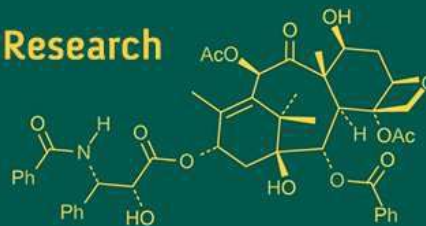
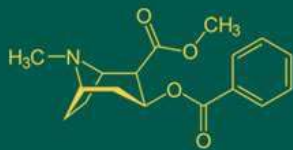


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Impact of cluster wise frontline demonstration on yield and economics of mustard in Shimla district of Himachal Pradesh

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Abstract

The present investigation was conducted by Krishi Vigyan Kendra (KVK), Rohru, during 2021-22 to evaluate the impact of cluster wise frontline demonstrations (FLDs) on yield, technology adoption and economic returns of mustard (*Brassica juncea*) in Shimla district of Himachal Pradesh. A total of 86 demonstrations were carried out over 10 ha in 4 cluster- Shah, Sanarsa villages (Rampur block) and Gari, Rathi villages (Rohru block)-using the high yield mustard variety RH-0749. The study assessed the parameters including yield performance, technology gap, extension gap, technology index and economic analysis. Results showed that the average yield under demonstration plots was 6.77 q/ha, higher than the local check yield 5.0 q/ha, with yield gains ranging from 28-44%. The highest yield (7.2 q/ha) and lowest technology gap (2.3 q/ha) was recorded in cluster 2 (Sanarsa) indicating favorable agroecological and adoption conditions. Extension gaps ranged from 1.4 to 2.2 q/ha, while the technology index varied from 24.21 to 32.63%, highlighting location specific variability in technology feasibility and adoption. Economic analysis revealed that higher net returns (₹45,023/ha) and B: C ratio (2.90) under demonstration, compared to traditional practices (₹30,000/ha and B: C ratio of 2.50). The study confirms that FLDs significantly enhance mustard productivity and profitability while bridging the technology dissemination gap. Strengthening extension services and localized interventions is recommended to sustain and scale the observed benefits.

Keywords: Frontline demonstration, cluster, economic, yield, extension gap

Introduction

Agriculture has been the cornerstone of human civilization, providing sustenance and livelihood for millennia. However, the rapid growth of the global population-expected to reach nearly 10 billion by 2050-has posed a significant challenge to global food security (FAO, 2025) [3]. In India, where over 58% of the population is directly dependent on agriculture, this challenge is compounded by fragile agro-ecological systems, erratic monsoon, and growing climate variability. As such, there is urgent need to adopt climate-resilient cropping system and improved agronomic practices that can ensure productivity and sustainability (Mukesh *et al.*, 2024) [12].

Among oilseed crops, mustard (*Brassica juncea*.) holds a prominent place in India, especially for small and marginal farmers in semi-arid and sub temperate regions. As a *Rabi* season crop, it is well suited to both rainfed and irrigated conditions. Mustard not only serves as a significant source of edible oil (Containing 30% oil content) but also contributes protein rich feed for livestock and nutritious leafy greens consumed in many Indian households (Kumar *et al.*, 2017; Ray *et al.*, 2024) [8, 9]. In Himachal Pradesh, mustard is primary cultivated in rainfed areas. Shimla, located in the mid-hill region of Himachal Pradesh, experiences cold winters and moderate rainfall, creating favourable conditions for mustard cultivation. However, the region's fragmented landholdings, traditional farming practices and low adoption of improved varieties often limit the productivity and profitability of mustard (Maitra *et al.*, 2024; Kumar *et al.*, 2019) [10, 7]. This situation calls for the introduction of improved technologies that are regionally suited and economically viable.

