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Estimation of Gap and Economic Analysis of CFLD Mustard Crop

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Abstract

The level of acceptance of advanced agricultural technology in the innovation diffusion process, is the most important element for encouraging a gain in agricultural production. The goal of the current study was to compare the yield disparities between the farmers' practices and the improved package of practices of rapeseed mustard under Cluster Font Line Demonstrations on mustard crop by KVK Fatehabad during *rabi* 2022–2023 season. The results revealed that the yield of mustard grown in demonstration plots was much higher than that of check plots (farmer's practice). Overall, the output of demonstration plots was 17.49% higher than that of check plots. The 3.03 q ha^{-1} average extension gap brought attention to the need for farmers to receive education through a range of extension approaches in order for them to adopt improved agricultural technology. An average technology index was 22.54% across three clusters. The economic feasibility of the intervention was shown by a good B:C ratio. The aforementioned information suggests that mustard crop productivity may be increased through cluster demonstrations, which encourage farmers to use the types of scientific production methods that were on exhibit in the CFLD plots.

Key words : FLD, Oilseeds, technology gap, B:C ratio.

The economics of agriculture depend significantly on oilseed in many regions of the world. The top five producers of oilseeds in the world-the United States, Brazil, Argentina, China, and India-account for 82% of total production. After groundnut, mustard-rapeseed is the most significant oil seed crop in India, accounting for around 25% of all oilseed output. Oilseed crops, the second-largest group of agricultural products after grains because of their high fat content, are crucial to the Indian agricultural economy. After soybean and palm oil, rapeseed mustard is the third-largest group of oilseed crops in the world. Mustard, which accounts for nearly one-third of all oil produced in India, is the principal edible oilseed crop. Indian mustard seeds have an oil content that ranges from 30% to 48%. The remainder of this oil, which is also used to create medicines and animal feed, is a great source of energy. Due to its role as a food preservative, it is a highly popular media for prickles (Gopale *et al*., 2022). In addition to the benefits of oil made from mustard rapeseed, the seeds, sprouts, leaves, and fragile plants provide health benefits when used as vegetables and seasonings. Selenium, calcium, magnesium, iron, phosphorus, zinc, magnesium, manganese, and other elements are present in them. (Verma and Prasad, 2023).

Indian mustard (Brassica juncea) is grown across the country over an area of 8.06 million hectares, yielding 11.75 million tonnes and 1457 kg ha^{-1}, respectively (Anonymous, 2022). The state of Rajasthan has the greatest acreage dedicated to this crop, with the next-largest amounts being in Uttar Pradesh, Haryana, Gujarat, Maharashtra, Punjab, Assam, and West Bengal. Haryana is the third-largest state in the country, producing 1.37 million tonnes across 0.71 million hectares with an average yield of 1914 kg ha^{-1} in 2021–2022 (Anonymous,

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2022). Due to population expansion and growing living standards, India's domestic usage of edible oils has greatly increased over time. When compared to the 115.71 lakh tonnes of net domestic edible oil availability in 2021–2022, it reached a level of 20.82 lakh tonnes, with imports covering the 141.94 lakh tonnes of necessary edible oil (Anonymous, 2022).

It demonstrates that there is still a sizable imbalance between the supply and demand of edible oil, which is covered by large imports that cost a sizable sum of foreign currency. The necessity to overcome various biotic, abiotic, and socioeconomic restrictions that prevent the yield potential from being fully used. To overcome stagnant oilseed output and achieve self-sufficiency in the production of edible oilseeds, the government decided to push the most recent production technology in oilseed production. The National Mission on Oilseeds and Oil Palm (NMOOP) authorized KVK to carry out the "Cluster Frontline Demonstrations on Oilseeds" project for ICAR-ATARI in Jodhpur. Cluster frontline demonstration is a novel strategy used by the Indian Council of Agricultural Research on Oilseed and Pulse crops to create a direct line of communication between scientists and farmers. During demonstrations, farmers are guided by KVK scientists in the application of improved technologies such as improved varieties, seed treatment, IPM, INM, land preparation, etc. In order to increase production, productivity, and interest in growing oilseed crops, which are losing significance as a result of the yield stagnation that farmers are currently facing, the stated goals of CFLDs were to show farmers the new technologies that Research Institutes and SAUs had recommended.

