, four major insect pests were reported by farmers. Among these, whitefly (*Bemisia tabaci*) was identified as the most prevalent, accounting for 44.64 percent of the reported incidences. This was followed by aphid (*Aphis gossypii*, 35.17%), jassid (*Orosius albicinctus*, 10.71%), and capsule borer (*Conogethes punctiferalis*, 8.90%).



Measures: Farmers adopted several management practices to mitigate the incidence of these insect pests. For aphid control, Chlorpyrifos 20 EC was applied @ 2 ml/L. To manage capsule borer, Flubendiamide 20% WG was used @ 0.3 ml/L, while jassid was controlled through the application of neem seed kernel extract @ 0.05 ml/L. In contrast, no specific control measures were undertaken against whitefly infestation.

Insecticide	Chlorpyrifos 20% EC	Flubendiamide 20% WG	Neem Seed Kernel
Farmers (%)	44.64%	8.92%	10.71%
Dose	2 ml/L	0.3 ml/L	0.05ml/L

Table 9: Technological modules developed for addressing the major key constraints for sesame cultivation in Jammu and Kashmir

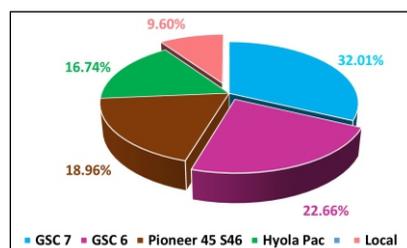
Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (RT 372/GJT 5)
Broadcasting	Line sowing (30 cm)
Non- recommended seed rate	Optimum seed rate (2.5 kg/ha)
Nutrient application	Apply 20 kg N/ha and 10 kg P ₂ O ₅ /ha

Rabi Season

RAPESEED AND MUSTARD

PUNJAB (N=406)

Varietal Adoption: Survey analysis revealed that 32.01 percent of farmers adopted GSC 7, the recommended variety of rapeseed and mustard. In contrast, a considerable proportion of farmers cultivated alternative varieties, including GSC 6 (22.66%), Pioneer 45S56 (18.96%), Hyola Pac (16.74%), and local cultivars (9.60%). The preference for these non-recommended varieties contributed to a reduction in yield, highlighting the importance of adopting improved and recommended cultivars such as GSC 7 for enhancing productivity.



Sowing Technique: Broadcasting, was the predominant sowing technique practiced by 81.77 percent, while 16.50 percent adopted line sowing and only 1.72 percent utilized bed planting. The limited adoption of line sowing, which ensures uniform plant population and contributes to enhanced productivity, has resulted in sub-optimal crop performance under broadcasting practices.

Sowing Technique	Farmers (%)
Broadcasting	81.77
Line sowing	16.50
Bed planting	1.72

Seed Inoculation: Survey findings revealed that none of the farmers (100%) practiced seed inoculation. Adoption of the recommended practice of seed inoculation with biofertilizers has been shown to enhance both seed yield and oil content, thereby contributing to improved crop productivity and quality.

Seed inoculation	Farmers (%)
No	100
Yes	--

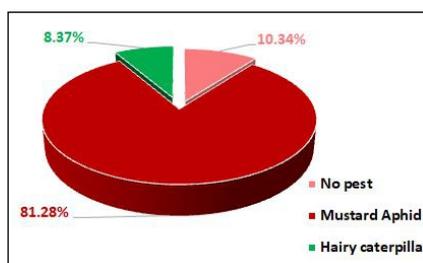
Nutrient management: The survey revealed that nutrient application practices were highly skewed towards nitrogen as compared to phosphorus. A majority of farmers (92.61%) applied N, whereas only 51.97 percent applied P₂O₅, with 48.02 percent completely neglecting its use. Among nitrogen users, 42.55 percent applied doses below 60 kg/ha (average 43.03 kg/ha), 10.10 percent applied between 60-100 kg/ha (average 77.74 kg/ha), while nearly half (47.34%) applied more than 100 kg/ha (average 110.14 kg/ha). In contrast, phosphorus application was more evenly distributed, 21.80 percent of farmers applied less than 25 kg/ha (average 21.80 kg/ha), 31.27 percent applied between 25-45 kg/ha (average 29.97 kg/ha), and 46.09 percent applied more than 55 kg/ha (average 57.40 kg/ha). These findings suggest an over-reliance on N and inconsistent or inadequate application of phosphorus, potentially leading to nutrient imbalances and suboptimal crop productivity.

	N			P ₂ O ₅		
Applied	92.61%			51.97%		
Not applied	7.38%			48.02%		
	Dose (kg/ha)	Farmer (%)	Average dose (%)	Dose (kg/ha)	Farmer (%)	Average dose (%)
Range	>60 kg	42.55	43.03	<25 kg	21.80	18.02
	60-100 kg	10.10	77.74	25-45 kg	31.27	29.97
	>100 kg	47.34	110.14	>45 kg	46.91	57.40

However, the survey revealed that farmers completely avoided the application of sulphur (S), despite its critical role in enhancing both crop yield and quality. S is essential for oilseed crops as it improves oil content, seed protein synthesis, and overall productivity. The absence of S application may therefore contribute to yield gaps and reduced seed quality.

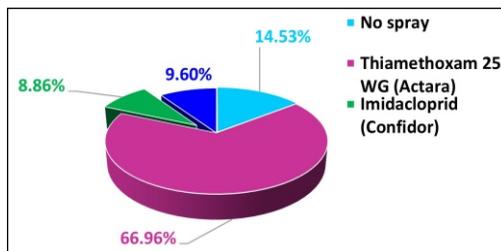
S application	Farmers (%)
No	100
Yes	--

Plant protection: Insect-Pest: From the baseline survey, Mustard aphid (*Lipaphis erysimi*) was the major insect pest reported by 81.28 percent, 8.37 percent reported the attack of the hairy caterpillar (*Spilosoma obliqua*) and no pest attack was reported by 10.34 percent.



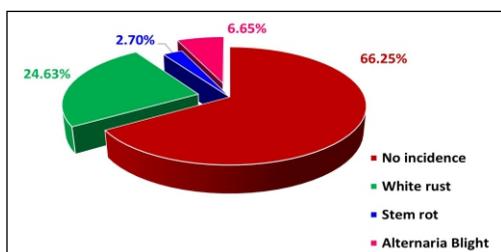
Measures: Survey results indicated that only 14.53 percent of farmers did not adopt any plant protection measures against

insect pests. The majority relied on chemical control, with Thiamethoxam 25 WG (Actara) being the most widely used (66.96%), followed by Dimethoate 30 EC (Rogor) (9.60%) and Imidacloprid (Confidor) (8.86%). Although these insecticides were commonly applied, their use was inconsistent with the recommended dosages, as most farmers applied doses lower than the prescribed levels. This suboptimal application often resulted in inadequate pest control and reduced effectiveness of chemical measures. To ensure effective pest suppression and sustainability, farmers should adhere to the recommended dosages: Thiamethoxam 25 WG (Actara) @ 100 g/ha in 200-300 L of water; Dimethoate 30 EC (Rogor) @ 1L/ha respectively.



Insecticide	Insect Pest management					
	Thiamethoxam 25 WG (Actara)		Dimethoate 30 EC (Rogor)		Imidacloprid (Confidor)	
	Dose	Farmers (%)	Dose	Farmers (%)	Dose	Farmers (%)
Range	0.4-0.9 g/L	72.79	0.4-0.5 ml/L	84.61	0.4 ml	69.44
	1.0-1.5 g/L	27.20	4 ml/L	15.38	1 ml	30.55

Disease: The major diseases observed in the crop were white rust (*Albugo candida*), Alternaria blight (*Alternaria brassicae*), and Sclerotinia stem rot (*Sclerotinia sclerotiorum*), with incidence reported by 24.64, 6.65 and 2.70 percent of farmers, respectively. In contrast, 66.25 percent of farmers reported no significant disease occurrence in their fields.



Measures: In terms of disease management, 69.45 percent of farmers reported not adopting any plant protection measures. Among those who practiced chemical control, the commonly used fungicides included Carbendazim (Bavistin), Azoxystrobin 11% + Tebuconazole 18.3% w/w SC (Custodia), Mancozeb 75% WP (Indofil M-45), Metalaxyl 4% + Mancozeb 64% (Ridomil Gold), and Propiconazole 25% EC (Tilt). Given that white rust was the most prevalent disease, the recommended fungicide for its management is Metalaxyl 4% + Mancozeb 64% (Ridomil Gold) @ 625 g/ha.

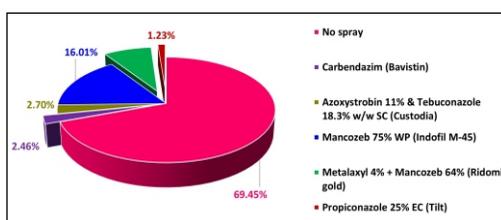
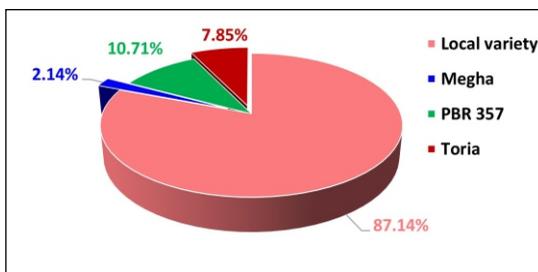


Table 10: Technological modules developed for addressing the major key constraints for rapeseed and mustard cultivation in Punjab

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (GSC 7/PBR 357)
Seed inoculation	Seed inoculation (<i>Azotobacter</i> @ 625 g/ha)
Sowing technique	Line sowing (45 cm)
Nutrient application	S application (Bentonite S @ 32.5 kg/ha)
Plant protection measures	Thiamethoxam 25 WG (Actara) @ 100 g/ha and Metalaxyl 4% + Mancozeb 64% (Ridomil Gold) @ 625 g/ha

HIMACHAL PRADESH (N=140)

Varietal Adoption: Farmers were found to adopt a mixture of varieties, with the local variety being predominantly cultivated (87.14%), followed by PBR 357 (10.71%), Toria (7.85%), and Megha (2.14%). These results indicate a considerable deviation from the recommended varieties (GSC 7 and PBR 357), which may contribute to reduced yield potential and productivity gaps.



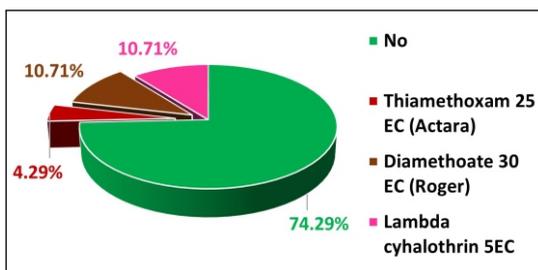
Seed inoculation: Survey findings revealed that none of the farmers (100%) practiced seed inoculation. However, adoption of the recommended practice of seed inoculation with biofertilizers has been demonstrated to significantly enhance seed yield and oil content, thereby improving both crop productivity and quality.

Seed inoculation	Farmers (%)
No	100
Yes	--

Nutrient management: The survey revealed considerable variability in nitrogen (N) management practices among rapeseed and mustard farmers. Approximately 27.85 percent of the farmers reported no application of N to the crop. A small proportion of farmers (15%) applied N at rates below 15 kg/ha, with an average of 14.40 kg/ha. About 16.42 percent of the farmers applied N within the range of 50-100 kg/ha, with a mean dose of 69 kg/ha, which is comparable to the recommended rate of 60 kg/ha. In contrast, the majority (40.71%) applied N at levels exceeding 100 kg/ha, with an average dose of 150.23 kg/ha, indicating substantial over-application relative to the prescribed recommendations. Furthermore, S application was completely neglected, with 100% of the surveyed farmers omitting its use in rapeseed-mustard cultivation.

Application of nutrients				
		N		S
Applied		72.14%		---
Not applied		27.85%		100%
	Dose (kg/ha)	Farmers (%)	Average dose (kg/ha)	
Range	>50 kg	15	14.40	--
	60-100 kg	16.42	69	--
	>100 kg	40.71	150.23	--

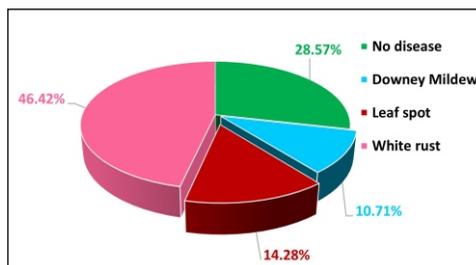
Plant Protection: Insect-Pests: The survey revealed that mustard aphid (*Lipaphis erysimi*) was the sole insect pest of economic significance, being reported by all (100%) of the respondents. Notably, 74.29 percent of the farmers did not adopt any form of plant protection to mitigate aphid infestation. The remaining 25.71 percent implemented various control strategies, with a predominance of chemical insecticides over traditional practices. Specifically, 4.29 percent of farmers used Thiamethoxam 25 WG (Actara), 10.71 percent applied Dimethoate 30 EC (Rogor), and an equal proportion (10.71%) utilized Lambda-cyhalothrin 5 EC. These findings highlight a substantial reliance on synthetic insecticides among



Insecticide	Insect Pest management					
	Thiamethoxam 25 WG (Actara)		Dimethoate 30 EC (Rogor)		Lambda-cyhalothrin 5 EC	
	Dose	Farmers (%)	Dose	Farmers (%)	Dose	Farmers (%)
Range	0.5-1 ml/L	4.28	0.5-1 ml/L	10.71	1 ml/L	10.71

adopting farmers, coupled with a considerable proportion of non-adoption, underscoring gaps in pest management practices.

Disease: The survey indicated that 28.57 percent of the farmers did not report any disease incidence in rapeseed and mustard crop. Among the reported cases, 10.71 percent observed downy mildew (*Peronospora brassicae*), 14.28 percent reported leaf spot, while the majority (46.42%) identified white rust (*Albugo candida*) as the predominant disease. With respect to disease management, control measures were adopted only against white rust. Overall, 79.28 percent of the respondents did not implement any plant protection practices. Among the farmers who adopted control measures, 17.14 percent reported the use of Carbendazim 50 WP (Bavistin), whereas 3.57 percent applied Mancozeb 75% WP (Indofil M-45). These findings highlight limited adoption of plant protection measures, with a strong reliance on chemical fungicides among adopting farmers.



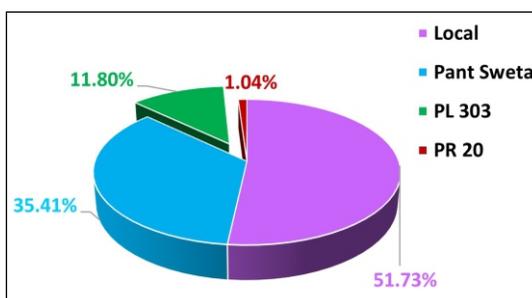
Fungicide	Dose (per L of water)	Farmers (%)
No application	---	79.28%
Carbendazim 50 WP (Bavistin)	2-4 g/L	17.14%
Mancozeb 75% WP (Indofil M-45)	3-4 g/L	3.57%

Table 11: Technological modules developed for addressing the major key constraints for rapeseed and mustard cultivation in Himachal Pradesh

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (GSC 7/PBR 357)
Seed inoculation	Seed inoculation (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed)
Nutrient application	Recommended N (Urea @ 200 kg/ha) and S application (Bentonite S @ 25 kg/ha)
Plant protection measures	Thiamethoxam 25 WG (Actara) @ 100 g/ha and use of yellow sticky traps.

UTARAKHAND (N=288)

Varietal Adoption: Analysis of the survey data revealed that a majority of farmers (51.73%) cultivated local varieties of rapeseed and mustard. Among the improved varieties, Pant Sweta was adopted by 35.41 percent of the respondents, followed by PL 303 (11.80%), while only 1.04 percent reported growing PR 20. The findings indicate a heavy reliance on local landraces, with comparatively limited adoption of recommended improved varieties. This limited varietal replacement not only restricts the realization of higher yield potential but also highlights the need for strengthening varietal dissemination among the farmers.



Seed inoculation: The survey revealed that seed inoculation was completely neglected, with 100 percent of the respondents reporting non-adoption of this practice. This indicates a critical gap in the awareness and adoption of low-cost, yield-enhancing technologies, for improving nutrient use efficiency and crop productivity.

Seed inoculation	Farmers (%)
No	100
Yes	--

Nutrient management: The survey data indicated that the majority of farmers (82.64%) did not apply N to the crop, while only 17.36 percent reported applying N, albeit at rates considerably lower than the recommended dose. Furthermore, none of the respondents applied S, reflecting a complete omission of this essential nutrient in rapeseed-mustard cultivation. These findings highlight significant nutrient management gaps that may contribute to suboptimal crop performance and reduced yield potential.

