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Assessment of front-line demonstrations of mustard production in transfer of technology at Balaghat District of Madhya Pradesh

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Abstract
Mustard is one of the principal oilseed crops grown in the Balaghat area of Madhya Pradesh. The district of Balaghat has an area, production, and productivity of 3337 ha, 2166 metric tons, and 649 kg/hectares of mustard, while Madhya Pradesh has 749473ha, 1307930 metric tons, and 1745 kg/ha. This illustrates how productivity can rise by implementing superior technologies for producing mustard. Modern technology needs a lot of work to be widely adopted. The main cause of farmers' comparatively tardy adoption of new methods is their low socioeconomic standing. In order to investigate the impacts of CFLD, Krishi Vigyan Kendra, Balaghat, held Cluster Front Line Demonstrations at four different villages in the Balaghat district of Madhya Pradesh during the rabi seasons of 2021–22 and 2022–23.

The technology index was 58.25% on average, the technological gap was 11.65 q/ha on average, and the average extension gap was 2.2 q/ha between 2021 and 2023. It was observed that suggested practices (CFLDs) had benefit cost ratios (B:C) of 2.2 and 2.3, in contrast to farmer practices for the preceding two years, which had B:C of 1.7 and 1.9. The experiment's application of improved mustard technology resulted in a yield increase above local levels. The demonstration's results indicate that higher yield can be achieved by using better techniques, like improved varieties, seed treatment, line planting, balanced fertilizer dosing, and insect-pest management.

Keywords: Average, management, treatment

Introduction
Mustard (*Brassica juncea* L.) is one of the most important winter oilseed crops. India is the third-largest producer of mustard and rapeseed in the world, after China and Canada, with 11.12% of worldwide production (DRMR, 2012–13). Rapeseed: Mustard is the second most important oilseed crop after soybean, accounting for 20–22% of all oilseeds produced in India. Most of it is grown in northern India, with the two states that produce the most being Rajasthan and Uttar Pradesh. Rain-fed farming methods are a good fit for mustard crops since they require less water (240–400 mm) to complete their life cycle. Mustard seed has an average oil content of 34–43% and accounts for 32% of all edible oil. Singh & Associates, 2021).

One of the oilseed crops that significantly boosts farmers' incomes is mustard. During 2020–21, Madhya Pradesh produces an average of 1745 kg/ha of mustard, or roughly 1307930 metric tons, on 749473 hectares. The Balaghat District now produces 2166 metric tonnes of mustard, with an area of roughly 3337 hectares and a yield of 649 kg/ha. This demonstrates that farmers are harvesting low yield due to a lack of knowledge about improved mustard production methods, which results in low income per unit area. Trainings and technological demos on Mustard manufacturing are being carried out in an attempt to boost Mustard productivity. This study attempts to give a comparative analysis of the technology displayed and the methods used by local mustard farmers.

Methodology
During Rabi 2022–22 and 2022–23, a study was conducted in the Krishi Vigyan Kendra

Balaghat operational zone with the goal of increasing mustard productivity. Farmers from the district of Balaghat took part in direct actions on their fields. All of the participating farmers received a full day of teaching prior to the showcase of improved methods for producing mustard. There were 47 demonstrations in a 20 hectare area in the Balaghat district in 2021–2022, and 50 demonstrations in a 20 hectare area in 2022–2023 in different villages. Better variety (PM 30), the optimal seed rate (5 kg/ha), the application of Trichoderma viridae & PSB 5–5 kg/ha to the soil, line sowing, RDF as STV, and pre-emergence weedicide—Pendimethalin—all contribute to improved crop quality.

Farmers' methods and the equipment on display produced production data through the use of a random crop cutting procedure. These figures were then subjected to basic statistical analysis. The procedures for choosing the site and farmers were followed in compliance with Choudhary's (1999) suggestions. The observations of the grain yield (q/ha) and the straw yield (q/ha) were recorded. Other parameters were calculated, as suggested by Kadian *et al*. (1997) [5], including the harvest index (%), increase in yield (%), technology gap (%), and extension gap (%). The benefit cost ratio, net return, cultivation cost, and gross return were all calculated. The extension gap, technology gap, technology index, and benefit-cost ratio were computed following the collection of data from farmers' behaviors and RP (Samui *et al*.).

$$\text{Harvest index (\%)} = \frac{\text{Grain yieldX100}}{\text{Biological yield}}$$

$$\text{Increasing yield (\%)} = \frac{\text{Demonstrated yield -Farmers Yield X100}}{\text{Farmers Yield}}$$

Technological gap = Potential yield – Demonstration Yield

Result and Discussion

The experimental findings obtained from the present study have been distributed in Yield and Economics of mustard cultivation as per Table 1 and Table 2.

