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Impact of front line demonstration on the yield and economics of mustard in Udaipur district of Rajasthan

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Abstract
A study was conducted to promote mustard production technologies during the *Rabi* seasons of 2021-22, 2022-23, 2023-24, and 2024-25 in the Udaipur district of Rajasthan. Cluster Front Line Demonstrations (CFLDs) on mustard were implemented across 160 hectares, encompassing 433 demonstrations on farmers' fields. The improved production technologies included high-yielding mustard varieties such as DRMRIJ-31 (Giriraj)**,** DRMR 2017-15 (Radhika)**,** DRMR 1165-40**,** and DRMRIC 16-38 (Brijraj)**,** along with the recommended agronomic practices. The Krishi Vigyan Kendra (KVK)**,** an innovative, science-based institution, played a pivotal role in bridging the gap between research scientists and farmers. Its primary objective is to minimize the time lag between technology generation at research institutions and its adoption by farmers, thereby enhancing productivity and income in the agriculture and allied sectors on a sustainable basis.
The average yield of mustard in the demonstration plots using improved technologies was 15.32 q/ha**,** compared to 13.43 q/ha under traditional farmer practices. The adoption of improved production technology resulted in a 14.19% increase in yield over farmer's conventional methods. The calculated technological gap**,** extension gap**,** and technological index were 5.78 q/ha**,** 1.89 q/ha**,** and 26.01%**,** respectively. From an economic perspective, the average net return under CFLDs was ₹53,875.75 per hectare, significantly higher than the ₹31,880.25 per hectare obtained through traditional practices. These results strongly suggest that the adoption of improved mustard production technologies can lead to sustainable yield enhancement and profitability in the Udaipur district of Rajasthan.

Keywords: Mustard, technology & extension gap, yield, CFLDs, technology index

Introduction
Indian mustard is an important oilseed crop that significantly influences the nation's oilseed-based agricultural economy. Despite its value, productivity remains low, mainly because many farmers are not fully aware of improved cultivation techniques and best practices. Frontline demonstrations offer an effective way to transfer technology and highlight the crop's yield potential directly in farmers' fields.
Mustard seeds contain 36-42% oil, 17-25% protein, 8-10% fiber, 6-10% moisture, and 10-12% extractable substances. They are commonly used as a condiment or processed to extract mustard oil. The oil is golden yellow, aromatic, and considered one of the healthiest cooking oils. It also serves as a valuable source of protein-rich meal. With an excellent fatty acid profile—low in saturated fats (about 8%), high in monounsaturated fats (around 70%), and rich in alpha-linolenic acid (approximately 10%)—mustard oil can significantly reduce the risk of coronary heart disease.
The residual oil cake is an important component of cattle feed and can also be used as an organic fertilizer. Brassica crops are rich in vitamins and minerals and possess notable medicinal properties. Mustard, in particular, is more drought-tolerant and less prone to shattering than other cultivated Brassica species, making it well suited for cultivation in semi-arid regions.
The leading mustard-producing states in India are Rajasthan, Madhya Pradesh, and Haryana. During the 2020-21 season, mustard was cultivated on 8.1 million hectares nationwide, yielding 11.70 million tonnes with an average productivity of 1458 kg per hectare. In Rajasthan alone, the 2021-22 season saw 4.16 million hectares under mustard cultivation, producing 7.14 million tonnes at a productivity of 1717 kg per hectare.

Rajasthan contributed 4.15 million tonnes to the national output, accounting for 44.57% of India's total mustard production (FOA, 2022-23) [1].

Krishi Vigyan Kendra (KVK) is an innovative, science-driven institution that plays a crucial role in linking research scientists directly with farmers. Its primary objective is to reduce the time lag between the development of new technologies and their adoption at the farm level, thereby improving productivity and income in agriculture and allied sectors on a sustainable basis. As grassroots organizations, KVKs focus on applying technology through the assessment, refinement, and demonstration of proven agricultural practices across diverse micro-farming conditions within a district (Das, 2007) [3].