	Application of nutrients					
	N		P ₂ O ₅		S	
Applied	17.36%		15.63%		---	
Not applied	82.64%		84.38%		100%	
	Dose (kg/ha)	Farmer (%)	Dose (kg/ha)	Farmer (%)	Dose (kg/ha)	Farmer (%)
Range	>50 kg	1.04	57.5 kg	24.44	--	--
	50-80 kg	4.51	80.5 kg	75.56	--	--
	>80 kg	11.81	--	--	--	--

Plant Protection: Insect Pest: The survey revealed that mustard aphid (*Lipaphis erysimi*) was the predominant insect pest infesting rapeseed-mustard crops. For its management, 78.81 percent of the farmers reported not adopting any plant protection measures. Among the adopting farmers, 15.97 percent used Imidacloprid @ 2 ml/L of water, while 5.20 percent applied neem oil @ 5 ml/L of water. However, the recommended control measures for mustard aphid include the application of Thiamethoxam 25 WG (Actara) @ 100 g/ha and neem oil @ 2300 ml/ha. The observed deviation from recommended practices highlights both an over-reliance on limited chemical options and a lack of awareness regarding scientifically validated pest management strategies.

Insecticide	Farmers (%)	
Not applied	78.81%	
Applied	21.19%	
	Dose (per L of water)	Farmers (%)
Imidacloprid	2 ml/L	15.97%
Neem oil	5 ml/L	5.20%

Disease: The survey indicated that 61.81 percent of the farmers did not report any incidence of disease in rapeseed-mustard crops, whereas 38.19 percent observed the occurrence of white rust (*Albugo candida*). With respect to disease management, 88.19 percent of the respondents did not adopt any control measures, while 11.81 percent reported the use of Carbendazim @ 2 g/L of water. The limited adoption of recommended fungicidal practices underscores a lack of disease management strategies among farmers.

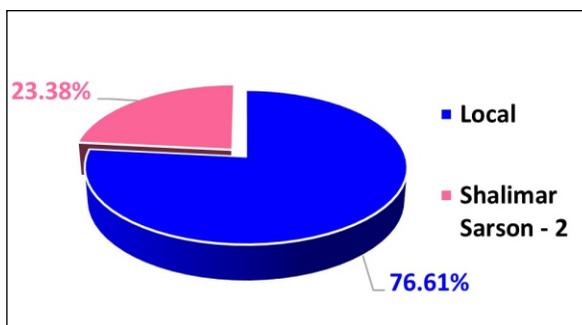
Fungicide	Farmers (%)	
Not applied	88.19%	
Applied	11.81%	
	Dose (per L of water)	Farmers (%)
Carbendazim	2 ml/L	11.81%

Table 12: Technological modules developed for addressing the major key constraints for rapeseed and mustard cultivation in Uttarakhand

Problems Identification	Technological Module
Use of Local varieties	Recommended varieties (Pant Sweta/PT 508)
Seed inoculation	Seed inoculation (<i>Azotobacter</i> + PSB @ 625 g/ha)
Nutrient application	Recommended N (Urea @ 200 kg/ha) and S application (Bentonite S @ 25 kg/ha)
Plant protection measures	Thiamethoxam 25 WG (Actara) @ 100 g/ha and neem oil @ 2300 ml/ha

JAMMU AND KASHMIR (N=278)

Varietal Adoption: The survey revealed that the majority of farmers (76.61%) cultivated local varieties of rapeseed and mustard, while only 23.38 percent adopted the recommended variety Shalimar Sarson 2. The predominance of local landraces and the comparatively limited adoption of improved varieties suggest a significant constraint to realizing the yield potential of the crop. Such reliance on non-recommended cultivars may contribute to reduced productivity and greater vulnerability to biotic and abiotic stresses.



Sowing technique: The analysis of data from the survey revealed that all the respondents (100%) practiced broadcasting as the method of sowing in rapeseed and mustard cultivation. This reflects a complete deviation from the recommended practice of line sowing with a row-to-row spacing of 30 cm. The reliance on broadcasting not only leads to uneven crop stands and higher seed rates but also constrains effective intercultural operations, ultimately reducing crop productivity.

Sowing Technique	Farmers (%)
Broadcasting	100
Line sowing	--

Seed treatment: The analysis of the responses indicated that none of the farmers (100%) practiced seed treatment with the recommended fungicide, Phthalimide (Captan) @ 2-3 g/kg seed. This represents a complete deviation from the prescribed package of practices. The non-adoption of seed treatment not only predisposes the crop to early-stage diseases that lead to reduction of crop productivity.

Seed inoculation	Farmers (%)
No	100
Yes	--

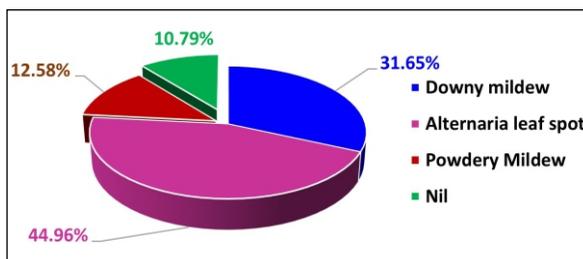
Nutrient Management: It was observed that all farmers (100%) applied N to the crop; however, a majority (55.03%) did not apply P_2O_5 , while 44.96% reported its use. The nutrient doses applied for both N and P_2O_5 deviated considerably from the recommended levels (N @ 80 kg/ha and P_2O_5 @ 50 kg/ha). Among the respondents, 68.34% applied N @ <25 kg/ha (22.85 kg/ha), 15.10% applied between 25-35 kg/ha (29.9 kg/ha), and 16.54% applied @ >35 kg/ha (39.66 kg/ha). With respect to P_2O_5 , 44.96% of farmers applied an average dose of 10 kg/ha, far below the recommended rate. Furthermore, S application was completely neglected, representing a total deviation from the recommended practice of 25 kg/ha. These findings highlight substantial nutrient management gaps, with widespread under-application of essential fertilizers likely contributing to nutrient deficiencies and reduced crop productivity.

Application of nutrients							
		N		P ₂ O ₅		S	
Applied		72.14%		55.03%		---	
Not applied		27.85%		44.96%		100%	
	Dose (kg/ha)	Farmer (%)	Average dose (%)	Dose (kg/ha)	Farmer (%)	Average dose (%)	
Range	>25 kg	68.34%	22.85	5-15 kg	44.96	10	--
	25-35 kg	15.10%	39.66	--	--	--	--
	>35kg	16.54%	39.66	--	--	--	--

Plant protection : Insect-Pest: The incidence of mustard aphid (*Lipaphis erysimi*) was predominantly reported by farmers. To manage the infestation, different insecticidal interventions were adopted. Among them, 44.96% of farmers applied Chlorpyrifos @ 1 ml/L of water, while 21.58 percent used Dimethoate 30 EC (Rogor) @ 80-100 ml/100 L of water. In contrast, 33.46 percent of the farmers did not use any insecticidal measures for aphid control.

Insecticide	Farmers (%)	
Not applied	33.46	
Applied	66.54	
	Dose (per L of water)	Farmers (%)
Chlorpyrifos	1 ml/L	44.96
Dimethoate 30 EC (Rogor)	80-100ml/100 L	21.58

Disease: Survey data revealed that 44.96 percent of farmers reported the incidence of Alternaria leaf spot (*Alternaria brassicae*), 31.65 percent observed downy mildew (*Peronospora brassicae*), and 12.58 percent recorded infections of powdery mildew (*Erysiphe cruciferarum*), while 10.79 percent reported no disease incidence. Notably, despite the prevalence of these diseases, none of the farmers adopted control measures to mitigate further crop damage. This lack of intervention poses a significant risk of yield reduction and may facilitate the persistence and spread of pathogens in subsequent cropping seasons.



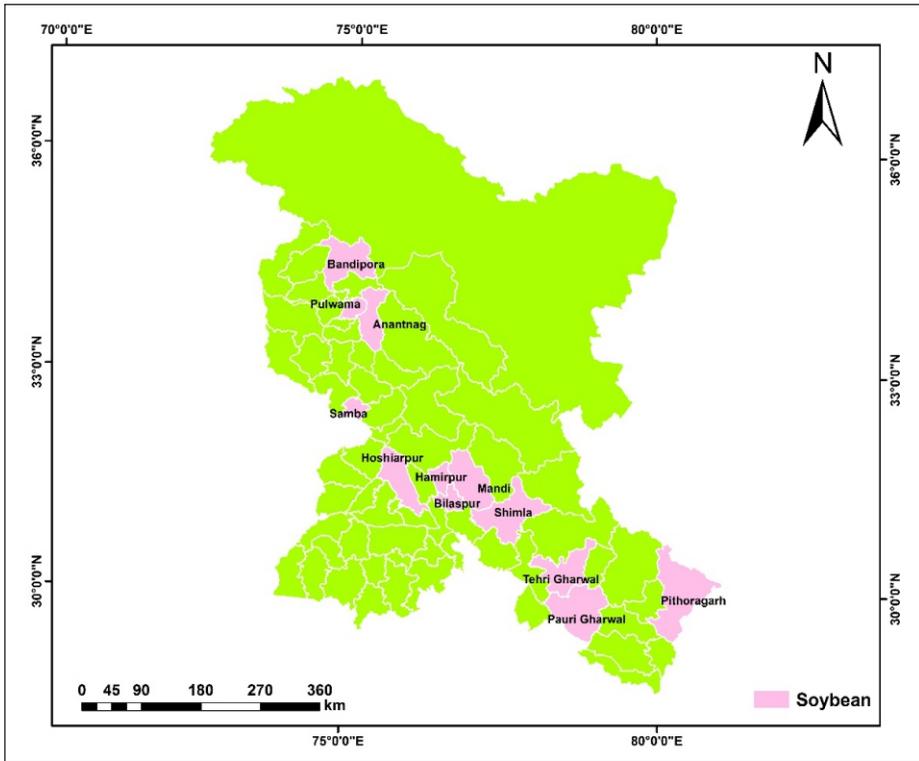


Fig 1. Area allocated for CFLDs on soybean across different KVKs of ICAR-ATARI, Zone-I.

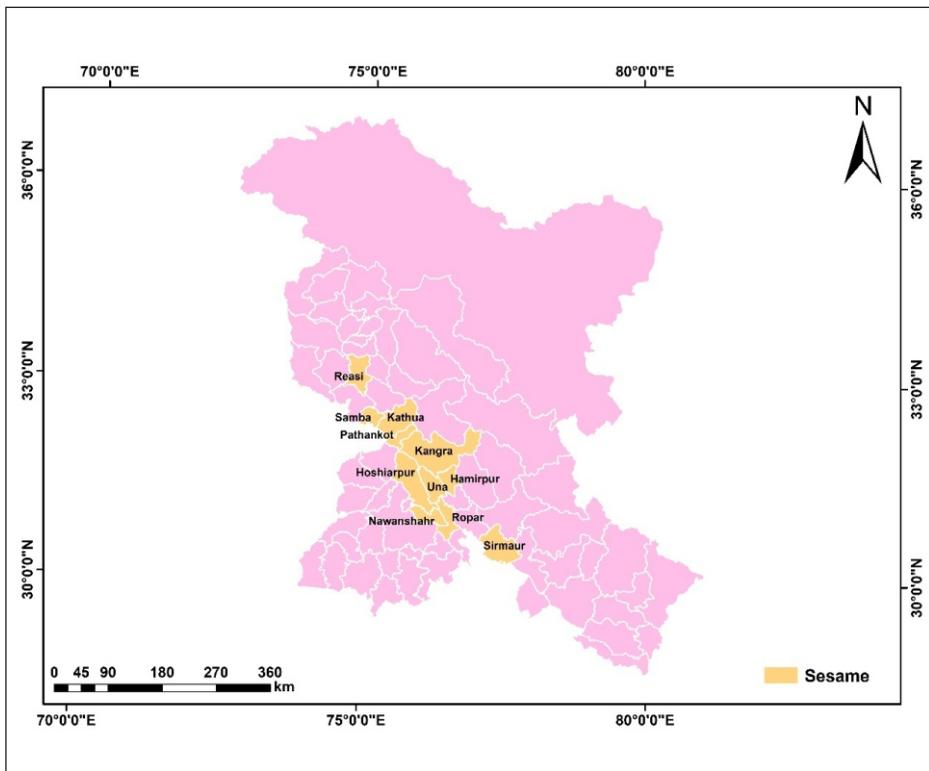


Fig 2. Area allocated for CFLDs on sesame across different KVKs of ICAR-ATARI, Zone-I.

KHARIF OILSEEDS

During the *Kharif* season of 2024-25, a total of 1171 Cluster Frontline Demonstrations (CFLDs) covering 263.70 ha were implemented across Zone-I. For the soybean crop, 50 demonstrations were laid out on 20 ha in Punjab, 162 CFLDs on 31.70 ha in Himachal Pradesh, 253 CFLDs covering 50 ha in Jammu & Kashmir, and 222 CFLDs on 35 ha in Uttarakhand (Fig 1). For sesame, CFLDs were conducted by four KVKs in Punjab, four in Himachal Pradesh, and three in Jammu & Kashmir. In total, 170 CFLDs were

Table 13: Details of CFLDs on oilseeds conducted during *Kharif* season

State	Name of KVK	Crop	Allocated		Conducted	
			Area	Demo	Area	Demo
Punjab	Hoshiarpur	Soybean	20	50	20	50
		Sub-Total	20	50	20	50
Himachal Pradesh	Bilaspur	Soybean	10	25	1.70	8
	Mandi	Soybean	10	25	10	73
	Shimla	Soybean	10	25	10	33
	Hamirpur	Soybean	10	25	10	48
	Sub-Total	40	100	31.70	162	
Jammu & Kashmir	Anantnag	Soybean	10	25	10	25
	Kulgam	Soybean	10	25	10	59
	Pulwama	Soybean	10	25	10	50
	Samba	Soybean	10	25	10	40
	Bandipora-I	Soybean	10	25	10	79
Sub-Total	50	125	50	253		
Uttarakhand	Champawat	Soybean	10	25	10	50
	Pauri Garhwal	Soybean	10	25	10	70
	Pithoragarh	Soybean	10	25	10	50
	Tehri Garhwal	Soybean	10	25	5	52
Sub-Total	40	100	35	222		
Punjab	Hoshiarpur	Sesame	20	50	20	50
	Nawanshahr	Sesame	20	50	8	20
	Pathankot	Sesame	20	50	20	50
	Ropar	Sesame	20	50	20	50
Sub-Total	80	200	68	170		
Himachal Pradesh	Sirmaur	Sesame	10	25	10	76
	Una	Sesame	10	25	10	93
	Kangra	Sesame	10	25	10	26
	Hamirpur	Sesame	10	25	5	14
Sub-Total	40	100	35	209		
Jammu & Kashmir	Reasi	Sesame	10	25	4	40
	Samba	Sesame	10	25	10	40
	Kathua	Sesame	10	25	10	25
Sub-Total	30	75	24	105		
Total (Soybean)			150	375	136.70	687
Total (Sesame)			150	375	127	484
Total <i>Kharif</i>			300	750	263.70	1171

implemented on 68 ha in Punjab, 209 demonstrations on 35 ha in Himachal Pradesh, and 105 CFLDs covering 24 ha in Jammu & Kashmir (Fig 2).

SOYBEAN

PUNJAB

CFLDs were conducted on soybean by KVK Hoshiarpur in Punjab. The demonstrated variety was SL-958, with a total area of 20 ha and 50 demonstrations. The yield recorded for the check plots was 13.33 q/ha, while the demonstrations yielded 17.88 q/ha, indicating a significant percentage increase in yield.



CFLDs on Soybean conducted by KVK Hoshiarpur (PB)

The net returns for the check plots stood at ₹33,054 compared to ₹53,918 for the demonstration plots, reflecting the economic benefits of the demonstrated variety. Additionally, the benefit-cost (B:C) ratio for the check plots was 2.00, while it rose to 2.54 for the demonstration plots, highlighting the financial viability of adopting the demonstrated variety SL-958 for soybean cultivation in the region. The details of CFLDs conducted on soybean by KVK Hoshiarpur are given in Table 14.