Keeping the above points in view, the 100 CFLDs on rapeseed-mustard using production improved technologies were conducted with the objectives of to evaluate the effect of CFLDs on improving mustard crop production and to evaluate the technological gap in mustard production and its expansion.

Materials and Methods

The present examinations on CFLDs were conducted during *rabi* 2022- 23 season by KVK, Fatehabad of Haryana state. An aggregate of 125 demonstrations were conducted in three clusters namely Fatehabad, Bhuna and Bhattu Blocks of Fatehabad district over an area of 50 hectares. Before conducting CFLD a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspect of cultivation etc., were followed as suggested by Chaudhary (1999) and Venkatta Kumar *et al*. (2010). The CCS HAU recommended package of practices for oilseed were followed in all the demonstration plots. The demonstrations at growers' fields were regularly covered at different stages of crop by KVK scientists. The yield data and economics of demonstration and check plots were recorded and analyzed. Different parameters like extension gap, technology gap and technology index as suggested by Dayanand *et al*. (2012) were used for calculating gap analysis, costs and returns. CFLDs were conducted at the planter's field, so that the maximum number of growers can observe the demonstrations in the fields and interest for cultivation of mustard crop can be generated among the growers as the main idea of FLD is seeing in believing.

The logical tool used for assessing the performance of the FLD is as under:

Extension Gap = Demonstration yield – Check Plot (Farmers' practice) yield

Technology Gap = Potential yield – Demonstration yield

$$\text{Technology Index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

CCSHAU's Hisar mustard variety RH 0725, which has a production potential of 26.25 q ha^{-1}, was used in CFLDS experiments. Using mustard varieties grown locally, checks have been made locally. Farmers have been given a set of procedures to follow in order to implement the CCS HAU Hisar recommendations. The mustard technologies and input materials given to farmers based on their requirements were used to demonstrate these financial literacy tests, as shown in Table 1.

Yield analysis : According to the findings of the farmers' field cluster frontline demonstrations, mustard yield was significantly higher under demonstration plots than check plots in all three clusters. In comparison to check plots, Cluster-II had the highest yield increase (20.11%), followed by Cluster-III (16.77%), and Cluster-I (15.60%). In demonstration plots a yield of 17.49 per cent more than in check plots was observed. Singh *et al* (2014) also suggested that the use of high yielding improved variety under FLD programmes leads to increase in the production as well as productivity also.

FLD practices created great awareness and motivated the other farmers to adopt appropriate oilseed production technologies. Rana *et al*. (2017) assessed the management of stem rot disease in mustard crop and concluded that the seed treatment with Carbendazim @ 2.0 g kg^{-1} seed controlled stem rot disease more efficiently in mustard crop among two recommended practices i.e. Soil treatment followed by seed treatment with *Trichoderme harzinium* and only seed treatment with Carbendazim @ 2.0 g kg^{-1}. The demonstrations resulted in significant average increase in yield of mustard crop and also higher net returns over checkplots. The adoption of a set of practices for mustard crops, such as improved variety, seed treatment and integrated pest and disease management, may be the cause of the demonstrated plots' increased yield.

Gap analysis : Gap analysis was calculated to assess the extension gap and technology gap. The perusal of the data in Table 2 reveals that extension gap in cluster-II was higher (3.6 q ha^{-1}) followed by cluster-III (2.8 q ha^{-1}) and cluster-I (2.7 q ha^{-1}). Shivran *et al*. (2020) evaluated performance analysis of improved varieties of Indian mustard in terms of gap analysis, yield enhancement and economic viability through front-line demonstrations. The average yield gaps for technology, extension and technology index were significant and resulted in realizing higher benefit:cost ratio compared to the Farmers' practice during six years study period. The overall extension gap was observed 3.03 q ha^{-1}, which emphasized the need to educate the farmers through various extension means for adoption of improved mustard production technologies, to bridge the wide extension gap.