Given the persistently low productivity of mustard, the present study was undertaken to evaluate the impact of Cluster Front Line Demonstrations (CFLDs) on mustard cultivation in two blocks of Udaipur district, Rajasthan. CFLD is a practical and participatory approach designed to accelerate the dissemination of proven technologies directly on farmers' fields. Its overarching aim is to bridge yield gaps, optimize resource use, and enhance mustard's contribution to national oilseed production.

In Udaipur district, mustard occupies a substantial area, yet yields remain low mainly due to farmers' limited awareness of newly developed crop production and protection technologies, as well as their management practices. To address this challenge, CFLDs on rapeseed-mustard were implemented, emphasizing improved production technologies and demonstrating their potential under real farm conditions.

Comprehensive efforts were made to plan, execute, and monitor the adoption of oilseed production technologies through these demonstrations. Consequently, this study was carried out to assess their impact on mustard cultivation, with the ultimate goal of increasing yields and providing farmers with higher economic returns and better-quality feed resources.

Materials and Methods

The cluster frontline demonstrations were conducted by Krishi Vigyan Kendra, Vallabhanagar in Udaipur district during *Rabi* 2021-22, 2022-23 2023-24 and 2024-25 total 433 cluster front line demonstrations on mustard variety DRMRIJ-31 (Giriraj), DRMR 2017-15 (Radhika), DRMR 1165-40 & DRMRIC 16-38 (Brijraj) was conducted at farmer's field of Udaipur district. The yield and economic performance of cluster frontline demonstrations, the data on output were collected from CFLDs as well as farmer plots and finally the grain yield, cost of cultivation, net returns with the benefit cost ratio was worked out. For the purpose of investigation, Udaipur district, where CFLDs were conducted during *Rabi* 2021-22, 2022-23 2023-24 and 2024-25. For selection of beneficiary farmers, a list of farmers where CFLDs on mustard were conducted (Table 1) during *Rabi* 2021-22, 2022-23 2023-24 and 2024-25 was prepared and taking equal representation.

Table 1: Detailed of package and practices with technological intervention for recommended practice

S. N.	Practice	Demonstrated practice	Farmers' practice
1	Variety	DRMRIJ-31 (Giriraj), DRMR 2017-15 (Radhika), DRMR 1165-40 & DRMRIC 16-38 (Brijraj)	Local Variety
2	Seed Treatment	Imidacloprid 48.0% FS @ 8 ml/kg seed	No seed treatment
3	Seed Rate and Spacing	4 kg/ha. and 30 cm RXR & 10 cm PXP	Approximately 8-10 kg/ha (about double) and 10-20 cm RXR & 5-7cm PXP or broadcasting
4	Manures and Fertilizers	Mix 8-10 ton FYM/ha. before 3 -4 weeks of sowing in soil. Recommended doses of Nitrogen and Phosphorus (60:40 kg/ha), 250 Kg Gypsum at the time of sowing as basal (Half dose of nitrogen as basal and half at the time of first irrigation)	Use of NP as DAP mixing with seed at the time of sowing (Inadequate nutrient supply)
5	Weed control	Pre emergence application of pendimethalin 37.8 CS @ 3 L ha-1 and one hand weeding at 45 DAS	No hand and cultural weeding
6	Plant Protection Management	Thiamethoxam 25 WG @ 0.4 g litre-1 of water, Imidacloprid 17.8 SL @ 250 ml ha-1, Mancozeb 80WP @ 2 g litre-1 of water. Application on The basis of ETL (Economic threshold level)	No application, application at Improper time and doses.

Data were collected through personal interviews using a well-structured interview schedule. The information obtained was processed, tabulated, classified, and analyzed using mean percent scores and ranking methods in accordance with the study's objectives. A difference of more than 10 percent between beneficiary and non-beneficiary farmers was considered significant. The extension gap, technology gap, and technology index were calculated using the formulas suggested by Samui *et al.* (2000) [6].

Results and Discussion

The improved package and practices is more important with technological intervention for productivity and profitability of oilseed crops. Detailed package and practices with technological intervention for recommended practice (Table 1).

Grain Yield

Yield (q/ha) During the period of study, it was observed that in cluster front line demonstrations of improved technologies increased productivity over respective farmer's practice (Table 2). Result revealed that an average yield was recorded 15.32 q/ha under demonstrated plots as compared to farmers' practice 13.43 q/ha. The highest yield of CFLD plot was 16.6 q/ha during the year 2021-22 and in farmers' practice 14.5 q/ha in the same year. Average yield of mustard increased per hectare by 14.19 percent over the farmer practice.