Table 14: Details of CFLDs on Soybean conducted in Punjab

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Hoshiarpur	SL 958	20	50	13.33	17.88	34.40
Total		20	50			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Hoshiarpur	SL-958	33054	53918	2.00	2.54

HIMACHAL PRADESH

CFLDs on oilseeds during Kharif season were conducted on soybean by four KVKs in Himachal Pradesh, viz. Bilaspur, Mandi, Shimla and Hamirpur. In Mandi, the demonstrated variety was Palam Soya, with a total area of 10 ha and 73 demonstrations. The yield for check plots was 12.25 q/ha, while the demonstrations yielded 16.07 q/ha, reflecting a percentage increase of 31.18 percent. In Bilaspur, Himso-1685 variety was demonstrated on 1.70 ha and an increase of 32.25 percent was observed in demo plots. Similarly, Harit Soya and Palam Soya variety of soybean was demonstrated by Shimla and Hamirpur on 10 ha area each by organizing 33 and 48 demonstrations respectively. An increase in yield of 26.59 percent in Hamirpur and 20.13 percent in Shimla was recorded in demo plots. The details of CFLDs conducted on soybean in Himachal Pradesh are given in Table 15.

Table 15: Details of CFLDs on Soybean conducted in Himachal Pradesh

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Bilaspur	Himso-1685	1.70	8	12.87	17.02	32.25
Mandi	Palam Soya	10	73	12.25	16.07	31.18
Shimla	Harit Soya	10	33	11.87	14.26	20.13
Hamirpur	Palam Soya	10	48	10.53	13.33	26.59
Total		31.70	162			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Bilaspur	Himso-1685	35728	49923	2.26	2.44
Mandi	Palam Soya	32436	44651	2.14	2.26
Shimla	Harit Soya	28576	35643	1.94	2.01
Hamirpur	Palam Soya	21864	30800	1.72	1.87

In the participating KVKs, all reflected higher net returns and higher B:C ratio in demo plots as compared to the checks. A total of 162 demonstrations were conducted on 31.70 ha area on soybean.



CFLDs on Soybean in Bilaspur (HP)



Line sowing of Soybean in Mandi (HP)

UTTARAKHAND

Soybean demonstrations conducted by four KVKs in Uttarakhand highlighted the benefits of improved varieties over traditional practices. The total area covered was 35 ha across 222 demonstrations, improved

Table 16: Details of CFLDs on Soybean conducted in Uttarakhand

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Champawat	Pant Soybean-25	10	50	12.15	14.66	20.63
Pauri Garhwal	VL Soya 89 (VLS 89)	10	70	10.83	13.63	25.85
Pithoragarh	JS-2098	10	50	12.03	14.98	24.52
Tehri Garhwal	Pant Soybean-25	5	52	11.89	14.28	20.06
Total		35	222			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Champawat	Pant Soybean-25	29700	39478	1.97	2.18
Pauri Garhwal	VL Soya 89 (VLS 89)	23525	34957	1.77	2.06
Pithoragarh	JS-2098	29328	41180	1.96	2.23
Tehri Garhwal	Pant Soybean-25	29051	37836	1.96	2.14

varieties Pant Soybean-25, VL Soya 89, and JS-2098 were demonstrated. In Champawat, Pant Soybean-25 showed a 20.63 percent yield increase, while Tehri Garhwal also recorded an increase of 20.06 percent with the same variety. KVK Pauri Garhwal achieved the highest gain, with VL Soya 89 boosting yields by 25.85 percent. Pithoragarh, using JS-2098, showed an increase of 24.52 percent. The net returns per hectare were consistently higher in demonstration plots across all districts. For instance, in Champawat, returns increased from ₹29,700 to ₹39,748, and the B:C ratio rose from 1.97 to 2.18. Similar trends were observed in Pauri Garhwal, Pithoragarh, and Tehri Garhwal, highlighting improved profitability with improved soybean varieties (Table 16).



Farmer participating in CFLDs demonstration on soybean

JAMMU & KASHMIR

The data presents the results of 253 CFLDs conducted by KVKs in five districts of Jammu and Kashmir viz., Anantnag, Kulgam, Pulwama, Samba, and Bandipora-I on 50 ha focusing on different soybean varieties. Shalimar Soybean-2 (SS 2) was the most widely demonstrated variety, in Anantnag, Kulgam, and Bandipora-I. The highest yield increase was observed in Anantnag, where SS 2 outperformed local practices by 25.49 percent. Pulwama also recorded a yield improvement of 19.59 percent using Shalimar Soybean-1. In terms of economics, Anantnag achieved the highest net return (₹35,466/ha) and benefit-cost ratio (2.04), indicating the strong profitability of Shalimar Soybean-I in that region. From an economic

Table 17: Details of CFLDs on Soybean conducted in Jammu & Kashmir

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Anantnag	Shalimar Soybean-2 (SS 2)	10	25	11.13	13.97	25.49
Kulgam	Shalimar Soybean-2 (SS 2)	10	59	11.51	13.63	18.39
Pulwama	Shalimar Soybean-1 (SS-1)	10	50	11.05	13.22	19.59
Samba	SL-958	10	40	10.56	12.27	16.19
Bandipora-I	Shalimar Soybean-2 (SS 2)	10	79	11.47	13.52	17.84
Total		50	253	11.14	13.41	20.37

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Anantnag	Shalimar Soybean-2 (SS 2)	24034	35466	1.77	2.04
Kulgam	Shalimar Soybean-2 (SS 2)	26835	33867	1.88	2.00
Pulwama	Shalimar Soybean-1 (SS-1)	23420	31561	1.74	1.92
Samba	SL-958	23033	30582	1.73	1.93
Bandipora-I	Shalimar Soybean-2 (SS 2)	26556	33299	1.87	1.98

perspective, Anantnag achieved the highest net return (₹35,466/ha) and benefit-cost ratio (2.04), indicating superior profitability of the demonstration plots over the farmers (Table 17).

SESAME

Apart from soybean, sesame was second crop demonstrated by the KVKs under CFLDs on oilseeds during *Kharif* season of 2024-25 was sesame. The state wise details of performance of demonstrations on sesame are given below:

PUNJAB

CFLDs on sesame were conducted by four KVKs i.e. Hoshiarpur, Pathankot, Ropar and Nawanshahr in Punjab (Table 18). The improved variety Punjab Til No. 2 of sesame was demonstrated by four KVKs conducting 170 demonstrations on 68 ha area. Among these, the maximum percentage increase in yield (36.48 %) was recorded by KVK Pathankot, with a demonstration yield of 5.20 q/ha. Along with that, a higher net returns and B:C ratio was recorded in demonstrated plots as compare to the local checks. In contrast, least increase yield (13.46 %) was observed in Hoshiarpur. Apart from this, a percentage increase of 25.41 percent and 20.39 percent in yield in demonstrated plots was recorded in Ropar and Nawanshahr respectively.

Table 18: Details of CFLDs on Sesame conducted in Punjab

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Nawanshahr	Punjab Til No.2	8	20	4.56	5.49	20.39
Pathankot	Punjab Til No.2	20	50	3.80	5.20	36.48
Ropar	Punjab Til No.2	20	50	4.25	4.53	25.41
Hoshiarpur	Punjab Til No.2	20	50	5.20	5.90	13.46
Total		68	170			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Nawanshahr	Punjab Til No.2	13720	17710	1.75	1.85
Pathankot	Punjab Til No.2	7800	14450	1.41	1.66
Ropar	Punjab Til No.2	11510	16220	1.63	1.77
Hoshiarpur	Punjab Til No.2	16144	19122	1.80	1.86



CFLDs on sesame in Hoshiarpur and Ropar (PB)

HIMACHAL PRADESH

A total of 209 CFLDs were conducted on 35 ha area on sesame by five KVKs Sirmaur, Una, Hamirpur and Kangra in Himachal Pradesh during *Kharif* season of 2024-25. The two improved varieties of sesame

LTK-4 and PB Til No 2 were demonstrated by the KVKs on farmers' fields. The maximum increase in average yield was observed in Sirmaur district (21.69%) followed by Hamirpur (17.24%), Kangra (14.68%) and Una (8.53%). Along with an increase in the yield a higher net returns and higher B:C ratio was recorded in demonstrated plots as compared to the local check plots (Table 19).

Table 19: Details of CFLDs on Sesame conducted in Himachal Pradesh

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Sirmaur	Punjab Til No.2	10	76	3.62	4.41	21.69
Una	Punjab Til No.2	10	93	3.75	4.07	8.53
Hamirpur	Punjab Til No.2	5	14	3.48	4.08	17.24
Kangra	LTK-4	10	26	4.02	4.61	14.68
Total		35	209			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Sirmaur	Punjab Til No.2	2925	6979	1.13	1.29
Una	Punjab Til No.2	3890	4890	1.17	1.21
Hamirpur	Punjab Til No.2	3820	6080	1.19	1.27
Kangra	LTK-4	7293	10035	1.35	1.45



CFLDs on sesame in Hamirpur and Sirmaur district (HP)

JAMMU & KASHMIR

In *Kharif* season of 2024-25, 105 demonstrations on 24 ha area were conducted on sesame by KVK Reasi, Samba and Kathua in Jammu & Kashmir demonstrating the improved variety RT-372 by KVK

Table 20: Details of CFLDs on Sesame conducted in Jammu and Kashmir

Name of KVK	Variety Demonstrated	Area (ha)	Demo (No.)	Yield (q/ha)		% increase
				Check	Demo	
Reasi	RT-372	4	40	3.65	4.33	18.63
Samba	GJT-6	10	40	3.89	4.29	10.15
Kathua	GJT-6	10	25	3.35	4.09	21.94
Total		24	105			

Name of KVK	Variety demonstrated	Net Returns (₹/ha)		B: C Ratio	
		Check	Demo	Check	Demo
Reasi	RT-372	3910	6126	1.18	1.27
Samba	GJT-6	5660	7930	1.26	1.36
Kathua	GJT-6	3080	5460	1.15	1.22

Reasi and GJT-6 by KVK Samba and Kathua. A yield increase of 21.94 percent was observed in Kathua while 18.63 percent in Reasi and 10.15 percent in Samba district in demonstration plots as compared to the checks. Similar increase was observed in net returns and B: C ratio. These results highlight the effectiveness of GJT- 6 and RT-372 varieties in enhancing both yield and profitability within the region. The details of CFLDs conducted on sesame in Jammu & Kashmir are given in Table 20.



Scientists of KVK Reasi (HP) assessing the field performance of improved sesame variety



Scientists of KVK Reasi (HP) interacting with women farmers at Gunn village to promote scientific techniques for sesame cultivation



Scientists of KVK Hoshiarpur (PB) assessing the performance of Sesame CFLD



Field day on Sesame conducted by scientists of KVK Ropar (PB)

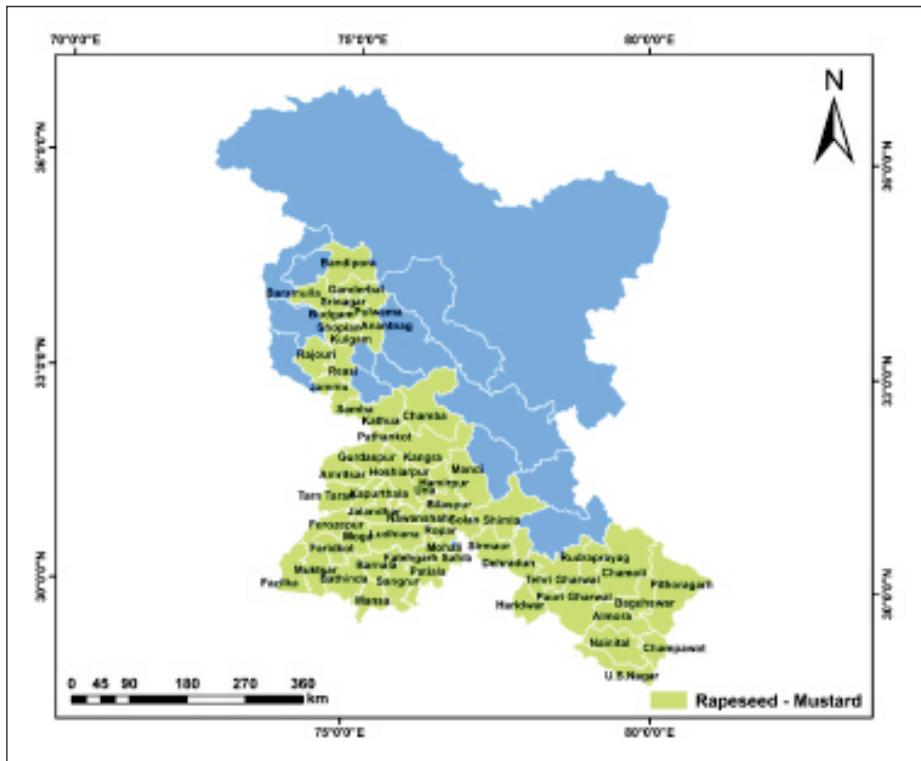


Fig 1. Area allocated for CFLDs on rapeseed and mustard across different KVKs of ICAR-ATARI, Zone-I.

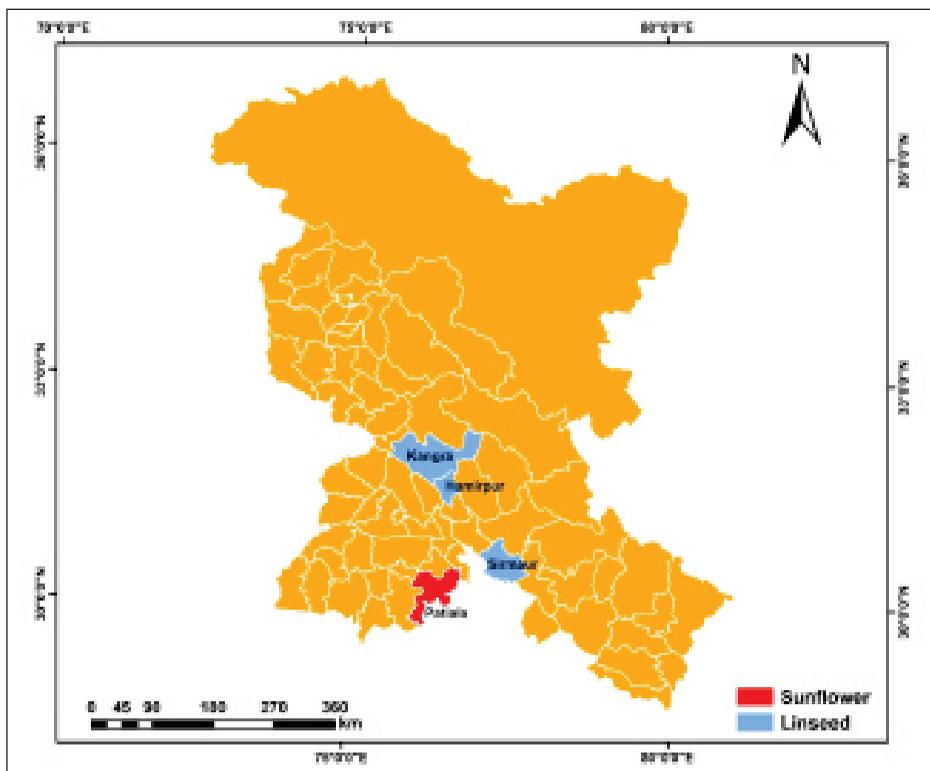


Fig 4. Area allocated for CFLDs on Linseed and Sunflower across different KVKs of ICAR-ATARI, Zone-I.

RABI & SUMMER OILSEEDS

During the *Rabi* season, a total of 6,800 demonstrations were allocated, covering an area of 2,720 ha. Against this target, 8377 demonstrations on oilseeds were actually conducted on an area of 2542 ha. These demonstrations were distributed across four states viz., Punjab, Himachal Pradesh, Uttarakhand, and Jammu & Kashmir. In Punjab, 2726 demonstrations on 1,117 ha were conducted, followed by 1,332 demonstrations on 350 ha in Himachal Pradesh, 1746 demonstrations on 399 ha in Uttarakhand, and 2498 demonstrations on 655 ha in Jammu & Kashmir. (Table 21).