Table 1: Productivity, technology gap, extension gap and technology index of Mustard under FLDs

Year	Crop	Variety	Area (ha)	No. of Demo.	Grain yield (q/ha)			% increase over FP	Straw Yield (q/ha)		Harvest Index		technology gap (q/ha)	extension gap (q/ha)	Technology Index (%)
					Potential	Demo	FP		Demo	FP	Demo	FP			
Rabi 2021-22	Mustard	PM 30	20	47	20	7.9	5.8	36.20	13.05	9.66	60.54	60.04	12.1	2.1	60.5
Rabi 2022-23	Mustard	PM 30	20	50	20	8.8	6.5	35.38	13.95	10.6	63.08	61.32	11.2	2.3	56.0
Tota/Average			40	97	20	8.35	6.15	35.79	13.5	10.13	61.81	60.68	11.65	2.2	58.25

The findings in Table 1 show that the Mustard PM 30 variety's demonstration yield performed better than traditional farming practices. The Rabi 2022–2023 and 2022–2023 years saw the lowest yield of 7.9 q/ha and the highest yield of 8.8 q/ha from the Mustard PM 30. Over a two-year period, the average yield was 8.35 q/ha, compared to 6.15 q/ha for the native variety. Over the course of the study, the yield increase % ranged from 35.38 to 36.20. The results align with the research conducted by Suthar and colleagues (2016). The results unequivocally demonstrate the advantages of FLDs over present farmer approaches for raising mustard output.

The disparity between prospective yield and demonstrated yield is known as the technological gap

There is currently an extension gap of 2.1 to 2.3 q/ha; in 2021–2022, there was a similar gap. 2.2 q/ha was the average extension gap during the course of the trial. The existence of extension gaps brought to light the necessity of providing farmers with continuous education via various extension techniques to increase consciousness and promote the adoption of improved mustard varieties, especially PM 30, with the aim of bridging the gaps. The new technologies will cause farmers to soon give up on their antiquated practices and adopt the new ones. The findings of Kumar *et al*. (2019) were in line with this outcome.

The technology index was represented by a percentage between 56.0 and 60.5%. A technology index of 58.25 percent on average was found.

Table 2: Gross realization, cost of cultivation, net return and B:C ratio as affected by improved and local practices

Year	Yield (q/ha)		% increase over FP	Gross Expenditure (Rs./ha)		Gross Return (Rs./ha)		Net Return (Rs./ha)		B:C Ratio	
	Demo	FP		Demo	FP	Demo	FP	Demo	FP	Demo	FP
Rabi 2021-22	7.9	5.8	36.20	21000	20000	47400	34800	26400	14800	2.26	1.7
Rabi 2022-23	8.8	6.5	35.38	23000	21000	52800	39000	29883	18000	2.30	1.9
Total	8.35	6.15	35.79	22000	20500	50100	36900	28142	16400	2.3	1.8

In the study period, the gross return from demonstrated technology (CFLDs) varied between Rs. 47400/-per ha in 2021-22 and Rs. 52800/-per ha in 2022-23, with an average gross return of Rs. 50100/-per ha. In contrast, the gross return from farmers' practices ranged from Rs. 34800/-per ha in 2021-22 to Rs. 39000/-per ha in 2022-23.

(Table II). Throughout the study period, the average net return from the exhibited The cost of The technology cost Rs. 28142/ha. Between 2021–2022 and 2022–2023–Rs. 29883/–per hectare, there was a variation in the net return. In 2022–2023, however, farmers' practices fluctuated between Rs. 14800/–per hectare and Rs. 18800/–per hectare.

The data presented in Table 2 indicates that the use of enhanced mustard technology raises the benefit cost ratio as well as the possibility for increased yield. In contrast to the farmer's practices, which had an average benefit cost ratio of 1.8, the average benefit cost ratio in 2022–2023 ranged from 2.26 to 2.30. This could be the outcome of a higher yield attained by the use of recommended approaches rather than farmer's ways. In contrast, studies on chickpea (Tomar *et al*., 1999, Tomar 2010, Mokidue *et al*., 2015) [20, 22] and moong.

Conclusion

In comparison to farmers' methods, the demonstration plot's production increased by 35.79%, according to frontline mustard demonstrations conducted in several villages within the Balaghat district. It has been shown that farmers can achieve their potential output by using effective management practices, obtaining high-quality inputs based on their demands, and obtaining scientific information. The horizontal spread of improved technologies can be facilitated by the efficient use of frontline demonstrations and a variety of extension activities, including training sessions, field trips, the distribution of literature in the local tongue, the use of ICT media (Kisan Mobile Sandesh, WhatsApp, video conferencing, etc.), and exposure visits planned as part of FLDs programs in the farmer's fields. In order to extensively distribute the technology that SAUs and other studies are prod.

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