To bridge this gap, frontline demonstrations (FLDs)-an initiative led by the Indian Council of Agricultural Research (ICAR) and implemented by Krishi Vigyan Kendra (KVK)-have emerged as an effective extension strategy. These demonstrations are conducted on farmer's

field to promote the adoption of recently released high yielding varieties and associated crop management practices. FLD work on the principle of “learning by doing” and “seeing is believing” enabling farmers to evaluate and experience the effectiveness of new technologies first-hand (Hossain *et al.*, 2021) [4]. The cluster-based approach to FLDs enhance their impact by concentrating demonstration within a geographical unit, thus promoting collective learning, reducing logistical constraints and facilitating real time knowledge dissemination. This model has been shown to significantly reduced technology and extension gaps while improving productivity and economic returns in several crops (Manasa *et al.*, 2021) [11].

This investigates the impact of cluster wise frontline demonstration on yield and economics of mustard in Shimla district of Himachal Pradesh. The objective includes assessing improvements in yield, evaluating economic benefits, identifying technology adoption gaps and understanding the role of FLDs in promoting sustainable mustard production. The findings aim to support policy formulation and agricultural extension strategies for enhancing oilseed production in hilly regions under changing climatic conditions.

Materials and Methods

The experiment was conducted by Krishi Vigyan Kendra (KVK), Shimla, Himachal Pradesh during the *rabi* seasons of 2021-22 to assess the impact of Front-line Demonstrations (FLDs) on mustard (*Brassica juncea* L.) in terms of yield performance, economic returns, farmer satisfaction and to identify the major production constraints under mid-hill agro-ecological conditions. The comparative details of technological interventions implemented under FLD versus traditional farmer practices are presented in table 1

A total of 86 farmers were selected based on their participation in FLD programs over an area of 10 ha. Improved mustard seed varieties (RH0749) and recommended inputs were supplied under the FLD scheme. Prior to implementation, capacity-building sessions were organized to educate farmers on the scientific package of practices for mustard cultivation (Choudhary, 2009; Singh *et al.*, 2014) [1, 16].

Periodic monitoring of demonstration plots was undertaken by KVK scientists to guide farmers on critical operations such as timely sowing, nutrient application, weed and pest control, and harvesting. Data on yield and other agronomic traits were recorded through field observations and personal interviews using structured schedules.

Economic parameters such as cost of cultivation, gross return, net return and benefit-cost (B: C) ratio were calculated based on prevailing market rates. To quantify the impact of FLDs, technology gap, extension gap and technology index were computed using the formulas suggested by Samui *et al.* (2000) [14].

Net return (Rs. ha⁻¹) = Gross cost (Rs. ha⁻¹) - Cost of cultivation (Rs. ha⁻¹)

Extension gap = Demonstration yield - Yield under Farmers practices

Technology gap = Potential Yield - Demonstration Yield

Technology index = ((Potential yield - Demonstration yield)/Potential yield) × 100

Results and Discussion

The frontline demonstrations (FLDs) on mustard crop productivity were conducted across 4 clusters during 2021-22, covering a total of 86 demonstration over an area of 10 hectares. The clusters included Rampur block (Cluster 1- Shah Village and cluster 2- Sanarsa village) and Rohru block (cluster 3- Gari village and cluster 4-Rathi village). The performance of improved technology over the local check was evaluated based on yield, percent increase in yield, technology gap, extension gap and technology index (Table 2).

The average yield under demonstration plots across all the clusters was 6.77 q/ha, which was notably higher than the local check yield 5.0 q/ha, indicating the effectiveness of improved technology. The highest yield of 7.2 q/ha was recorded in cluster 2 (Rampur) followed by, 6.8 q/ha in cluster 1 (Rampur), 6.7 q/ha in cluster 4 (Rohru) and 6.4 q/ha in cluster 3 (Rohru). The corresponding percentage increase in yield over local check ranged from 28 to 44%, with the maximum increased in cluster 2. The technology gap representing the difference between the potential yield and yield under demonstration ranged from, 2.3 to 3.1 q/ha with the lowest gap in cluster 2 and the highest in cluster 3. The variation in yield and associated parameters across the cluster underscores the location specific factors, such as soil type, climatic conditions, input use efficiency and the level of technology adoption by the farmers. For instance, the relatively lower yield and high technology gap in cluster 3 (Rohru) suggest that suboptimal implementation or environmental constraints may have limited the performance of demonstrated technology in that area. This highlights the importance of customizing extension strategies to local agroecological contexts (Sharma *et al.*, 2016) [15].