Although the yields obtained from the demonstration plots were lower than the variety's potential yield, this can be attributed to various biotic and abiotic factors influenced by year-to-year variations in microclimatic conditions. The yield improvements observed under the recommended practices may be due to balanced nutrient management based on soil test values and the integrated use of chemical fertilizers and bio-fertilizers, both of which play a vital role in enhancing nutrient availability to plants. Similar results have been reported by Tomar *et al*. (2003) [11], Tiwari and Saxena (2001) [9] and Tiwari *et al*. (2003) [10].

Data presented in Table 2 show that the demonstrated technology produced a positive impact compared with farmers' traditional practices. This improvement may be due to the combined effect of enhanced yield components and a higher seed index. The yield gains achieved under demonstration conditions suggest that these technological interventions can be successfully replicated in similar agro-climatic environments. These observations align with the findings of Tomar *et al*. (2003) [11].

Table 2: Yield and yield difference of mustard under cluster front line demonstrations

Year	No. of CFLDs	Area (ha)	Yield (q/ha)		Additional yield over local check (Kg/ha)	Per cent increase yield DP over Local Check
			DP	FP		
2021-22	50	20	16.6	14.5	2.10	14.48
2022-23	85	30	14.2	12.5	1.70	13.68
2023-24	100	40	15.3	13.5	1.80	13.33
2024-25	198	80	15.18	13.22	1.96	14.85
Average	-	-	15.32	13.43	1.89	14.19

Extension gap (q/ha) and Technology gaps

During the years 2021-22, 2022-23, 2023-24 and 2024-25, the extension gap was recorded at 2.10 q/ha, 1.70 q/ha, 1.80 q/ha and 1.96 q/ha respectively (Table 3). The goal was to reduce this gap through various extension activities, including training programs on improved production and protection technologies, promotion of high-yielding varieties, awareness campaigns, and kisan gosthi is focused on integrated pest and nutrient management. These initiatives aimed to support farmers in adopting advanced agricultural practices, ultimately contributing to the narrowing of the extension gap. Similarly, the technology gap observed was 8.26 q/ha, 3.68 q/ha, 8.7 q/ha and 2.47 q/ha in 2021-22, 2022-23, 2023-24 and 2024-25 respectively. This gap can be attributed to localized farming conditions such as variations in soil fertility, weather patterns during mustard crop maturity, and differences in crop management practices. To overcome these challenges and achieve the full potential of demonstration yields, it is crucial to develop and recommend location-specific crop management strategies. These results are consistent with the findings of Singh *et al*., (2007) [8], Singh *et al*., (2011) [7] and Jain *et al*. (2020) [2].

Table 3: Yield gap and technology index in cluster front line demonstrations

Year	No. of FLDs	Improved Variety Potential Yield (q/ha)	Technology gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
2021-22	50	24.86	8.26	2.10	33.23
2022-23	85	17.88	3.68	1.70	20.58
2023-24	100	24.00	8.7	1.80	36.25
2024-25	198	17.65	2.47	1.96	13.99
Average	-	21.10	5.78	1.89	26.01

The technology index for mustard cultivation varied from 33.23%, 20.58%, 36.25 and 13.99% in 2021-22, 2022-23, 2023-24 and 2024-25, respectively. The technology index could be reduced through the effective adoption of demonstrated technical interventions, which would help improve the yield performance of mustard crops.

Economic return

The economic analysis of the data over three years revealed that mustard under cluster front line demonstrations recorded higher gross returns. Cost involves in adoption of improved technology in mustard varies and was more profitable. The cultivation of mustard under improved technologies gave higher net return of Rs. 52130/-, 52820/-, 54916/- and 55637/- per ha, respectively, as compared to farmers practices Rs 30250/-, 31523/-, 33205/- and 32543/- per ha in the year 2021-22, 2022-23, 2023-24 and 2024-25, respectively (Table 4). An average cost of cultivation of demonstration field was Rs. 31500/-, 32600/-, 34715/-, 38504/- per ha, gross return 83630, 85420, 89631, 94141 and B: C ratio 2.65, 2.62, 2.58 and 2.44 respectively as compared to farmers practice (Rs. 60750/-, 63668-, 67955/- and 94141 per ha and B: C ratio 1.99, 1.98, 1.96, and 1.86. These results are in accordance with the findings of Sagar *et al*., (2018) [5] and Rachhoya *et al*. (2018) [4]. The benefit cost ratio of mustard cultivation under improved practices has higher than farmers' practices in all the years and this may be due to higher yield obtained under improved technologies compared to farmers' practice.