Table 21: Details of CFLDs on oilseeds conducted during the *Rabi* and Summer season

State	Name of KVK	Crop	Targets		Achievements	
			Area (ha)	Demo (Nos.)	Area (ha)	Demo (Nos.)
Punjab	Amritsar	R & M	50	125	50	125
	Bathinda	R & M	70	175	70	177
	Faridkot	R & M	50	125	47	117
	Fatehgarh Sahib	R & M	50	125	50	125
	Ferozepur	R & M	50	125	50	125
	Gurdaspur	R & M	50	125	50	125
	Hoshiarpur	R & M	50	125	50	125
	Jalandhar	R & M	50	125	50	81
	Kapurthala	R & M	50	125	50	125
	Ludhiana	R & M	50	125	50	125
	Mansa	R & M	50	125	50	125
	Moga	R & M	50	125	50	125
	Muktsar	R & M	50	125	50	125
	Nawanshahr	R & M	50	125	50	77
	Pathankot	R & M	50	125	50	125
	Patiala	R & M	50	125	50	125
	Ropar	R & M	50	125	50	128
	Sangrur	R & M	50	125	50	125
	Barnala	R & M	50	125	50	140
	Mohali	R & M	50	125	50	131
Tarn Taran	R & M	50	125	50	125	
Fazilka	R & M	50	125	50	125	
Sub-Total			1120	2800	1117	2726
Himachal Pradesh	Bilaspur	R & M	40	100	40	136
	Hamirpur	R & M	40	100	40	61
	Kangra	R & M	40	100	40	100
	Mandi	R & M	20	50	20	117
	Sirmaur	R & M	40	100	40	240
	Una	R & M	70	175	70	374
	Chamba	R & M	40	100	40	114
	Shimla	R & M	20	50	20	55
	Solan	R & M	40	100	40	135
Sub-Total			350	875	350	1332

State	Name of KVK	Crop	Targets		Achievements	
			Area (ha)	Demo (Nos.)	Area (ha)	Demo (Nos.)
Uttarakhand	Almora	R & M	40	100	40	100
	Chamoli	R & M	20	50	20	100
	Champawat	R & M	20	50	20	85
	Dehradun	R & M	40	100	40	125
	Haridwar	R & M	40	100	40	100
	Nainital	R & M	40	100	40	150
	Pithoragarh	R & M	40	100	32	250
	Rudraprayag	R & M	40	100	7	35
	Udham Singh Nagar	R & M	40	100	40	76
	Pauri Garhwal	R & M	40	100	40	93
	Tehri Garhwal	R & M	40	100	40	333
	Bageshwar	R & M	40	100	40	299
Sub-Total			440	1100	399	1746
Jammu & Kashmir	Jammu	R & M	70	175	40	388
	Kathua	R & M	40	100	40	100
	Rajouri	R & M	40	100	20	175
	Reasi	R & M	40	100	40	145
	Samba	R & M	50	125	50	126
	Anantnag	R & M	50	125	50	130
	Bandipora	R & M	40	100	40	100
	Budgam	R & M	50	125	50	363
	Kulgam	R & M	70	175	70	277
	Pulwama	R & M	70	175	70	225
	Srinagar	R & M	70	175	35	87
	Ganderbal	R & M	50	125	50	125
	Shopian	R & M	50	125	50	172
	Baramulla	R & M	50	125	50	85
Sub-Total			740	1850	655	2498
Punjab	Fatehgarh Sahib	Sunflower	20	50	0	0
	Patiala	Sunflower	10	25	4	10
Jammu and Kashmir	Bandipora	Sunflower	10	25	0	0
Sub-Total			40	100	4	10
Himachal Pradesh	Hamirpur	Linseed	10	25	5	21
	Kangra	Linseed	10	25	10	30
	Sirmaur	Linseed	10	25	2	14
Sub-Total			30	75	17	65
Total (R & M)			2650	6625	2521	8302
Total (Sunflower)			40	100	4	10
Total (Linseed)			30	75	17	65
Total (Rabi)			2720	6800	2542	8377

Technological modules for addressing key constraints in oilseed cultivation

Technological modules were strategically developed after systematic problem identification across Punjab, Himachal Pradesh, Uttarakhand and Jammu & Kashmir. The region-specific

challenges included low productivity of local varieties, delayed sowing, use of non-recommended seed rates, and inadequate nutrient and pest management practices. To address these constraints, modules integrating improved varieties, line sowing, balanced nutrient management, and integrated plant protection measures were implemented. The adoption of these tailored technological interventions under CFLDs led to enhanced crop performance, reflected in higher productivity and improved resource-use efficiency. Overall, these modules demonstrated their effectiveness in strengthening the profitability and sustainability of oilseed cultivation across diverse agro-ecological conditions.

RAPESEED AND MUSTARD

PUNJAB

A total of 2,726 CFLDs on rapeseed and mustard were conducted across an area of 1,117 ha by different KVKs of Punjab. The demonstrations were implemented through diverse technological assemblage, which included the use of improved varieties coupled with integrated crop management practices, tailored to the conditions of various districts. The details of these modules along with the performance results for each KVK are presented below:

AMRITSAR

CFLDs on oilseeds conducted by KVK Amritsar showed that improved production modules outperformed traditional practices in rapeseed-mustard. Farmers' practice yielded 17.50 q/ha (₹62,250/ha; B:C ratio- 2.59), while GSC 7 with biofertilizer increased yield by 7.14 percent to 18.75 q/ha (B:C ratio -2.74). Adding Bentonite S raised yield to 20.00 q/ha (B:C ratio- 2.84), and the integrated module with biofertilizer, Bentonite S, and quinalphos achieved the maximum yield of 21.25 q/ha (18.75% increase), net returns of ₹82,398/ha, alongwith B:C ratio of 3.02 (Table 22).

BARNALA

CFLDs on Oilsseds at KVK Barnala demonstrated that improved technological modules outperformed farmers' practice in rapeseed-mustard (Table 23). Farmers' practice yielded 16.80 q/ha (₹64,319/ha; B:C

Table 22: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Amritsar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Amritsar	Farmers plot	Local variety+ Broadcasting + Fertilizer application	17.50	----	39250	101500	62250	2.59
		Variety (GSC 7)+Biofertilizer (625 g/ha)	18.75	7.14	39715	108750	69035	2.74
		Variety (GSC 7)+Biofertilizer (625 g/ha) Bentonite Sulphur (32.5 kg/ha)	20.00	13.33	40778	116000	75223	2.84
	Demo plot	Variety (GSC 7)+Biofertilizer (625 g/ha) + Bentonite Sulphur (32.5kg/ha) + Quinalphos 25 EC (Ekalux @ 625 ml/ha)	21.25	18.75	41563	123250	81687	2.97

ratio-2.94), while GSC 7 with biofertilizer increased yield by 12.50 percent to 18.90 q/ha (B:C ratio- 3.20). Adding gypsum raised yield to 19.62 q/ha (B:C ratio-3.27), and the integrated module with biofertilizer, gypsum, and pest management achieved the highest yield of 20.37 q/ha (21.25% increase), along with high economic returns.

Table 23: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Barnala

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Barnala	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.80	----	33121	97440	64319	2.94
		Variety (GSC 7)+Biofertilizer (625 g/ha)	18.90	12.50	34298	109620	75323	3.20
	Demo plot	Variety (GSC 7)+Biofertilizer (625 g/ha) + Gypsum (200 kg/ha)	19.62	16.79	34860	113825	78965	3.27
		Variety (GSC 7)+Biofertilizer (625 g/ha)+Gypsum (200 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	20.37	21.25	35798	118175	82378	3.30

BATHINDA

KVK Bathinda demonstrated that improved technological modules outperformed traditional practices in rapeseed-mustard. Farmers' practice yielded 17.68 q/ha (Net returns- ₹60,088/ha; B:C ratio- 2.42), while

Table 24: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Bathinda

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Bathinda	Farmers plot	Local variety+ Broadcasting + Fertilizer application	17.68	----	42456	102544	60088	2.42
		Variety (PBR 357)+ Biofertilizer (625 g/ha)	19.50	10.29	43644	113100	69456	2.59
	Demo plot	Variety (PBR 357)+ Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	19.85	12.27	43685	115130	71445	2.64
		Variety (PBR 357)+ Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+ Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.25	20.19	44415	123250	78835	2.77

PBR 357 with biofertilizer increased yield by 10.29 percent to 19.50 q/ha (B:C ratio- 2.59). Adding Bentonite S raised yield to 19.85 q/ha while the integrated module with biofertilizer, Bentonite S, and pest management achieved the highest yield of 21.25 q/ha (20.19% increase), net returns ₹78,835/ha, and B:C ratio of 2.77 (Table 24).

FARIDKOT

CFLDs on oilseeds demonstrated by KVK Faridkot showed improved technological modules outperformed traditional practices in rapeseed-mustard. Farmers' practice yielded 15.95 q/ha (Net returns-₹50,852/ha; B:C ratio- 2.22), while GSC 7 with biofertilizer increased yield by 7.37 percent to 17.13 q/ha (B:C ratio 2.33). Adding Bentonite S raised yield to 12.07 percent, and the integrated module achieved the highest yield of 18.90 q/ha (18.50% increase), net returns ₹65,123/ha, and B:C ratio of 2.46 (Table 25).

Table 25: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Faridkot

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Faridkot	Farmers plot	Local variety + Broadcasting + Fertilizer application	15.95	----	41658	92510	50852	2.22
		Variety (GSC 7)+Biofertilizer (625 g/ha)	17.13	7.37	42615	99325	56710	2.33
	Demo plot	Variety (GSC 7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	17.875	12.07	43175	103675	60500	2.40
		Variety (GSC 7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	18.9	18.50	44498	109620	65123	2.46

FATEHGARH SAHIB

CFLDs on rapeseed and mustard at KVK Fatehgarh Sahib showed that improved crop management enhanced crop performance over farmers' practice (18.26 q/ha; Net returns-₹73,848/ha; B:C ratio- 3.30). GSC 7 with biofertilizer increased yield to 20.38 q/ha (B:C ratio -3.54), and adding Bentonite S further improved it by 12.95 percent. The full package achieved the highest yield of 21.88 q/ha (19.80% increase) with a B:C ratio of 3.67 (Table 26).

FEROZEPUR

Under the CFLDs on oilseeds conducted by KVK Ferozepur, the farmers' practice using a local variety recorded a yield of 18.44 q/ha (Net returns ₹74,225/ha; B:C ratio 3.27). The Adoption of GSC 7 with biofertilizer increased yield to 22.38 q/ha (21.35% increase), and adding Bentonite S raised it to 23.13 q/ha (B:C ratio -3.92). The full package combining biofertilizer, Bentonite S, and pest management achieved the highest yield of 23.78 q/ha (28.97% increase), net returns of ₹1,01,927/ha, and B:C ratio of 3.90, highlighting the effectiveness of integrated crop management (Table 27).

Table 26: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Fatehgarh Sahib

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Fatehgarh Sahib	Farmers plot	Local variety + Broadcasting + Fertilizer application	18.26	----	32060	105908	73848	3.30
		Variety (GSC 7)+Biofertilizer (625 g/ha)	20.38	11.58	33412	118175	84763	3.54
	Demo plot	Variety (GSC 7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.62	12.95	33912	119625	85713	3.53
		Variety (GSC 7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.88	19.80	34578	126875	92297	3.67

Table 27: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Ferozepur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Ferozepur	Farmers plot	Local variety + Broadcasting + Fertilizer application	18.44	----	32719	106944	74225	3.27
		Variety (GSC7)+Biofertilizer (625 g/ha)	22.38	21.35	33649	129775	96126	3.86
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha)+Bentonite S (32.5 kg/ha)	22.95	24.47	34225	133110	98885	3.89
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	23.78	28.97	35388	137924	102536	3.90

GURDASPUR

At KVK Gurdaspur, rapeseed and mustard responded positively to improved technological modules (Table 28). Farmers' practice produced 16.98 q/ha (net return ₹62,471/ha; B:C ratio 2.73), while GSC 7 with biofertilizer increased yield by 3.06 percent. Adding Bentonite S raised yield to 20.25 q/ha (net return ₹80,325/ha), and the highest productivity (21.72 q/ha; 27.92% increase) with GSC 7 under integrated management achieved a net return of ₹87,730/ha and B:C 3.29.

Table 28: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Gurdaspur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Gurdaspur	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.98	---	36013	98484	62471	2.73
		Variety (GSC7)+Biofertilizer (625 g/ha)	17.50	3.06	36577	101500	64923	2.77
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.25	19.26	37125	117450	80325	3.16
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.72	27.92	38246	125976	87730	3.29

HOSHIARPUR

Rapeseed and mustard yield improved significantly under demonstration modules compared to farmers' practice (15.97 q/ha; Net returns ₹50,176/ha; B:C ratio 2.18). GSC 7 with biofertilizer increased yield by 14.28 percent, and adding Bentonite S raised it by 18.97 percent. Maximum productivity (19.50 q/ha; 22.10% increase) and profitability (Net returns ₹68,143/ha; B:C ratio 2.52) were achieved with GSC 7 combined with biofertilizer, Bentonite S, and fungicidal-insecticidal treatment (Table 29).

Table 29: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Hoshiarpur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Hoshiarpur	Farmers plot	Local variety + Broadcasting + Fertilizer application	15.97	---	42450	92626	50176	2.18
		Variety (GSC7)+Biofertilizer (625 g/ha)	18.25	14.28	43417	105850	62433	2.44
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	19.00	18.97	44125	110200	66075	2.50
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	19.50	22.10	44957	113100	68143	2.52

JALANDHAR

The adoption of improved technological modules significantly enhanced yield and economic returns over farmers' practice (Table 30). While the local variety yielded 16.25 q/ha (Net returns ₹60,627/ha; B:C ratio 2.80), GSC7 with biofertilizer increased yield to 18 q/ha and net return to ₹70,072/ha (B:C ratio 3.04). The highest yield of 20.38 q/ha (Net returns ₹82,415/ha) was achieved with GSC 7 combined with biofertilizer, Bentonite S, and pest management, showing the benefits of integrated nutrient and pest management practices.

Table 30: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Jalandhar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Jalandhar	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.25	---	33623	94250	60627	2.80
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha)	18.00	10.77	34328	104400	70072	3.04
		Variety (GSC7)+ Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	19.13	17.72	34947	110954	76007	3.17
		Variety (GSC7)+Biofertilizer (625 g/ha)+Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4%+mancozeb 64% (Ridomil Gold @ 625 g/ha)	20.38	25.42	35789	118204	82415	3.30

KAPURTHALA

CFLDs on rapeseed and mustard conducted by KVK Kapurthala showed higher yield and returns with improved practices over farmers' practice (16.30 q/ha; B:C ratio 2.43). Adoption of GSC 7 with

Table 31: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Kapurthala

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Kapurthala	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.30	---	38960	94540	55580	2.43
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha)	19.75	21.17	39852	114550	74698	2.87
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.55	26.07	40452	119190	78738	2.95
		Variety (GSC7)+Biofertilizer (625 g/ha)+Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4%+mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.65	32.82	41588	125570	83983	3.02

biofertilizer and Bentonite S enhanced yield up to 20.55 q/ha, while integrated crop management achieved the highest yield (21.65 q/ha; 32.82% increase) with net returns of ₹83,983/ha and B:C ratio of 3.02 (Table 31).

LUDHIANA

The demonstrations conducted by KVK Ludhiana with the adoption of technological modules significantly enhanced yield and profitability over farmers' practice (19.72 q/ha, B:C 3.23) at KVK Ludhiana. Yield improved with biofertilizer (20.38 q/ha) and Bentonite Sulphur (21.33 q/ha), while the full package of practices achieved the highest yield (22.63 q/ha), maximum net returns (₹93,562/ha), and B:C ratio (3.48) (Table 32).

Table 32: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Ludhiana

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Ludhiana	Farmers plot	Local variety + Broadcasting + Fertilizer application	19.72	---	35390	114376	78986	3.23
		Variety (GSC7)+Biofertilizer (625 g/ha)	20.38	3.32	36256	118175	81919	3.26
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	21.33	8.14	36854	123685	86831	3.36
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	22.63	14.73	37663	131225	93562	3.48

MANSA

At KVK Mansa, the farmers' practice yielded 16.06 q/ha with a B:C ratio of 2.87, while improved variety PBR 357 with biofertilizer and inputs enhanced yield up to 21.15 q/ha, showing a 31.69 percent increase. The highest net return (₹87,296/ha) and improved B:C ratio confirmed the significance of integrated technological modules over local practices (Table 33).

MOGA

The CFLDs on rapeseed-mustard conducted in Moga district demonstrated that the adoption of improved technological modules significantly enhanced the crop's performance (Table 34). Farmers' practice yielded 15.85 q/ha (Net returns ₹59,067/ha; B:C ratio 2.80), while GSC 7 with biofertilizer increased yield by 20.98 percent (B:C ratio 3.26). Adding Bentonite S further raised yield to 20.80 q/ha (B:C ratio 3.49), and the integrated module with biofertilizer, Bentonite S, and pest management achieved the highest yield of 21.68 q/ha (36.75% increase), net returns ₹90,087/ha, and B:C ratio of 3.53.