The extension gap, calculated as the difference between the yield of demonstration and the local check, ranged from 1.4 to 2.2 q/ha, further emphasize the critical role of knowledge transfer and advisory services in bridging the productivity gap between improved technologies and traditional farmer practices. A narrower extension gap, as seen in cluster 3, may indicate better responsiveness to extension inputs or higher baseline knowledge levels among farmers.

The technology index, which indicates the feasibility of the demonstrated technology at the farmer level, varied from 24.21 to 32.63%, with the lowest index in cluster 2, is indicative of more favourable conditions for adoption and better compatibility of technology with local resources and farm technology. The mean technology index across all demonstration was 28.68%.

Overall, the findings are consistent with earlier studies demonstrating that FLDs are effective tools in promoting improved technologies among farmers, increasing awareness and building confidence in new agricultural practices (Dhaka *et al.*, 2010) [2]. They serve as a bridge between research institutions and the farming community, help to validate and adapt technologies under real field conditions (Ray *et al.*, 2021) [13]. To sustain and enhance the gains observed, future efforts should focus on capacity building, timely input supply, regular monitoring and strengthening farmers-extension research linkage. In particular, clusters with high technology gaps and indices

may benefit from more intensive support and follow-up interventions.

The economic analysis of frontline demonstrations (FLDs) conducted during 2021-22 reveals a clear advantage of improved technologies over traditional farmer practices in terms of profitability (Table 3). The average cost of cultivation under demonstration plots was ₹ 23419, slightly higher than the local check (₹20000), reflecting the investment in improved input and practices.

Despite the higher marginally cost, the average gross return from demonstration plots was substantially higher at ₹68442, compared to ₹50000 under local check. This resulted in an average net return of ₹45,023 under demonstrations, as opposed to ₹ 30,000 from traditional practices.

The benefit-cost (B: C) ratio also showed a marked improvement with the improved technology, averaging 2.90 under demonstration compared to 2.50 in local check. Among all clusters, the highest B: C ratio (2.96) was recorded under cluster 2 (Rampur), followed closely by cluster 1 (2.95), indicating the strong economic viability of the demonstrated interventions.

The economic gains from the FLDs underlines the profitability of adopting improved agricultural technologies (Kumar *et al.*, 2017) ^[8]. While the cost of cultivation was higher in demonstration plots due to the use of quality inputs and scientific practices (Joshi *et al.*, 2014) ^[5]. This cost-benefit trade-off clearly suggests that improved technologies not only increase production but also enhance farm profitability (Kumar *et al.*, 2018) ^[6].

Table 1: Details of technological interventions in FLD practices vs. traditional farmers practices

Particulars	FLD	Farmer practices
Farming situation	Rainfed	Rainfed
Variety	RH-0749	Local
Seed treatment	Seed treatment with mancozeb @ 2 g/kg of seed	Nil
Method of sowing	Line sowing using seed driller	Broadcasting
Irrigation	2 supplemental irrigation is given during critical stages	Nil
Weeding	Application of pendimethalin (30EC) @ 3.3 l/ha	Nil
Seed rate	6 kg/ha	8-10 kg/ha

Table 2: Yield performance of mustard under front line demonstration in Shimla district

Year	Cluster	No. of Dem ⁿ	Area (ha)	Yield (q/ha)		% increase over local check	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
				Dem ⁿ	Local check				
2021-22	1-Rampur	51	5.1	6.8	5	36	2.7	1.8	28.42
	2-Rampur	18	2.7	7.2	5	44	2.3	2.2	24.21
	3-Rohru	7	0.7	6.4	5	28	3.1	1.4	32.63
	4-Rohru	10	1.5	6.7	5	34	2.8	1.7	29.47
Mean		86	10	6.77	5	35.5	2.72	1.77	28.68

Table 3: Economic performance of mustard in front line demonstration in Shimla District