Table 4: Economic analysis of the cluster frontline demonstrations on mustard

Year	Cost of cultivation (Rs/ha)		Gross return (Rs)		Net return (Rs/ha)		Additional net return (Rs)	B:C ratio	
	DP	FP	DP	FP	DP	FP		DP	FP
2021-22	31500	30500	83630	60750	52130	30250	21880	2.65	1.99
2022-23	32600	32145	85420	63668	52820	31523	21297	2.62	1.98
2023-24	34715	34750	89631	67955	54916	33205	21711	2.58	1.96
2024-25	38504	37877	94141	70420	55637	32543	23094	2.44	1.86
Average	34329.75	33818	88205.50	65698.25	53875.75	31880.25	21995.50	2.57	1.95

This also improved linkages between farmers and scientists, and built confidence for adoption of the improved technology. Productivity enhancement under CFLDs over farmer practices of Mustard cultivation created a greater awareness, and motivated other farmers not growing Mustard to adopt improved technologies in this oilseed crop *i.e*. Mustard.

Conclusion

Thus, the cultivation of mustard using improved technologies—including suitable varieties, balanced nutrient management, and effective pest control—has proven to be more productive. The Cluster Frontline Demonstrations (CFLDs) conducted by KVK not only enhanced mustard yields but also facilitated the rapid horizontal dissemination of recommended production technologies through various extension activities such as training programs, field days, and exposure visits organized at farmers' fields.

Therefore, it is recommended that policymakers provide adequate financial support to the frontline extension system for organizing CFLDs under the close supervision of agricultural scientists and extension professionals. Such a strategy would help boost mustard productivity at both micro and macro levels.

References

1. FAO Statistics. Food and Agriculture Organization of the United Nations. Rome; 2022-23.
2. Jain DK, Kumar H, Singh B. Impact of cluster front line demonstration on mustard in Udaipur district of Southern Rajasthan, India. Int J Chem Stud. 2020;8(4):313-317.
3. Mamoni D, Puzari NN, Ray BK. Impact of training of skill and knowledge development of rural women. Agric Ext Rev. 2007;1(1):29-30.
4. Rachhoya HK, Sharma M, Sodh KR. Evaluation of yield performance of mustard (*Brassica juncea*) through cluster front line demonstration. Int J Curr Microbiol App Sci. 2018;7(7):500-505.
5. Sagar RL, Chandra G. Evaluation of frontline demonstration on mustard in Sunderbans, West Bengal. Indian J Ext Educ. 2018;40(3-4):96-97.
6. Samui SK, Maitra S, Roy DK, Mandal AK, Saha D. Evaluation of front line demonstration on groundnut. J Indian Soc Coast Agric Res. 2003;18(2):180-183.
7. Singh G, Dhaliwal NS, Singh J, Sharma K. Effect of frontline demonstrations on enhancing productivity of mustard. Asian J Soil Sci. 2011;6:230-233.
8. Singh SN, Singh VK, Singh RK, Singh RK. Evaluation of on-farm frontline demonstrations on the yield of mustard in central plains zone of Uttar Pradesh. Indian Res J Ext Edu. 2007;7:79-81.
9. Tiwari KB, Saxena A. Economic analysis of FLD of oilseed in Chhindwara. Bhartiya Krishi Anusandhan Patrika. 2001;16(3-4):185-189.
10. Tiwari RB, Singh V, Parihar P. Role of FLD in transfer of gram production technology. Maharashtra J Ext Educ. 2003;22(1):19-19.
11. Tomer LS, Sharma BP, Joshi K. Study on yield gap and adoption level of potato production technology in grid region. Maharashtra J Ext Educ. 2003;22(1):15-18.