Table 33: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Mansa

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Mansa	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.06	----	32500	93148	60648	2.87
		Variety (PBR 357)+Biofertilizer (625 g/ha)	19.00	18.31	33489	110200	76711	3.29
	Demo plot	Variety (PBR 357)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.50	27.65	34118	118900	84782	3.48
		Variety (PBR 357)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.15	31.69	35374	122670	87296	3.47

Table 34: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Moga

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Moga	Farmers plot	Local variety + Broadcasting + Fertilizer application	15.85	----	32863	91930	59067	2.80
		Variety (GSC7)+Biofertilizer (625 g/ha)	19.18	20.98	34152	111215	77063	3.26
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.80	31.23	34587	120640	86053	3.49
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	21.68	36.75	35628	125715	90087	3.53

MOHALI

A significant improvement in crop yield was observed in Mohali district by demonstrating improved technological modules when compared to farmers' practice (Table 35). The farmers practices yielded 16.72 q/ha (Net returns ₹59,173/ha; B:C ratio 2.57), while GSC 7 with biofertilizer increased yield to 18.90 q/ha (B:C ratio 2.84). Incorporating Bentonite S further raised yield to 19.25 q/ha (B:C ratio 2.85), and the integrated module achieved the highest yield of 19.87 q/ha (18.84% increase) and net returns of ₹75,290/ha (B:C ratio-2.88).

Table 35: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Mohali

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Mohali	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.72	----	37803	96976	59173	2.57
		Variety (GSC7)+Biofertilizer (625 g/ha)	18.90	13.04	38655	109620	70965	2.84
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	19.25	15.13	39124	111650	72526	2.85
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	19.87	18.84	39956	115246	75290	2.88

PATHANKOT

The farmers' practice yielded 13.90 q/ha (Net returns ₹50,033/ha; B:C ratio 2.64), while GSC 7 with biofertilizer increased yield to 16.85 q/ha (B:C 3.09). Adding Bentonite S raised yield to 17.13 q/ha, and the integrated module with biofertilizer, Bentonite S, and pest management achieved the highest yield of 17.89 q/ha (28.71% increase) and net returns of ₹70,347/ha (B:C ratio 3.11). Thus, resulting in a significant advantage in terms of both yield and profitability (Table 36).

Table 36: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Pathankot

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Pathankot	Farmers plot	Local variety + Broadcasting + Fertilizer application	13.90	----	30587	80620	50033	2.64
		Variety (GSC7)+Biofertilizer (625 g/ha)	16.85	21.22	31597	97730	66133	3.09
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	17.13	23.20	32158	99325	67167	3.09
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	17.89	28.71	33415	103762	70347	3.11

PATIALA

The CFLDs on oilseed conducted in Patiala district revealed that improved technological modules enhanced rapeseed-mustard yield and profitability compared to farmers' practice (18.66 q/ha; Net returns ₹75,372/ha; B:C ratio 3.29). GSC 7 with biofertilizer increased yield to 19.25 q/ha (B:C ratio 3.32), and adding Bentonite S further raised it to 19.75 q/ha (B:C ratio 3.35). The integrated module with biofertilizer, Bentonite S, and pest management achieved the highest yield of 20.55 q/ha (10.13% increase) and net returns of ₹83,927/ha (B:C ratio 3.38) (Table 37).

Table 37: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Patiala

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio	
KVK Patiala	Farmers plot	Local variety + Broadcasting + Fertilizer application	18.66	---	32856	108228	75372	3.29	
		Variety (GSC7)+Biofertilizer (625 g/ha)	19.25	3.16	33623	111650	78027	3.32	
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	19.75	5.84	34236	114550	80314	3.35	
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	20.55	10.13	35263	119190	83927	3.38	

ROPAR

The yield and profitability were enhanced by demonstrating technological modules in district Ropar in CFLDs on oilseeds when compared to farmers' practices (16.42 q/ha; Net returns ₹61,952/ha; B:C ratio 2.86). Varietal adoption (GSC 7) with biofertilizer raised yield to 17.35 q/ha (B:C ratio 2.97), and adding Bentonite S further increased it to 17.94 q/ha (B:C ratio 3.02). The integrated module achieved the highest yield of 18.75 q/ha (14.19% increase) and net returns of ₹73,267/ha (B:C ratio 3.06) (Table 38).

SANGRUR

The demonstrations conducted by KVK Sangrur revealed a consistent improvement in yield and profitability over the farmers' practice. Adoption of improved variety (GSC 7) with biofertilizer enhanced yield by 10.09 percent, while the integration of Bentonite S further increased productivity by 14.46 percent. The complete technological package, including biofertilizer, Bentonite S, and plant protection chemicals, recorded the highest yield (22.42 q/ha) with 19.64 percent increase, maximum net return (₹96,247/ha), and highest B:C ratio (3.85), thereby confirming the superiority of integrated input management over conventional practices (Table 39).

Table 38: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Ropar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Ropar	Farmers plot	Local variety + Broadcasting + Fertilizer application	16.42	----	33284	95236	61952	2.86
		Variety (GSC7)+Biofertilizer (625 g/ha)	17.35	5.66	33856	100630	66774	2.97
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	17.94	9.26	34432	104052	69620	3.02
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	18.75	14.19	35483	108750	73267	3.06

Table 39: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Sangrur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Sangrur	Farmers plot	Local variety + Broadcasting + Fertilizer application	18.74	----	31625	108692	77067	3.44
		Variety (GSC7)+Biofertilizer (625 g/ha)	20.63	10.09	32415	119654	87239	3.69
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	21.45	14.46	32862	124410	91548	3.79
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	22.42	19.64	33789	130036	96247	3.85

TARN TARAN

The demonstration of improved technological modules at district Tarn Taran under CFLDs on oilseed significantly increases the yield and economic returns of rapeseed and mustard when compared to farmers' practice (18.35 q/ha; Net return ₹66,251/ha; B:C ratio 2.65). Adoption of GSC 7 with biofertilizer led to yield increase of 8.99 percent, while the addition of Bentonite S further increased it to 12.40 percent (20.03 q/ha; B:C ratio 2.85). The highest productivity and returns were achieved with the integrated module along with adoption of GSC 7 yielding 23.95 q/ha (30.52% increase) and net returns of ₹96,663/ha (B:C ratio 3.29) by KVK Tarn Taran (Table 40).

Table 40: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Tarn Taran

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Tarn Taran	Farmers plot	Local variety + Broadcasting + Fertilizer application	18.35	----	40179	106430	66251	2.65
		Variety (GSC7)+Biofertilizer (625 g/ha)	20.00	8.99	40689	116000	75311	2.85
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.63	12.40	41233	119625	78392	2.90
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	23.95	30.52	42247	138910	96663	3.29

MUKTSAR

The demonstrations organized by KVK Muktsar in GSC 7 variety using improved management practices significantly increased crop yield and profitability compared to farmers' practice (Table 41). The use of variety GSC 7 with biofertilizer raised yield by 9.7 percent, while adding Bentonite S and plant protection measures further enhanced yield up to 22 q/ha, a 23.73 percent increase. Correspondingly, net returns and B:C ratio improved, reaching ₹86,933/ha and 3.14, highlighting the economic advantage of integrated technology adoption in district Muktsar.

Table 41: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Muktsar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Muktsar	Farmers plot	Local variety + Broadcasting + Fertilizer application	17.78	----	38223	103124	64901	2.70
		Variety (GSC7)+Biofertilizer (625 g/ha)	19.50	9.67	38829	113100	74271	2.91
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	20.50	15.30	39628	118900	79272	3.00
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	22.00	23.73	40667	127600	86933	3.14

NAWANSHAHR

The adoption of improved technologies in district Nawanshahr under CFLDs on oilseed has led to both yield and monetary advantages over farmers' practice (Table 42). The varietal adoption (GSC 7) with biofertilizer increased the yield by 5.98 percent, while further addition of Bentonite S and plant protection measures raised it to 17.88 q/ha. Net returns and the B:C ratio was also improved, reaching ₹69,157/ha and 3.00, respectively.

Table 42: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Nawanshahr

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Nawanshahr	Farmers plot	Local variety + Broadcasting + Fertilizer application	15.38	---	32215	89204	56989	2.77
		Variety (GSC7)+Biofertilizer (625 g/ha)	16.30	5.98	32845	94540	61695	2.88
	Demo plot	Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)	17.00	10.53	33458	98600	65142	2.95
		Variety (GSC7)+Biofertilizer (625 g/ha) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Metalaxyl 4% + mancozeb 64% (Ridomil Gold @ 625 g/ha)	17.88	16.22	34518	103675	69157	3.00

FAZILKA

In the CFLDs on oilseed, the adoption of improved technological modules resulted in higher yield and profitability compared with the farmers' practices (Table 43). The use of *Trichoderma harzianum* with

Table 43: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Fazilka

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Fazilka	Farmers plot	Local variety + Broadcasting + Fertilizer application	19.12	---	38083	110896	72813	2.91
		Variety (RH 1424) + <i>Trichoderma harzianum</i> (5 g per kg seed)	21.36	11.72	38950	123888	84938	3.18
	Demo plot	Variety (RH 1424) + <i>Trichoderma harzianum</i> (5 g per kg seed) + S (45 kg/ha) + B (5 kg/ha)	21.88	14.44	39413	126904	87491	3.22
		Variety (RH 1424) + <i>Trichoderma harzianum</i> (5 g per kg seed) + ZnSO ₄ (12.5 kg/ha) + B (5 kg/ha)	22.63	18.36	40428	131254	90826	3.25

varietal adoption (RH 1424) raised yield by 11.7 percent, while further application of S, B, and Zn increased yield by 18.36 percent. Net returns and the B:C ratio also increased, reaching ₹90,826/ha and 3.25, highlighting the benefits of integrated nutrient and biofertilizer management in Fazilka district with the adoption of variety RH 1424.

A total of 2,726 demonstrations covering an area of 1117 ha were conducted by 22 KVKs in Punjab. The demonstrated plots recorded an average yield of 19.99 q/ha, compared to 17.05 q/ha under farmers' practice, showing a 16.85 percent yield advantage. The net returns from the demonstrated plots (₹ 78,550/ha) were higher than those from farmers' practice (₹ 63,531/ha), with an improved B:C ratio of 3.13, indicating the economic efficiency of improved practices over traditional practices (Table 44).

Table 44: Performance of CFLDs on rapeseed and mustard conducted in Punjab

State	Demonstrated Variety	Area (ha)	No. of Demonstrations	Yield (q/ha)		% increase
				Check	Demo	
Punjab (22 KVKs)	GSC 7, PBR 357, RH 1424	1117	2726	17.05	19.99	16.85
Total (R & M)		1117	2726	17.05	19.99	16.85

State	Net Returns (₹/ha)		B: C Ratio	
	Check	Demo	Check	Demo
Punjab (22 KVKs)	63531	78550	2.80	3.13
Total (R & M)	63531	78550	2.80	3.13



Monitoring of *gobhi sarson* crop at Ghumiara village by scientists from KVK Faridkot (PB)



Visit to the CFLD demonstration field by scientists from KVK Fatehgarh Sahib (PB)



KVK Gurdaspur (PB) scientists visiting the CFLD demonstration field



Field Day conducted by scientists from KVK Mansa (PB)



Training programme on technologies for enhancing crop production organized by KVK Kapurthala (PB)



Field Day conducted by KVK Pathankot (PB) in a gobhi sarson field



Input distribution at village Jatana organized by KVK Faridkot (PB)



Input distribution at village Mani Majri organized by KVK Fatehgarh Sahib (PB)

HIMACHAL PRADESH

A total of 1,332 cluster demonstrations on rapeseed and mustard were implemented across 350 ha by different KVKs of Himachal Pradesh. The demonstrations incorporated diverse technological interventions, including improved varieties and integrated crop management practices according to the agro-climatic conditions of the state. The performance outcomes of these CFLDs, as evaluated across participating KVKs, are presented below:

BILASPUR

The technological interventions led to significant yield and economic gains over farmers' practice. The improved varieties (GSC 7/ONK 1) with biofertilizers enhanced yield by 20.96 percent, while further integration of bentonite S and plant protection measures increased the production to 8.20 q/ha, a 30.4 percent improvement in Bilaspur district. The net returns rose from ₹11,785/ha in farmers' plots to ₹21,385/ha in demonstrations, with the B:C ratio improving from 1.46 to 1.76, indicating the profitability of integrated technologies in oilseed cultivation (Table 45).

CHAMBA

In Chamba district, yield improvement ranged from 4.58 percent with the adoption of improved varieties (GSC 7/Karan Rai) and the use of biofertilizers alone to 26.80 percent when bentonite S and plant protection measures were included, with yield reaching to 9.70 q/ha. The net returns increased from ₹19,152/ha under farmers' practice to ₹29,478/ha in demonstrations, while the B:C ratio improved from 1.72 to 2.03. These results clearly highlight the economic viability of the demonstrated technologies, with improved varieties, biofertilizers, and integrated crop management practices markedly outperforming traditional practices (Table 46).

Table 45: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Bilaspur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Bilaspur	Farmers plot	Local variety + Broadcasting + Fertilizer application	6.25		25715	37500	11785	1.46
		Variety (GSC 7/ONK-1) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed)	7.56	20.96	26116	45360	19244	1.74
	Demo plot	Variety (GSC 7/ONK-1) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha)	7.86	25.76	26815	47160	20345	1.76
		Variety (GSC 7/ONK-1) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha)	8.20	30.40	27815	49200	21385	1.77

Table 46: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Chamba

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Chamba	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.65	----	26748	45900	19152	1.72
		Variety (GSC 7/Karan Rye) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 gram each/ 3 kg seed)	8.00	4.58	27356	48000	20644	1.7
	Demo plot	Variety (GSC 7/Karan Rye) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 gram each/ 3 kg seed) + Bentonite S (32.5 kg/ha)	8.93	16.67	27915	53550	25635	1.92
		Variety (GSC 7/Karan Rye) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha) + Pendimethalin (1.5 L/ha)	9.70	26.80	28722	58200	29478	2.03

HAMIRPUR

The adoption of improved variety (GSC 7) along with biofertilizers and integrated crop management practices markedly enhanced crop performance over farmers' practice in district Hamirpur (Table 47).

The yield advantage ranged from 20.77 percent with biofertilizers alone to 29.58 percent with the addition of bentonite S and plant protection inputs, attaining 9.20 q/ha of yield. The net returns increased substantially from ₹18,414/ha to ₹28,883/ha, accompanied by an improvement in the B:C ratio from 1.76 to 2.10, demonstrating the profitability of the demonstrated technologies.

Table 47: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Hamirpur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Hamirpur	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.10	----	24186	42600	18414	1.76
	Demo plot	Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/ 3 kg seed)	8.58	20.77	24815	51450	26635	2.07
		Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha)	8.84	24.51	25512	53040	27528	2.08
		Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> +PSB @50 g/ 3 kg seed)+Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha)	9.20	29.58	26317	55200	28883	2.10

KANGRA

The demonstrated technologies along with adoption of improved variety of GSC 7 in district Kangra significantly outperformed farmers' practice in rapeseed-mustard cultivation (Table 48). The yield improvement ranged from 19.31 percent with improved variety and biofertilizers to 28.69 percent with the addition of bentonite S and plant protection measures, achieving 11.26 q/ha yield. The net returns increased from ₹21,011/ha in farmers' plots to ₹33,708/ha in demonstrations, while the B:C ratio improved from 1.67 to 2.00, confirming the economic advantage of integrated crop management practices in Rapeseed and Mustard.

MANDI

The farmers' practice using local variety with broadcasting and fertilizer application yielded 6.81 q/ha with a net return of ₹7045/ha and a B:C ratio of 1.21. The demonstration plots with improved practices showed significant increases in yield and profitability. The adoption of improved varieties (GSC 7/ ONK 1 and Karan Rai) with biofertilizers increased yield by 11.97 percent (7.63 q/ha) and net return to ₹11,384/ha (B:C ratio 1.33). Further integration of bentonite S and pest management enhanced yield up to 8.66 q/ha, net return ₹16,245/ha, and B:C ratio 1.45, highlighting the effectiveness of combined technological interventions (Table 49).

SHIMLA

The farmers' practice with local variety, broadcasting, and fertilizer application yielded 9.88 q/ha with a net return of ₹24,780/ha and a B:C ratio of 1.72. The adoption of GSC 7 with biofertilizers increased yield

Table 48: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Kangra

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Kangra	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.75	----	31489	52500	21011	1.67
		Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/ 3 kg seed)	10.44	19.31	32245	62640	30395	1.94
	Demo plot	Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha)	10.78	23.20	32856	64680	31824	1.97
		Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> +PSB @50 g/ 3 kg seed)+Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha) + Pendimethalin (1.5 L/ha)	11.26	28.69	33852	67560	33708	2.00

Table 49: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Mandi

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Mandi	Farmers plot	Local variety + Broadcasting + Fertilizer application	6.81	----	33815	40860	7045	1.21
		Variety (GSC7/ ONK 1/ Karan Rai) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed)	7.63	11.97	34366	45750	11384	1.33
	Demo plot	Variety (GSC7/ONK1/ Karan Rai)+Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha)	8.28	21.51	34763	49650	14887	1.43
		Variety (GSC7/ ONK 1/ Karan Rai)+ <i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha) + Pendimethalin (1.5 L/ha)	8.66	27.17	35715	51960	16245	1.45

to 11.26 q/ha, net return to ₹32,324/ha, and B:C ratio to 1.92 in district Shimla. Further, incorporation of bentonite S further improved yield to 12.18 q/ha and net return to ₹37,264/ha (B:C ratio 2.04). The highest performance was achieved with the integrated use of biofertilizers, bentonite S, and pest management, resulting in 12.62 q/ha, net return ₹38,860/ha, and B:C ratio 2.05 (Table 50).