Year	Cluster	Cost of cultivation		Gross return		Net return		B:C	
		Dem ⁿ	Local check	Dem ⁿ	Local check	Dem ⁿ	Local check	Dem ⁿ	Local check
2021-22	1-Rampur	23,300	20,300	68,657	49,125	45,357	28,825	2.95	2.42
	2-Rampur	23,576	19,800	69,735	50,446	46,159	30,646	2.96	2.55
	3-Rohru	23,600	19,900	67,440	49,975	43,840	30,075	2.86	2.51
	4-Rohru	23,200	20,000	67,936	50,454	44,736	30,454	2.93	2.52
Mean		23419	20000	68442	50000	45023	30000	2.9	2.5

Conclusion

From the above facts mention, it could be inferred that using improved production technology, the yield and net returns of mustard can be increased substantially. The mustard yield under frontline demonstration with improved variety found always greater than the yield of mustard in local check, which could further be increased by adopting recommended production technology. However, demonstration yield of mustard is still less than its potential yield. Hence, there is need to disseminate recommended technologies of mustard through effective extension teaching methods *i.e.* need based training, continuous farmer engagement and FLD.

Implication

The findings of the present study have significant implications for the planning, execution and design of effective demonstration methodologies. While focused on mustard, the impact extends beyond single crop, offering valuable insights applicable to other sectors and cropping systems. Furthermore, the study provides essential feedback

to institution and agencies involved in demonstration programs, supporting the development of more targeted, impactful and scalable extension strategies.

Disclosure statement

No potential conflict of interest reported by the author(s).

References

1. Choudhary BN. Krishi Vigyan Kendra - A Guide for KVK Managers. New Delhi: Division of Agricultural Extension, ICAR; 2009.
2. Dhaka BL, Meena BS, Suwalka RL. Popularization of improved maize production technology through frontline demonstrations in south-eastern Rajasthan. J Agril Sci. 2010;1(1):39-42.
3. FAO. World Food and Agriculture Statistical Yearbook. Rome: Food and Agriculture Organization of the United Nations; 2025.
4. Hossain MA, Singh R, Sinha M. Impact of frontline demonstrations on farmer's knowledge and adoption

- behaviour. *J Community Mobil Sustain Dev*. 2021;16(2):357-362.
5. Joshi NS, Bariya MK, Kunjadia BB. Yield gap analysis through front line demonstrations in wheat crop. *Int. J Sci Res Publ*. 2014;4(9):1-3.
 6. Kumar A, Kumari M, Sinha N, Kumar G, Kumar A. Impact of frontline demonstration on yield and economics of wheat. *Int. J Agric Invention*. 2018;3(1):20-24.
 7. Kumar A, Singh D, Meena RK. Role of oilseed crops in agricultural sustainability. *Indian J Agron*. 2019;64(2):145-149.
 8. Kumar R, Singh AK, Singh SK. Evaluation of FLDs on mustard productivity in Eastern Uttar Pradesh. *Int. J Curr Microbiol App Sci*. 2017;6(11):2375-2382.
 9. Ray DK, Maitra S. Nutritional and economic importance of mustard in Indian agriculture. *J Agron Nutr*. 2024;11(1):25-33.
 10. Maitra S, Zaman A, Palai JB. Climate-smart approaches in Indian agriculture. *J Oilseed Res*. 2024;41(1):17-22.
 11. Manasa D, Reddy BV, Kumari K. Role of FLDs in promoting integrated farming practices. *Res J Agric Sci*. 2021;12(3):455-460.
 12. Mukesh M, Ray DK, Maitra S. Climate-resilient cropping systems for Indian agriculture. *Clim Agric*. 2024;13(1):44-52.
 13. Ray DK, Maitra S, Sahu PK. Enhancing agricultural resilience through technology dissemination. *Int. J Agric Extens*. 2021;9(4):65-71.
 14. Samui SK, Mitra S, Roy DK, Mandal AK, Saha D. Evaluation of frontline demonstration on groundnut. *J Indian Soc Coast Agric Res*. 2000;18(2):180-183.
 15. Sharma V, Kumar V, Sharma SC, Singh S. Productivity enhancement and popularization of improved production technologies in wheat through front line demonstrations. *J Appl Nat Sci*. 2016;8(1):423-428.
 16. Singh AK, Singh L, Kumar S. Impact of FLD on mustard in Rajasthan. *Agric Sci Digest*. 2014;34(2):102-105.