Table 1. Particulars of mustard grown under frontline demonstrations and farmers practices

Particulars	**Farmers' practice (Local check)**	**Front Line Demonstrations (Improved technology)**
Variety	Local/ RH-30	RH-0725
Seed rate (Kg Acre^{-1})	1 -1.5 kg	1.5 Kg
Seed treatment	No	Carbendazim @2 g kg^{-1} seed
Line spacing	30 cm	30 cm
Sowing time	1st week of October	25th September to 15th October
Nutrient management (N:P:K)	50 kg Urea + 50 kg DAP	52 kg Urea + 50 kg SSP +10 kg $ZnSO_4$
Pest and Disease management	As suggested by Dealers/ Farmers	Bavistin -500 gm, Mencozeb -500 gm, Monocrotophos -250 ml and Dimethoate- 500 ml

Table 2. Cluster wise grain yield and gap analysis of frontline demonstrations on mustard crop

Clusters	No. of demo	Yield (q ha^{-1})		Increase in yield (%)	Extension gap (q ha^{-1})	Technology gap (q ha^{-1})	Technology index (%)
		Demo	Farmer's practice				
I	40	20	17.3	15.60	2.7	6.25	23.81
II	50	21.5	17.9	20.11	3.6	4.75	18.09
III	35	19.5	16.7	16.77	2.8	6.75	25.71
	125	20	17.3	17.49	3.03	5.92	22.54

The technology gap showed the feasibility of the technology at farmers' field. The lower the value of technology gap, more will be the feasibility of technology distributed. The data in Table 2 reveals that technology index range from 18.09 to 25.71 per cent in three clusters. The average technology index of three clusters was 22.54 per cent. Low value of technology index reflects adequacy of technology. This means that technology demonstrated through CFLDs was feasible in that region and needs to popularize through various extension departments for the benefits of farmers.

Economic analysis : Data regarding economic indicators i.e. cost of cultivation, gross returns, net return and benefit cost ratio are depicted in Fig. 1. Economic return was observed to be a function of grain yield and sale price or Minimum Support Price. The data in Fig. 1 clearly shows that net return of demonstration plots was Rs. 83.25 Thousands ha^{-1} as compared to check plots (farmers' practice) which was Rs.71.28 Thousands ha^{-1}. The higher additional returns obtained under demonstrations could be due to improved technology, nonmonetary factors, timely operations of crop cultivation and scientific monitoring. Favorable benefit cost ratio proved the economic viability of intervention. The B: C ratio was 3.9 under demonstration, while it was 3.7 under control plots. Singh *et al* (2014) also concluded that the FLD programme was found to be useful in imparting knowledge and adoption level of farmers in various aspects of oilseed production technologies. FLD practices created greater awareness and motivated the other farmers to adopt appropriate oilseed production technologies.

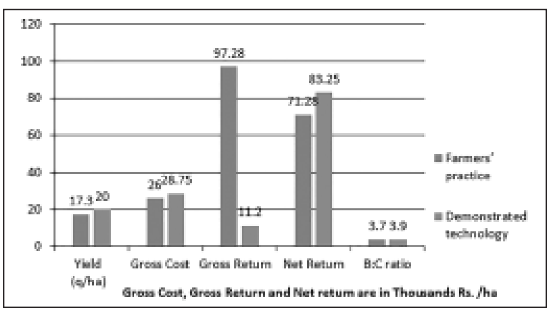

Fig. 1. Economic analysis of cluster frontline demonstrations on mustard crop

Conclusion

From the above data it is inferred that the Cluster Front Line demonstration program was successful in influencing farmers' attitudes toward growing mustard. Farmers' skill and knowledge was increased as a result of the demonstration plots of mustard crop being grown using improved technologies. Through cluster demonstrations, farmers can be encouraged to adopt the cutting-edge production techniques that were shown to work in the CFLD plots, thereby increasing mustard crop production and productivity. It has been found that scientific knowledge transmission, provision of high-quality, need-based inputs, and proper application of those inputs can all increase potential yield. For a quicker and more extensive spread of the advised practices among other farmers, the front line demonstration concept may be applied to all farmer categories, including progressive farmers. The availability of soil moisture, rainfall amounts, climatic anomalies, and disease infestation are also to blame for differences in crop yield. Additionally, it was found that farmers in the study area were ignorant of seed treatment for mustard crops, which led to significant losses from diseases spread by seeds like stem rot. It is further recommended that farmers be informed about seed treatment. As a result, the technologies presented under CFLDs helped to increase the area under mustard cultivation as well as production and productivity.

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