Table 50: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Shimla

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Shimla	Farmers plot	Local variety + Broadcasting + Fertilizer application	9.88	----	34500	59280	24780	1.72
	Demo plot	Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/3 kg seed)	11.26	13.97	35236	67560	32324	1.92
		Variety (GSC 7)+Biofertilizer (<i>Azotobacter</i> + PSB @50 g/3 kg seed) + Bentonite S (32.5 kg/ha)	12.18	23.28	35816	73080	37264	2.04
		Variety (GSC7)+Biofertilizer (<i>Azotobacter</i> +PSB @50 g/3 kg seed)+Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha)	12.62	27.73	36860	75720	38860	2.05

SIRMAUR

KVK Sirmaur demonstrated that the adoption of improved technological interventions with the variety Karan Rai-Jayanti significantly enhanced yield and profitability compared with farmers' practices. (Table 51). The local variety with conventional fertilizer produced 6.25 q/ha, whereas Karan Rai-Jyanti with biofertilizers, bentonite S and pest management achieved the highest yield of 7.88 q/ha, reflecting a 26 percent increase. These interventions also improved economic returns, with the net return rising from

Table 51: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Sirmaur

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Sirmaur	Farmers plot	Local variety + Broadcasting + Fertilizer application	6.25	----	30455	37500	7045	1.23
	Demo plot	Variety (Karan Rai-Jayanti) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed)	7.38	18.00	31412	44250	12838	1.41
		Variety (Karan Rai-Jayanti) +Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed) + Bentonite S (32.5 kg/ha)	7.63	22.00	31948	45750	13802	1.43
		Variety (Karan Rai-Jayanti) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed)+ Bentonite S (32.5 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha)	7.88	26.00	32845	47250	14405	1.44

₹7,045/ha in farmers' practice to ₹14,405/ha in the best treatment, and the B:C ratio increased from 1.23 to 1.44. The results highlighted the effectiveness of integrated nutrient and pest management in enhancing productivity and profitability in rapeseed and mustard crop

SOLAN

CFLDs on oilseeds conducted by KVK Solan showed that improved practices significantly enhanced rapeseed and mustard yield and profitability over farmers' practices. The local variety recorded a yield of 10.55 q/ha, whereas the best technological module comprising the adoption of Him Palam Gobhi Sarson along with biofertilizers, Bentonite S, and pest management achieved 12.98 q/ha, reflecting a 23.03 percent increase in yield. The economic analysis revealed that net returns increased from ₹34,355/ha under farmers' practice to ₹46,665/ha with the integrated interventions, with the B:C ratio improved from 2.19 to 2.49. These results highlight the benefits of integrated nutrient and pest management in boosting both productivity and profitability of rapeseed and mustard during the *Rabi* season (Table 52).

Table 52: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Solan

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Solan	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.55	----	28945	63300	34355	2.19
		Variety (Him Palam Gobhi Sarson 2) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed)	11.60	9.95	29578	69600	40022	2.35
	Demo plot	Variety (Him Palam Gobhi Sarson 2) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/ 3 kg seed) + Bentonite S (32.5 kg/ha)	12.15	15.17	30287	72900	42613	2.41
		Variety (Him Palam Gobhi Sarson 2) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed) + Bentonite S (32.5 kg/ha)+Thiomethaxam 25 WG (Actara @ 100 g/ha)	12.98	23.03	31215	77880	46665	2.49

UNA

The demonstration at farmer's fields in district Una showed that improved management practices significantly increased mustard yield and profitability compared to farmers' practices (Table 53). The local variety produced 9.88 q/ha, whereas the best technological module comprising of improved varieties (PBR 357) along with biofertilizers, Bentonite S, and pest management-yielded 12.65 q/ha, a 28.04 percent increase in the yield of the crop. The net returns rose from ₹28,830/ha to ₹43,255/ha, and the B:C ratio improved from 1.95 to 2.33, demonstrating the effectiveness of integrated nutrient and pest management for higher productivity and economic gains in *Rabi* oilseeds.

Table 53: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Una

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Una	Farmers plot	Local variety + Broadcasting + Fertilizer application	9.88	---	30450	59280	28830	1.95
	Demo plot	Variety (PBR 357) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed)	11.60	17.41	31274	69600	38326	2.23
		Variety (PBR 357)+ Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed) + Bentonite S (32.5 kg/ha)	12.15	22.98	31945	72900	40955	2.28
		Variety (PBR 357) + Biofertilizer (<i>Azotobacter</i> + PSB @ 50 g/3 kg seed) + Bentonite S (32.5 kg/ha) + Thiomethaxam 25 WG (Actara @ 100 g/ha)	12.65	28.04	32645	75900	43255	2.33

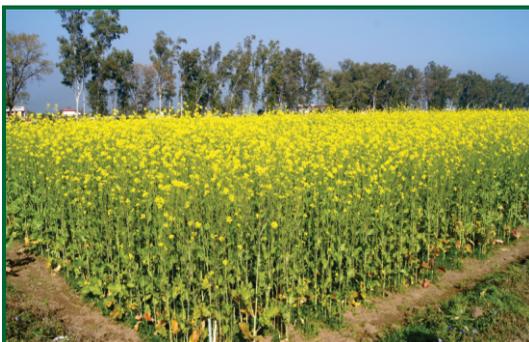
In Himachal Pradesh, a total of 1332 demonstrations were conducted by 9 KVKs, covering an area of 350 ha. The demonstrated plots recorded an average yield of 9.85 q/ha, compared to 8.12 q/ha in the



Field visit conducted by scientists from KVK Mandi (HP)



Demonstration field preparation conducted by KVK Mandi (HP)



Demonstration plot of *gobhi sarson* under CFLD on oilseeds in Sirmaur district (HP)



Field day conducted by the scientists of KVK Sirmaur (HP)

farmer's plots, representing a 21.46 percent increase in yield. The demonstrated plots achieved net returns of ₹ 28,131/ha with a B:C ratio of 1.92, confirming the economic advantage of improved production practices over farmers' practices in oilseed production (Table 54).

Table 54: Performance of CFLDs on rapeseed and mustard conducted in Himachal Pradesh

State	Demonstrated Variety	Area (ha)	No. of Demonstrations	Yield (q/ha)		% increase
				Check	Demo	
Himachal Pradesh (9 KVKs)	GSC 7, PBR 357, Karan Rai, ONK 1, Him Palam Gobhi Sarson	350	1332	8.12	9.85	21.46
Total (R & M)		350	1332	8.12	9.85	21.46

State	Net Returns (₹/ha)		B: C Ratio		
	Check	Demo	Check	Demo	
Himachal Pradesh (9 KVKs)	19157	28131	1.65	1.92	
Total (R & M)		19157	28131	1.65	1.92

UTTARAKHAND

A total of 1746 demonstrations were implemented over 399 ha across 12 KVKs in Uttarakhand. These demonstrations integrated improved varieties and location-specific crop management practices suited to the agro-climatic conditions of the region. The performance of these CFLDs, as assessed across participating KVKs, is summarized below:

ALMORA

The demonstrated interventions in district Almora significantly enhanced productivity and profitability over the farmers' practice. The improved variety Pant Sweta with biofertilizer (Sagarika) alone increased yield by 4.50 percent, while its combination with bentonite S recorded an 11.56 percent increase in yield. The integrated application of Pant Sweta + Sagarika + Bentonite S + Thiamethoxam achieved the highest yield (9.38 q/ha), reflecting a 17.25 percent increase with maximum net returns (₹27,602/ha) and a B:C ratio of 1.96. These results indicate the superiority of integrated interventions in improving yield and economic efficiency of oilseeds by KVK Almora (Table 55).

BAGESHWAR

The demonstration plots at farmer's field in Bageshwar district outperformed farmers' practice in both yield and profitability. Pant Sweta with Sagarika alone increased yield by 3.43 percent, while the addition of Bentonite S recorded an 8.0 percent gain. The integrated package of practices involving Pant Sweta, Sagarika, bentonite S, and IPM recorded the highest yield of 10.38 q/ha, reflecting an 18.57 percent increase, along with maximum net returns of ₹29,075/ha and a B:C ratio of 1.88 in the oilseed demonstrations by KVK Bageshwar (Table 56).

CHAMOLI

A significant improvement in yield and profitability was observed in oilseeds in Chamoli district with the demonstration of technological modules compared with the farmers' practices. (Table 57). The

Table 55: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Almora

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Almora	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.00	---	26748	48000	21252	1.79
		Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha)	8.36	4.50	27155	50160	23005	1.85
	Demo plot	Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha)	8.93	11.56	27766	53550	25784	1.93
		Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) + Thiamethoxam 25 WG (Actara @ 100 g/ha)	9.38	17.25	28678	56280	27602	1.96

Table 56: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Bageshwar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Bageshwar	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.75	---	30956	52500	21544	1.70
		Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha)	9.05	3.43	31363	54300	22937	1.73
	Demo plot	Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha)	9.45	8.00	32156	56700	24544	1.76
		Variety (Pant Shweta) + Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + IPM (Neem Oil @ 2 L/ha, Imidacloprid @ 1.5 L/ha, Mencozeb @ 2.0 kg/ha)	10.38	18.57	33175	62250	29075	1.88

improved variety PHT-1 with Sagarika alone increased yield by 14.16 percent, while its combination with Bentonite S achieved an 18.94 percent gain in yield. The full package of practices recorded the highest yield (7.10 q/ha), reflecting a 25.66 percent increase with maximum net returns (₹12,225/ha) and a B:C ratio of 1.40.

Table 57: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Chamoli

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Chamoli	Farmers plot	Local variety + Broadcasting + Fertilizer application	5.65	----	27894	33900	6006	1.22
		Variety (PHT-1) + Biofertilizer (Sagarika @ 4 L/ha)	6.45	14.16	28363	38700	10337	1.36
	Demo plot	Variety (PHT-1) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha)	6.72	18.94	29138	40320	11182	1.38
		Variety (PHT-1)+Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + IPM (Neem Oil @ 4 ml/L of water)	7.10	25.66	30375	42600	12225	1.40

CHAMPAWAT

The technological interventions with adoption of improved varieties viz., PHT-1, PT 508 and Pant Sweta varieties consistently outperformed the farmers' practice (Table 58). The adoption of improved varieties (PHT 1/ PT 508/Pant Sweta) with Sagarika enhanced yield by 7.35 percent, while the addition of Bentonite S resulted in a 14.12 percent increase in yield. The integrated package comprising of improved varieties (PHT 1/ PT 508/Pant Sweta) Sagarika, Bentonite S, and IPM recorded

Table 58: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Champawat

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Champawat	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.50	----	29458	51000	21542	1.73
		Variety (PHT 1/ PT 508/ Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha)	9.13	7.35	30128	54750	24622	1.82
	Demo plot	Variety (PHT 1/ PT 508/ Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha)	9.70	14.12	30789	58200	27411	1.89
		Variety (PHT 1/ PT 508/ Pant Sweta) + Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + IPM (Neem Oil @ 4 ml/L of water)	10.13	19.18	31789	60780	28991	1.91

the highest yield (10.13 q/ha), showing a 19.18 percent improvement with maximum net returns (₹28,991/ha) and a B:C ratio of 1.91 in CFLDs on oilseeds.

DEHRADUN

In Dehradun district, demonstrations using improved technological interventions significantly outperformed the farmers' practice in rapeseed and mustard. The use of variety PT 508 with biofertilizer, Bentonite S, and Thiamethoxam resulted in the highest yield of 10.38 q/ha, showing a 30.18 percent increase over the local variety with traditional practices. These interventions also enhanced economic returns, with the net return reaching ₹33,466/ha and a B:C ratio of 2.16, indicating higher profitability compared to the farmers' plot under oilseed crop (Table 59).

Table 59: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Dehradun

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Dehradun	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.97	----	26458	47820	21362	1.81
		Variety (PT 508) + Biofertilizer (Sagarika @ 4 L/ha)	9.45	18.57	27156	56700	29544	2.09
	Demo plot	Variety (PT 508) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) kg/ha)	9.80	22.96	27851	58800	30949	2.11
		Variety (PT 508)+Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + Thiamethoxam 25 WG (Actara @ 100/ha)	10.38	30.18	28784	62250	33466	2.16

HARIDWAR

The demonstrations conducted by KVK Haridwar in farmer's field with improved interventions recorded significantly higher yield and profitability than farmers practices. The combination of variety Pro 5232 with biofertilizer, Bentonite S, and Thiamethoxam produced the highest yield of 12.55 q/ha, a 17.29 percent increase over the local variety. This treatment also achieved the maximum net return of ₹44,655/ha and a B:C ratio of 2.46, highlighting the effectiveness of integrated nutrient and pest management in enhancing productivity and economic returns in oilseed cultivation (Table 60).

NAINITAL

CFLDs on oilseed conducted by KVK Nainital showed that the demonstrated interventions significantly enhanced yield and profitability compared to the farmers' practice. The local variety produced 10.50 q/ha, while the best module with varietal adoption (PT 508/Pant Sweta) along with Bentonite S and plant protection measures further increased yield up to 13.35 q/ha (27.14% increase). The economic analysis showed the highest net return of ₹50,644/ha and a B:C ratio of 2.72, demonstrating the effectiveness of combined nutrient and pest management strategies. (Table 61).

Table 60: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Haridwar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Haridwar	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.70	----	28678	64200	35522	2.24
	Demo plot	Variety (Pro 5232) + Biofertilizer (Sagarika @ 4 L/ha)	11.56	8.04	29215	69360	40145	2.37
		Variety (Pro 5232) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) kg/ha)	12.10	13.08	29638	72600	42962	2.45
		Variety (Pro 5232) + Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + Thiamethoxam 25 WG (Actara @ 100/ha)	12.55	17.29	30645	75300	44655	2.46

Table 61: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Nainital

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Nainital	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.50	----	27210	63000	35790	2.32
	Demo plot	Variety (PT 508/Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha)	12.44	18.48	27856	74640	46784	2.68
		Variety (PT 508/Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) kg/ha)	12.75	21.43	28451	76500	48049	2.69
		Variety (PT 508/Pant Sweta) + Bentonite S (25 kg/ha)+ Biofertilizer (Sagarika @ 4 L/ha)+Thiamethoxam 25 WG (Actara @ 100/ha) +Pendimethalin (1.5 L/ha) + Propiconazole 25% EC (1.0 L/ha)	13.35	27.14	29456	80100	50644	2.72

PAURI GARHWAL

The adoption of improved technological module in district Pauri Garhwal significantly enhanced crop yield and profitability when compared to traditional farmers' practices. The local variety with broadcasting and fertilizer produced 8.00 q/ha, while the improved Pant Sweta variety with biofertilizer (Sagarika) achieved 9.15 q/ha, showing a 14.38 percent gain in yield. The addition of Bentonite S and pest management interventions further raised yield to 9.87 q/ha, resulting in the highest net return of ₹29,573/ha and a B:C ratio of 2.00, highlighting the benefits of integrated nutrient and plant protection measures along with varietal demonstrations (PT 508) in oilseed cultivation during the *Rabi* season (Table 62).

Table 62: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Pauri Garhwal

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Pauri Garhwal	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.00	---	27487	48000	20513	1.75
	Demo plot	Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha)	9.15	14.38	28115	54900	26785	1.95
		Variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) kg/ha)	9.38	17.25	28645	56280	27635	1.96
		Variety (Pant Sweta) + Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + Thiamethoxam 25 WG (Actara @ 100/ha)	9.87	23.38	29647	59220	29573	2.00

PITHOURAGARH

CFLDs conducted by using technological interventions has led to a significant enhancement in yield and economic returns compared to traditional farmers' practices in district Pithouragarh. The adoption of farmers practices yielded 6.63 q/ha, whereas varietal adoption (PT 508/PHT 1) along with biofertilizer (Sagarika) recorded 8.00 q/ha, marking a 20.66 percent increase in yield. Further incorporation of Bentonite S and pest management measures, including yellow sticky traps and insecticides, along with varietal adoption (PT 508/PHT 1) increased yield to 8.66 q/ha, achieving the highest net return of ₹20,414/ha and a B:C ratio of 1.65 (Table 63).

RUDRAPRAYAG

CFLDs on oilseed conducted by KVK Rudraprayag, with the adoption of improved technologies resulted in a significant increase in yield and profitability over traditional farmers' practices. The adoption of traditional practices produced 5.66 q/ha, while the improved variety PHT 1 with *Trichoderma* seed treatment yielded 6.56 q/ha, reflecting a 15.90 percent increase in yield. Further integration of Bentonite S and neem oil along with the improved variety PHT 1 enhanced the yield to

Table 63: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Pithourgarh

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Pithourgarh	Farmers plot	Local variety + Broadcasting + Fertilizer application	6.63	----	29415	39780	10365	1.35
	Demo plot	Variety (PT 508/ PHT 1) + Biofertilizer (Sagarika @ 4 L/ha)	8.00	20.66	29856	48000	18144	1.61
		Variety (PT 508/ PHT 1) + Biofertilizer (Sagarika @ 4 L/ha) + Bentonite S (25 kg/ha) kg/ha)	8.20	23.68	30516	49200	18684	1.61
		Variety (PT 508/ PHT 1) + Bentonite S(25 kg/ha) kg/ha) + Biofertilizer (Sagarika @ 4 L/ha) + Yellow sticky traps (15/ha) + Imidacloprid (25 g/ha) + Thiamethoxam 25 WG (100 g/ha)	8.66	30.62	31546	51960	20414	1.65

7.45 q/ha, resulting in the highest net return of ₹16,063/ha with a B:C ratio of 1.56, demonstrating the benefits of combined nutrient and plant protection measures demonstrated by KVK Rudraprayag in farmers' fields. (Table 64).

Table 64: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Rudraprayag

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Rudraprayag	Farmers plot	Local variety + Broadcasting + Fertilizer application	5.66	----	26423	33960	7537	1.29
	Demo plot	Variety (PHT 1)+Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50g/kg seed)	6.56	15.90	26897	39360	12463	1.46
		Variety (PHT 1) + Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50 g/kg seed)+Bentonite S (25 kg/ha)	7.15	26.33	27815	42900	15085	1.54
		Variety (PHT 1)+Bentonite S (25 kg/ha) + Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50g/kg seed) + Neem Oil (50 ml/L)	7.45	31.63	28637	44700	16063	1.56

TEHRI GARHWAL

CFLDs on oilseeds conducted in Tehri Garhwal district showed a significant improvement in yield and profitability compared with the farmers' practice (7.66 q/ha). The highest yield of 9.35 q/ha was obtained with the integrated approach of improved variety (PHT 1/PT 508/Pant Sweta), seed treatment with *Trichoderma* sp., Bentonite S, and neem oil, registering a 22.06 percent increase in yield over the local practice. The net returns were enhanced up to ₹24,546/ha with a B:C ratio of 1.78, highlighting the effectiveness of improved technological interventions in enhancing productivity and profitability in oilseed cultivation conducted by KVK Tehri Gharwal (Table 65).

Table 65: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Tehri Gharwal

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Tehri Garhwal	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.66	---	29674	45960	16286	1.55
	Demo plot	Variety (PHT 1/PT 508/ Pant Sweta) + Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50 g/kg seed)	8.88	15.93	30245	53280	23035	1.76
		Variety (PHT 1/PT 508/ Pant Sweta) + Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50 g/kg seed) + Bentonite S (25 kg/ha)	9.05	18.15	30645	54300	23655	1.77
		Variety (PHT 1/PT 508/ Pant Sweta) + Bentonite S (25 kg/ha) + Seed treatment (Bioagent <i>Trichoderma</i> sp. @ 50g/kg seed) + Neem Oil (50 ml/L)	9.35	22.06	31554	56100	24546	1.78

U.S. NAGAR

The demonstrations laid by KVK U.S. Nagar in farmer's field with improved interventions outperformed farmers' practice (11.00 q/ha). The highest yield of 12.88 q/ha was recorded with Pant Shweta along with biofertilizer, Bentonite S, and fungicidal seed treatment, showing a 17.09 percent increase over local practice. The net returns rose to ₹48,302/ha with a B:C ratio of 2.67, indicating the economic viability of the improved package of practices in oilseed cultivation under KVK U.S. Nagar (Table 66).

Overall, across the 12 KVKs of Uttarakhand, the CFLDs on oilseeds recorded a demonstrated plot yield of 9.67 q/ha compared with 8.25 q/ha under the farmers' practice, reflecting a yield advantage of 17.72 percent. The demonstrated interventions with improved varieties further resulted in higher economic returns, with net returns of ₹28,606/ha and a benefit-cost ratio of 1.98, thereby establishing the superiority and profitability of improved production technologies over traditional practices (Table 67).

Table 66: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK U.S. Nagar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK U.S. Nagar	Farmers plot	Local variety + Broadcasting + Fertilizer application	11.00	----	25833	66000	40167	2.55
	Demo plot	Improved variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 lit/ha)	12.15	10.45	27585	72900	45315	2.64
		Improved variety (Pant Sweta) + Biofertilizer (Sagarika @ 4 lit/ha) + Bentonite S (25 kg/ha)	12.35	12.27	27987	74100	46113	2.65
		Improved variety (Pant Shweta) + Bentonite S (25 kg/ha) + Biofertilizer (Sagarika @ 4 lit/ha) + Carbendazim + Mancozeb (625 g/ha)	12.88	17.09	28978	77280	48302	2.67

Table 67: Performance of CFLDs on rapeseed and mustard conducted in Uttarakhand

State	Demonstrated Variety	Area (ha)	No. of Demonstrations	Yield (q/ha)		% increase
				Check	Demo	
Uttarakhand (12 KVKs)	Pant Sweta, PHT 1, PT 508	399	1746	8.25	9.67	17.72
Total (R & M)		399	1746	8.25	9.67	17.72

State	Net Returns (₹/ha)		B: C Ratio		
	Check	Demo	Check	Demo	
Uttarakhand (12 KVKs)	21491	28606	1.77	1.98	
Total (R & M)		21491	28606	1.77	1.98



Field visit done by scientists of KVK Dehradun (UK)



CFLD on rapeseed and mustard conducted by KVK Champawat (UK)

JAMMU & KASHMIR

A total of 2498 frontline demonstrations were conducted by 14 KVKs across the Jammu & Kashmir region, covering an area of 655 ha. The technological modules were designed and implemented based on baseline surveys to address farmers' needs and enhance crop productivity. The performance assessment of these demonstrations across various KVKs is presented below:

ANANTNAG

The demonstrated interventions in Anantnag district with improved variety Shalimar Sarson 2 (SS 2) along with integrated nutrient and pest control measures outperformed farmers' practice (8.87 q/ha). The highest yield of 10.38 q/ha was obtained with the combination of SS2, balanced fertilizers, and pest management, reflecting a 16.97 percent increase in yield. This module also recorded maximum net returns of ₹38,013/ha with a B:C ratio of 2.11, establishing its superiority over traditional practices (Table 68).

Table 68: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Anantnag

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Anantnag	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.87	---	33342	61877	28535	1.86
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	9.63	8.51	33874	67178	33304	1.98
		Improved variety SS2 + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	10.88	22.60	35538	72376	38013	2.11

BANDIPORA

The adoption of improved variety SS 2 with integrated nutrient and pest control measures resulted in good performance compared to the farmers' practice (10.00 q/ha). The highest productivity of 12.48 q/ha, reflecting a 24.75 percent increase, was recorded under the module involving balanced fertilizers, and plant protection measures. This full package of practices also yielded the highest net returns of ₹51,813/ha with a B:C ratio of 2.47, signifying its profitability and suitability for farmers (Table 69).

BARAMULLA

CFLDs demonstrated by KVK Bandipora, with the introduction of improved variety SS 2 with nutrient and pest management practices significantly enhanced yield and profitability over farmers' practice (8.55 q/ha). The highest yield of 10.36 q/ha, corresponding to a 21.17 percent increase, was obtained with the module comprising of balanced fertilizers, and pest management. This intervention also generated the maximum net return of ₹38,036/ha with a B:C ratio of 2.11, demonstrating its economic advantage and suitability for wider adoption (Table 70).

Table 69: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Bandipora

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Bandipora	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.00	----	32604	69760	37156	2.14
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	10.88	8.75	33500	75864	42364	2.26
		Improved variety (Shalimar) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	12.48	24.75	35213	87026	51813	2.47

Table 70: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Baramulla

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Baramulla	Farmers plot	Local variety + Broadcasting + Fertilizer application	8.55	----	32678	59645	26967	1.83
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	9.37	9.59	33645	65365	31720	1.94
		Improved variety (Shalimar) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	10.36	21.17	34235	72271	38036	2.11

BUDGAM

The demonstrations with improved interventions outperformed farmers' practice (10.23 q/ha). The highest yield of 12.65 q/ha was recorded with SS 2 combined with balanced fertilizers, and plant protection measures, showing a 23.66 percent increase over the local practice. Net returns increased to ₹53,951/ha with a B:C ratio of 2.57, highlighting the economic advantage of the adoption of integrated technological modules (Table 71).

GANDERBAL

The cluster demonstrations conducted by KVK Ganderbal demonstrated a significant enhancement in both yield and productivity when compared to the farmers' practice (7.50 q/ha). The highest yield of 8.56 q/ha was recorded with SS 2 combined with balanced fertilizers, and Dimethoate application, showing a 14.13 percent increase over the local practice. The net returns increased to ₹24,926/ha with a B:C ratio of 1.72, demonstrating the economic benefit of the improved management practices in oilseed cultivation in Ganderbal district (Table 72).

Table 71: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Budgam

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Budgam	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.23	–	31615	71364	39749	2.26
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	11.85	15.84	32463	82666	50203	2.55
		Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	12.18	23.66	34315	88246	53931	2.57

Table 72: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Ganderbal

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Ganderbal	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.50	---	32564	52320	19756	1.61
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	7.95	6.00	33215	55459	22244	1.67
		Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	8.56	14.13	34789	59715	24926	1.72

JAMMU

In Jammu district, the improved interventions surpassed farmers' practice (10.50 q/ha). The maximum yield of 12.13 q/ha was achieved with improved varieties (RH 725/ RSPN 25/ JM-135) along with balanced fertilizers, and application of plant protection measures, representing a 15.48 percent increase over the local variety. The corresponding net returns reached ₹52,017/ha with a B:C ratio of 2.60, indicating the profitability and effectiveness of the improved technological module (Table 73).

KATHUA

In Kathua district, all improved interventions surpassed the farmers' practice (9.15 q/ha). The maximum yield of 11.25 q/ha (22.95% increase) was obtained with adoption of RSPN 25/PM 32 combined with balanced NPK (Urea, DAP, MOP), gypsum and plant protection measures. This package increased net returns to ₹42,591/ha with a B:C ratio of 2.19, indicating significant gains in both productivity and profitability (Table 74).

Table 73: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Jammu

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Jammu	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.50	----	30478	73246	42770	2.40
	Demo plot	Improved variety (RH 725/ RSPN 25/JM 135) + Urea (132 kg/ha) + DAP + (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	10.88	3.57	31150	75896	44746	2.44
		Improved variety (RH 725/ RSPN 25/JM 135) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	12.13	15.48	32567	84584	52017	2.60

Table 74: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Kathua

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Kathua	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.50	----	33750	63830	30080	1.89
		Improved variety (RSPN 25/PM 32) + Urea (132 kg/ha) + DAP + (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	10.56	15.41	34275	74375	39392	2.15
	Demo plot	Improved variety (RSPN 25/PM 32) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	11.25	22.95	35889	78480	42591	2.19

KULGAM

The adoption of improved practices significantly increased the yield and profitability in demonstration plots when compared to the farmers' practice (9.48 q/ha) In Kulgam district. The highest yield of 11.80 q/ha was achieved with SS 2 combined with balanced NPK (Urea, DAP, MOP), gypsum and plant protection measures, representing a 24.54 percent increase over the local check. The net returns rose to ₹48,902/ha with a B:C ratio of 2.46 in cluster demonstrations performed by KVK Kulgam (Table 75).

PULWAMA

In Pulwama district, adoption of improved interventions in cluster demonstrations outperformed the farmers' practice (9.56 q/ha). The maximum yield of 12.45 q/ha was recorded with SS 2 combined with balanced

Table 75: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Kulgam

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Kulgam	Farmers plot	Local variety + Broadcasting + Fertilizer application	9.48	–	30897	66098	35201	2.14
		Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	10.88	14.78	31456	75864	44408	2.41
	Demo plot	Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	11.80	24.54	33415	82317	48902	2.46

fertilizers (Urea, DAP, MOP), gypsum, and Dimethoate application, showing a 30.23 percent increase over the local practice. The net returns increased to ₹53,385/ha with a B:C ratio of 2.60, highlighting the effectiveness and economic advantage of integrated nutrient and pest management (Table 76).

Table 76: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Pulwama

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Pulwama	Farmers plot	Local variety + Broadcasting + Fertilizer application	9.56	–	30356	66691	36335	2.20
		Improved variety (SS2) + Urea (132 kg/ha) + DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	11.40	19.25	31456	79526	48070	2.53
	Demo plot	Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	12.45	31.23	33466	86851	53385	2.60

RAJOURI

The adoption of improved interventions by KVK Rajouri significantly outperformed the farmers' practice (7.12 q/ha). The maximum yield of 8.65 q/ha was obtained with RSPN 25 integrated with balanced NPK fertilizers (Urea, DAP, MOP), gypsum, and application of plant protection measures, reflecting a 21.49 percent increase over the local variety. The net returns reached ₹26,927/ha with a B:C ratio of 1.81, demonstrating the effectiveness and economic viability of the improved management practices (Table 77).

REASI

The implementation of improved technological interventions in Reasi district significantly exceeded the farmers' practice (6.88 q/ha). The maximum yield of 8.77 q/ha was recorded with RSPN 25 combined with balanced

Table 77: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Rajouri

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Rajouri	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.12	----	30256	49664	19408	1.64
	Demo plot	Improved variety (RSPN 25) + Urea (132 kg/ha)+DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	7.88	10.60	31245	54936	23691	1.76
		Improved variety (RSPN 25) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	8.65	21.49	33415	60342	26927	1.81

fertilizers and Dimethoate application, indicating a 30.09 percent increase over the local variety in farmer's field. The net returns were ₹28,765/ha with a B:C ratio of 1.89, demonstrating the effectiveness and economic profitability of the integrated management approach in district Reasi for cultivation of oilseed (Table 78).

Table 78: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Reasi

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Reasi	Farmers plot	Local variety + Broadcasting + Fertilizer application	6.88	----	28754	47995	19241	1.67
	Demo plot	Improved variety (RSPN 25) + Urea (132 kg/ha)+DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha).	8.05	17.01	30845	56157	25312	1.82
		Improved variety (RSPN 25) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	8.77	27.47	32415	61180	28765	1.89

SAMBA

The improved technological interventions in district Samba significantly outperformed the farmers' practice (7.55 q/ha). The maximum yield of 9.89 q/ha was obtained with Giriraj by KVK Samba integrated with balanced NPK fertilizers, gypsum, and plant protection measures, representing a 30.99 percent increase over the local variety in farmer's field. The net returns increased to ₹35,146/ha with a B:C ratio of 2.04, highlighting the agronomic and economic advantages of the integrated management practices in oilseed cultivation with adoption of variety Giriraj (Table 79).

SHOPIAN

All improved technological interventions demonstrated in district Shopian outperformed the farmers' practice. The highest yield (11.42 q/ha) and net return (Net returns ₹48,021; B:C ratio 2.52) were

Table 79: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Samba

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Samba	Farmers plot	Local variety + Broadcasting + Fertilizer application	7.55	---	31156	52669	21513	1.69
	Demo plot	Improved variety (Giriraj) +Urea (132 kg/ha)+DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha)	9.05	19.87	31945	63133	31188	1.98
		Improved variety (Giriraj) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	9.89	30.99	33845	68993	35148	2.04

achieved with SS 2 + fertilizers + plant protection measures, showing a 26.89 percent increase over the local variety. Thus, indicating that integrated nutrient and pest management clearly enhanced productivity and profitability in district Shopian for oilseed cultivation with adoption of variety SS2 in farmer's field (Table 80).

Table 80: Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Shopian

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Shopian	Farmers plot	Local variety + Broadcasting + Fertilizer application	9.00	–	28750	62784	34034	2.18
	Demo plot	Improved variety (SS2) +Urea (132 kg/ha)+DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha).	10.38	15.28	29678	72376	42698	2.44
		Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	11.42	26.89	31645	79666	48021	2.52

SRINAGAR

Cluster demonstrations conducted by KVK Srinagar led to increased yield and profitability compared to farmers' practices (10.08 q/ha). The adoption of improved varieties combined with balanced fertilization and plant protection measures enhanced yield by up to 24.40 percent (12.54 q/ha). The integrated approach also delivered the highest economic benefits, with net returns of ₹54,957/ha and a B:C ratio of 2.69 achieved through the adoption of the improved variety SS2 in demonstrations conducted in Srinagar district during the *Rabi* season. (Table 81).

The cluster demonstrations on rapeseed and mustard in Jammu & Kashmir demonstrated by 14 KVKs with adoption of improved varieties viz., SS 2, RSPN 25, JM-135, PM 32 and RH 725 achieved a yield of 10.63 q/ha, showing a 18.11 percent increase over the farmers' practice (8.94 q/ha). The economic

Table 81 : Performance assessment of CFLDs on rapeseed and mustard conducted by KVK Srinagar

		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Shopian	Farmers plot	Local variety + Broadcasting + Fertilizer application	10.08	–	29858	70560	40702	2.36
	Demo plot	Improved variety (SS2) + Urea (132 kg/ha)+DAP (110 kg/ha) + MOP (67 kg/ha) + Gypsum (100 kg/ha). Improved variety (SS2) + Urea (99 kg/ha)+DAP (110 kg/ha)+MOP (67 kg/ha) + Dimethoate 30 EC@100ml /100 L of water)	11.95 12.54	18.55 24.40	36.78 32522	83650 87479	52972 54957	2.73 2.69

analysis indicated higher net returns of ₹40,335/ha compared to ₹30,801/ha in check plots, and the benefit-cost ratio increased from 1.99 to 2.23, highlighting the enhanced profitability and efficiency of the demonstrated interventions (Table 82).

Table 82: Performance of CFLDs on rapeseed and mustard conducted in Jammu & Kashmir

State	Demonstrated Variety	Area (ha)	No. of Demonstrations	Yield (q/ha)		% increase
				Check	Demo	
Jammu & Kashmir (14 KVKs)	Shalimar Sarson 2, RSPN 25, RH 725, JM-135 & PM 32	655	2498	8.94	10.63	18.11
Total (R & M)		655	2498	8.94	10.63	18.11

State	Net Returns (₹/ha)		B: C Ratio		
	Check	Demo	Check	Demo	
Jammu & Kashmir (14 KVKs)	30801	40335	1.99	2.23	
Total (R & M)		30801	40335	1.99	2.23



Field visit conducted by the scientists of KVK Budgam (J&K)



Demonstration of an improved variety of *gobhi sarson* in Pulwama (J&K)



Field day conducted by the scientists of KVK Samba (J&K)



Field visit conducted by the scientists of KVK Reasi (J&K)

LINSEED

HIMACHAL PRADESH

A total of 65 cluster demonstrations were implemented by 3 KVKs in Himachal Pradesh, covering an area of 17 ha. The performance evaluation of these demonstrations across the participating KVKs is summarized below:

KANGRA

Cluster demonstrations on linseed conducted by KVK Kangra showed that adoption of improved variety KL 263 with line sowing and Bentonite S application significantly enhanced yield (10.0 q/ha), reflecting a 33.33 percent increase over the farmers' practice. This intervention also improved profitability, with net returns rising to ₹31,573/ha compared to ₹17,043/ha in farmer's practices. The B:C ratio increased from 1.55 to 1.97, demonstrating the economic viability of the improved technological package (Table 83).

Table 83: Performance of CFLDs on linseed conducted by KVK Kangra

	Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
KVK Kangra	Farmers plot Local variety + Broadcasting + Fertilizer application	7.50	---	31122	48165	17043	1.55
	Demo plot Variety (KL 263) + Line sowing + Bentonite S (25 kg/ha)	10.00	33.33	32647	64220	31573	1.97

HAMIRPUR

Adoption of improved variety KL 263 with line sowing and Bentonite S application increased yield to 6.29 q/ha, showing a 14.78 percent gain over farmers' practice. The economic analysis revealed higher net returns (₹10,082/ha) compared to ₹7,930/ha in local practice, while the B:C ratio improved slightly from 1.29 to 1.33, highlighting moderate but positive advantages of the improved interventions of linseed crop (Table 84).

SIRMAUR

Cluster demonstrations conducted by KVK Sirmaur highlighted the advantage of improved practices over the local method. The adoption of variety KL 263 with line sowing and Bentonite S application enhanced yield to 8.88 q/ha, representing a 22.31 percent increase over the farmers' practice. The intervention also improved net

Table 84: Performance of CFLDs on linseed conducted by KVK Hamirpur

KVK Hamirpur	Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
Farmers plot	Local variety + Broadcasting + Fertilizer application	5.48	---	27263	35193	7930	1.29
Demo plot	Variety (KL 263) + Line sowing + Bentonite S (25 kg/ha)	6.29	14.78	30312	40394	10082	1.33

returns (₹24,549/ha) and raised the B:C ratio from 1.53 to 1.76, thereby establishing its higher economic efficiency and profitability in cultivation of linseed crop under rainfed conditions (Table 85).

Table 85: Performance of CFLDs on linseed conducted by KVK Sirmaur

KVK Sirmaur	Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
Farmers plot	Local variety + Broadcasting + Fertilizer application	7.26	---	30452	46624	16172	1.53
Demo plot	Variety (KL 263) + Line sowing + Bentonite S (25 kg/ha)	8.88	22.31	32478	57027	24549	1.76

The results of CFLDs on linseed conducted by 3 KVKs of Himachal Pradesh demonstrated the effectiveness of improved technology over the local practice (Table 86). The variety KL 263 recorded a higher yield of 6.75 q/ha, showing a 23.48 percent increase over the farmers' practice (8.39 q/ha).

Economic analysis further highlighted higher net returns (₹22,068/ha) compared to ₹13,715/ha in check plots. The B:C ratio also improved from 1.46 to 1.69, confirming the profitability and suitability of the demonstrated interventions for enhancing linseed productivity in the region.

Table 86: Performance of CFLDs on linseed conducted in Himachal Pradesh

State	Demonstrated Variety	Area (ha)	No. of Demonstrations	Yield (q/ha)		% increase
				Check	Demo	
Himachal Pradesh (3 KVKs)	KL 263	17	65	6.75	8.39	23.48
Total (Linseed)	17	65	6.75	8.39	23.48	

State	Net Returns (₹/ha)		B: C Ratio	
	Check	Demo	Check	Demo
Himachal Pradesh (3 KVKs)	13715	22068	1.46	1.69
Total (Linseed)	13715	22068	1.46	1.69

SUNFLOWER

PUNJAB

KVK Patiala in Punjab conducted 10 cluster demonstrations on sunflower, covering 4 ha. The performance outcomes of these demonstrations across the participating KVK are summarized below:

PATIALA

The demonstrations at KVK Patiala showed that adoption of improved variety PSH 2080 with line sowing and Bentonite S application achieved a yield of 20.50 q/ha, marking a 1.49 percent increase over the farmers' practice. Despite a marginal yield gain, the intervention significantly reduced production cost and enhanced profitability, resulting in higher net returns (₹57,824/ha) compared to ₹52,697/ha. The B:C ratio improved from 2.77 to 3.23, indicating increase in economic efficiency of the demonstrated technology (Table 87).

Table 87: Performance of CFLDs on sunflower conducted by KVK Patiala

KVK Patiala		Technological Module	Yield (q/ha)	% increase	Cost of Cultivation (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
Farmers plot		Variety (Pioneer) + Broadcasting + Fertilizer application	20.20	----	29800	82497	52697	2.77
Demo plot		Variety (PSH 2080) + Line sowing + Bentonite S (25 kg/ha)	20.50	1.49	25900	83722	57822	3.23



Demonstration plot of the linseed crop



Demonstration of linseed under CFLDs on Oilseeds by KVK Hamirpur (HP)



Sunflower demonstration plot conducted by KVK Patiala (PB)



Scientist-farmer interaction on sunflower CFLD

EXTENSION ACTIVITIES

EXTENSION ACTIVITIES IN KHARIF SEASON 2024

During *Kharif* 2024, 64 extension activities were conducted across participating KVKs, reaching 1,544 farmers. These included 8 awareness camps by 4 KVKs benefitting 359 participants, and 5 diagnostic visits supporting 21 farmers through on-site problem assessment (Table 88).

Additionally, 8 field days organized by 4 KVKs engaged 209 farmers, while 15 field visits by 4 KVKs provided advisory support to 99 farmers. 5 monitoring visits by 2 KVKs covered 52 participants, ensuring regular monitoring of the demonstrations. The largest contribution came from 23 training programmes conducted by 10 KVKs, imparting technical skills to 804 farmers for improved oilseed cultivation.

Table 88: Details of extension activities conducted during the *Kharif* season of 2024 across Zone-I

Extension activity	No. of Activities	No. of KVKs	No. of Participants
Awareness Camp	8	4	359
Diagnostic Visit	5	2	21
Field Day	8	4	209
Field Visit	15	4	99
Monitoring Visit	5	2	52
Training Programme	23	10	804
Total	64		1544

EXTENSION ACTIVITIES DURING RABI/SEASON 2024-25

During *Rabi* 2024-25, a total of 361 extension activities were conducted across participating KVKs, reaching 13,085 farmers through diverse capacity-building and advisory interventions. A significant focus was placed on skill development, with 146 training programs organized by 44 KVKs, benefitting 6,266 farmers (Table 89).

Table 89: Details of extension activities conducted during the *Rabi* season 2024-25 across Zone-I

Extension activity	No. of Activities	No. of KVKs	No. of Participants
Awareness Camp	28	12	1648
Farmer-Scientist Interaction	4	2	115
Field Day	68	32	2491
Field Visit	51	11	727
Kisan Goshties	5	4	174
Monitoring Visit	28	11	343
Training Programme	146	44	6266
Others	31	11	1321
Total	361	--	13085

EXTENSION ACTIVITIES CONDUCTED UNDER CFLDs ON OILSEEDS DURING THE YEAR 2024-25

During 2024-25, a total of 425 extension activities were conducted across participating KVKs, benefitting 14,692 farmers. A prominent highlight was 76 field days across 36 KVKs, exposing 2,700 farmers to demonstrated technologies. Additionally, 66 field visits by 15 KVKs provided advisory support to 826 farmers, and 5 Kisan Goshties engaged 174 farmers through group discussions (Table 90).



Field day on Soybean organized by KVK Anantnag (J&K)



Field day on Soybean organized by KVK Mandi (HP)



Field day on Sesame organized by KVK Hoshiarpur (PB)



Monitoring of soybean CFLDs conducted by KVK Hoshiarpur (PB) in collaboration with scientists from Punjab Agricultural University



Training on CFLDs on Sesame organized by KVK Hoshiarpur (PB)



Training on CFLDs on Sesame organized by KVK Ropar (PB)

Table 90: Details of extension activities conducted under CFLDs on Oilseeds 2024-25 across Zone-I

Extension activity	No. of Activities	No. of KVKs	No. of Participants
Awareness Camp	36	16	2007
Farmer-Scientist Interaction	4	2	115
Field Day	76	36	2700
Field Visit	66	15	826
Kisan Goshties	5	4	174
Monitoring Visit	33	13	395
Diagnostic Visits	5	2	21
Training Programme	169	54	7070
Others	31	11	1321
Total	425	--	14629



Field day organized by KVK Fatehgarh Sahib (PB)



Farmer Scientist interaction organized by KVK Gurdaspur (PB)



Training Programme on oilseed cultivation organized by KVK Ludhiana (PB)



Training Programme on oilseed cultivation organized by KVK Solan (HP)



Training Programme on oilseed cultivation organized by KVK Mansa (PB)



Kisan Goshtis organized by KVK Hoshiarpur (PB)



Field day on Rapeseed Mustard organized by scientist of KVK Mandi (HP)



Field Visit done by scientists of KVK Kulgam (J&K)

Demonstrations conducted by the KVKs of the states of Zone-I

Year	Punjab		Himachal Pradesh		Jammu & Kashmir		Uttarakhand		Ladakh		Haryana		Delhi		Grand total	
	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)	Demo (No.)	Area (ha)
2015-16	40	16.00	--	--	50	20.00	--	--	--	--	310	124.00	--	--	400	160.00
2016-17	859	300.00	329	50.00	392	113.69	--	--	--	--	616	284.00	50	20.00	2246	767.69
2017-18	1260	504.40	188	75.20	226	90.30	--	--	--	--	--	--	--	--	1674	669.90
2018-19	1237	516.00	265	107.20	180	71.81	178	71.26	--	--	--	--	--	--	1860	766.27
2019-20	612	228.00	715	118.20	529	93.00	701	90.50	30	2.00	--	--	--	--	2587	531.70
2020-21	586	210.00	808	127.00	602	129.00	947	140.00	15	1.00	--	--	--	--	2958	607.00
2021-22	787	290.00	989	166.00	625	120.00	813	128.00	--	--	--	--	--	--	3214	704.00
2022-23	1537	590.00	1420	315.50	1381	331.00	889	210.00	--	--	--	--	--	--	5227	1446.50
2023-24	1652	540.00	1909	278.00	1072	265.00	537	120.00	--	--	--	--	--	--	5170	1203.00
2024-25	2956	1209.0	1768	433.7	2856	729.00	1968	434.00	--	--	--	--	--	--	9548	2805.70



List of contributors in CFLDs on Oilseeds project (Year 2024-25)

S.No.	KVK	Scientist Contribution
PUNJAB		
1.	Amritsar	Dr Rajan Bhatt
2.	Barnala	Dr Sanjay Kumar
3.	Bathinda	Dr Vinay Singh
4.	Faridkot	Dr Pawitar Singh
5.	Fatehgarh Sahib	Mrs Reet Verma & Dr Arvindpreet Kaur
6.	Ferozepur	Dr Harpreet Kaur
7.	Gurdaspur	Dr Satwinderjit Kaur
8.	Hoshiarpur	Dr Prabhjot Kaur
9.	Jalandhar	Dr Prabhjit Kaur Brar
10.	Kapurthala	Dr Suman Kumari
11.	Ludhiana	Dr Jagdeep Kaur
12.	Mansa	Dr Tejpal Singh Sran
13.	Moga	Dr Sandeep Kumar
14.	Muksar	Dr Manjeet Kaur
15.	Nawanshahr	Dr Baljit Singh
16.	Pathankot	Dr Seema Sharma
17.	Patiala	Dr Rachna Singla
18.	Ropar	Dr Ankurdeep Preety
19.	Sangrur	Dr Rukinder Preet Singh,
20.	Mohali	Dr Harmeet Kaur
21.	Tarn Taran	Dr Navjot Singh Brar
22.	Fazilka	Dr Prakash Chand Gurjar
HIMACHAL PRADESH		
23.	Bilaspur	Dr Gourav
24.	Hamirpur	Dr Navneet Jaryal
25.	Kangra	Dr Deep Kumar
26.	Mandi	Dr L.K. Sharma
27.	Sirmaur	Dr. Shiwali Dhiman
28.	Una	Dr Sanjay Kumar Sharma
29.	Chamba	Dr Sushil Dhiman
30.	Shimla	Dr Ajay Bragta
31.	Solan	Dr Meera Devi
UTTARAKHAND		
32.	Almora	Dr.R.K.Sharma
33.	Chamoli	Dr D. C. Kala
34.	Champawat	Dr Avikal Kumar
35.	Dehradun	Dr Sanjay Kumar
36.	Haridwar	Dr Vinod Kumar
37.	Nainital	Dr Kanchan Nainwal
38.	Pithoragarh	Dr Alankar Singh
39.	Rudraprayag	Dr Sanjay Sachan
40.	Udham Singh Nagar	Dr Ajay Prabhakar

S.No.	KVK	Scientist Contribution
41.	Pauri Garhwal	Dr Ardeep
42.	Tehri Garhwal	Dr Aalok Gulabrao Yewale
43.	Bageshwar	Dr Amit Kumar
JAMMU & KASHMIR		
44.	Jammu	Dr Ravneet Kour
45.	Kathua	Dr Berjesh Ajrawat
46.	Rajouri	Dr Vikas Gupta
47.	Reasi	Dr Sanjay Koushal
48.	Samba	Dr Neerja Sharma
49.	Anantnag	Dr Shabeer Ahmad Ganaie
50.	Bandipora	Dr Tariq Sultan
51.	Budgam	Dr Sabia Akhter
52.	Kulgam	Dr Ab Shakoor
53.	Pulwama	Dr Syed Shujhat Hussain
54.	Srinagar	Dr Rayees A Wani
55.	Ganderbal	Dr Farooq Ahanger
56.	Shopian	Dr Bilal A Pandit
57.	Baramulla	Dr Neeraj





हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

*Agr*search with a human touch



<https://atariz1.org.in>



<https://x.com/atari1icar>



www.facebook.com/icaratari.ludhiana.5



www.youtube.com/@icar-atariludhianazone-i8059



**ICAR-Agricultural Technology Application Research Institute (ATARI)
Zone -1, Ludhiana, Punjab -141 004**