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Effect of front line Demonstration on Production, Profitability, and Social impact on Mustard cultivation

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ABSTRCT
Indian mustard is an important oilseed crop of Uttar Pradesh. It is also one of the most important oilseed crops of Unnao district of Uttar Pradesh. Krishi Vigyan Kendra, Dhaura, Unnao conducted 150 frontline demonstrations of Indian mustard. Frontline demonstration (FLD) is one of the most powerful tools for transfer of technology. Keeping in view of an effective extension approach of FLDs for dissemination of improved varieties of Indian mustard, an impact assessment of FLDs conducted by KVK, Uttar Pradesh was assessed. The results were compared between FLD plots & control plots (Farmer Practice). The FLD on Indian mustard registered 35.0 percent higher yield over farmer's practice on an average. The highest yield (18.65 q ha^{-1}) was recorded in 2015-16 in FLD with variety NDRE - 4, which was 52.0 per cent more yield over the farmer's practice (12.20 q ha^{-1}). Average extension gap was recorded 4.60 q ha^{-1} and average technology gap was recorded 4.70 q ha^{-1}. The technology index ranged from 16.55 per cent to 22.42 per cent. The results indicated that the frontline demonstration made a good impact on the farming community of Unnao district as they were motivated by the new agricultural technologies applied in the FLD of Indian mustard.
Key words: Indian mustard, FLD, Extension gap, Technology gap, Technology index.

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INTRODUCTION

In India Rapeseed-mustard crops comprises indigenously grown species, like brown sarson (*Brassica rapa* L. var. brown sarson), toria (*Brassica rapa* L. var. toria), black mustard (*Brassica nigra*), yellow sarson (*Brassica rapa* L. var. yellow sarson), Indian mustard (*Brassica juncea*), and taramira (*Eruca sativa/vesicaria*), which have been grown since about 3,500 BC with exotic species like gobhi sarson (*Brassica napus*) and Ethiopian mustard or karan rai (*Brassica carinata*). (Anonymous, 2015). India rank first in total rapeseed mustard production**.** The major rapeseed mustard growing states in India are Rajasthan, Madhya Pradesh, Utter Pradesh, Haryana, Punjab, West Bengal, Gujarat, Bihar and Assam occupies approximately 86.5% of total area which is 5.76 Million hectare in the country and 91% of total production of 6.82 million tonnes**.** Among the nine oil seed crops grown in India rapeseed mustard contribute about one third of the oil to the country. This crops can be cultivated both rain fed as well as irrigated condition and fetches higher market value, thus add to the rural economy specially to marginal and small farmer. In Uttar Pradesh crop occupy 0.59 million hectare area (10.30% of the total area in country) with production of 0.60 million tonnes (8.83% of the country). (Anonymous, 2016).

Rapeseed mustard is annual *rabi* season oil seed crop. Though the crop is having the high quality of oil and meal and is widely adaptable to varied agro-climatic conditions, the area, production and productivity of rapeseed-mustard in India have been varying each year due to various abiotic and biotic factors coupled with India's domestic price support program. The data in Table 1 shows that Uttar Pradesh having less productivity among other States and this was mainly due faulty sowing practices, improper crop geometry, avoid use of biofertilizers, other intercultural operations and climatic variabilities are predominant reasons for limiting the potential yield of pigeon pea. To enhance the production and productivity, Krishi Vigyan Kendra Dhaura Unnao have conducted front line demonstration (FLDs) under National Mission on Oilseed and Oil palm (NMOOP) funded by government of India. The Frontline demonstrations (150) were conducted on farmer's field to demonstrate the impact

of improved variety and bed planting methods other crop management technology on mustard over four years during *Rabi* 2013-14 to 2016-17.

Table 1. Rape seed mustard area, production and Yield in major producing states India during 2014-15 and 2015-16*.

State	2015-16					2014-15				
	Area	% to All India	Production	% to All India	Productivity	Area	% to All India	Production	% to All India	Productivity
Haryana	0.51	8.77	0.81	11.80	1594	0.49	8.50	0.71	11.24	1432
Madhya Pradesh	0.62	10.71	0.70	10.26	1135	0.71	12.30	0.72	11.42	1006
Rajstahan	2.55	44.26	3.27	47.93	1282	2.47	42.67	2.90	46.11	1170
Uttar Pradesh	0.59	10.30	0.60	8.83	1015	0.63	10.79	0.58	9.27	930
West Bengal	0.46	7.95	0.50	7.32	1090	0.45	7.74	0.48	7.64	1069

*Source: *Agricultural statistics 2016 at glance*

MATERIALS AND METHODS

The study was conducted by Krishi Vigyan Kendra, Dhaura, Unnao from 2013-14 to 2016-17 using two varieties of Indian mustard ((*Brassica juncea*)) *var*. Kanti (RK9807) released from CSAUAT Kanpur recommended for production in Uttar Pradesh notified in 2003 with potential yield 18.0 q ha^{-1}. Maturity duration is 100-105 days, oil content 40-42% and NDRE4 with potential yield 20.00 q ha^{-1} released from NDUA&T, Faizabad with maturity duration of 105-107 oil content 40% Plant height 110-135 cm. Seeds were procured from National Seeds Corporation, regional station Kanpur and distributed to the selected farmer. The Objectives of the FLDs was to find out gap between potential yield, demonstration yield, extension gap, and technology index. The FLDs was conducted with selected farmers group of the district. The sowing was done in the first fortnight of October. The farmers were guided by scientists from Krishi Vigyan Kendra in every stage of the crop, with respect to optimum plant population, recommended dose of fertilizer, irrigation management and plant protection measure. The yield data were collected from both the demonstration and farmers practice by random crop cutting method. Qualitative data were converted into quantitative form and expressed in terms of per cent increase in yield calculated using following formula:

- % Increase in the yield: (Demonstration yield - farmers yield/Farmers yield) X 100
- Technological gap: Potential yield – demonstration yield
- Extension gap: Demonstration yield – yield under farmer practice
- Technology index (%): (Potential yield - demonstration yield/potential yield) X 100

RESULT AND DISCUSSION

Grain Yield

It is apparent from the data presented in Table 2 that selected varieties of Indian mustard (Kanti and NDRE - 4) have significant and beneficial effect on grain yield of mustard. Data indicated that maximum yield per hectare (18.65 q ha^{-1}) were found with variety NDRE – 4 in 2015-16 followed by farmer practice. Minimum values for these parameters were observed in farmer practice over all the experimental years. Similarly, data presented in Table 2 exhibit a beneficial response to variety Kanti and NDRE - 4 that 21.4 per cent increase in yield during 2013-14, 15.90 per cent during 2014-15, 52.0 per cent during 2015-16 and 51.0 per cent during 2016-17 respectively. The average yield of the four year of demonstration was 18.30 q ha^{-1} against the check variety under farmers practices 13.70 q ha^{-1}. Benefit cost ratio for the Year 2013-14 was 1.86:1 & 1.80:1 for the year 2014-15 against the farmer practice 1.60:1 for 2013-14 & 1.56:1 in 2014-15. Similarly all these parameter was calculated for the variety NDRE4 with the potential yield of 20. 0 q ha^{-1} sown for the two year 2015-16 and 2016-17.The average yield of the Year 2015-16 was 18.64 q ha^{-1} and it was maximum over variety Kanti (17.92 q ha^{-1}) and farmer practice (13.70 q ha^{-1}). This results clearly indicated that the higher average grain yield with bed planting method in demonstration plots over the years compare to local check due to knowledge and adoption of full package of practices *i.e.* improved variety *e.i.* Kanti and NDRE - 4, sowing method and crop management technologies like timely sowing, seed treatment use of balanced dose of fertilizer as well application of sulphur, timely weed management, need based plant protection etc. The yield of mustard could be increased over the yield obtained under farmers practices (old variety, no use of the balanced dose of fertilizer, untimely sowing and no control measure adopted for pest management) of mustard cultivation. The above findings are in similarity with the findings of Chauhan *et.al.,* 2006, Chauhan and Singh, 2004 & Kumpawat, 2004.

Economics

Data on economic returns presented in Table 2 and revealed that demonstrated technology of improved variety of mustard (Kanti and NDRE - 4) and their associated agronomical practices produced 85.52 per cent higher net return (Rs. 28617/-) over the existing farmer practices (Rs. 15425/-). Benefit cost ratio of NDRE – 4 variety for the Year 2015-16 was 2.59:1 & 2.57:1 for the year 2016-17 against the check variety 1.70:1 for 2015-6 and 1.17:1 in 2016-17. For motivating the farmers for acceptance of improved mustard varieties Kanti and NDRE – 4, the Front Line Demonstrations were carried out at the farmer's field and data also indicated that 35.0 per cent higher yield was recorded in demonstrated field than the existing technologies adopted by the farmers. In case of benefit cost ratio maximum benefit cost ratio was observed with NDRE - 4 variety of mustard compared to variety Kanti and farmer practice. The results revealed that improved mustard variety is able to produce, by itself, plant growth and grain yield that were higher compared to farmer practice. The highest growth and yield response were achieved with variety NDRE - 4. This positive performance of the variety might be due to production potential of the improved variety and adoption of scientific agronomical practices leads to improved nutrient availability to growing crop (Singh *et al*., 1999). As the crop grown under irrigated condition, the beneficial effect of improved variety with scientific agronomic practices like nutrient management, weed management etc. results in greater and longer availability of nutrients as per demand of the crop. The similar findings also reported by Shekhawat *et. al.*(2012).

Technological gap

Consequently extension parameter was also calculated and given in the table No 3. The technology gap for demonstrated plots were 3.64 and 4.44 q ha-1 with variety Kanti and 5.35 & 5.38 q ha-1 with variety NDRE – 4 during the year 2013-14, 2014-15, 2015-16 and 2016-17 respectively (Chauhan and Singh 2004). On an average technology gap under four years of FLD program were 4.70 q ha-1 for the mustard cultivation in the district Unnao. The technology gap observed may be attributed to dissimilarity in the crop management practices, soil fertility status, and local climatic situation.

Extension gap

Extension gap of Kanti variety were 3.24 and 2.41 q ha^{-1} during 2013-14 and 2014-15 respectively and 6.45 and 6.29 q ha^{-1} with variety NDRE – 4 during 2015 -16 and 2016-17 respectively. On an average extension gap under four years of FLD experiment was 4.60 q ha^{-1} of mustard cultivation which emphasized the need to educate the farmers through various extension means *i.e.* front line demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of hurdle extension gap. . The above findings are in similarity with the findings of Samui, *et.al.* (2000).

Technology Index

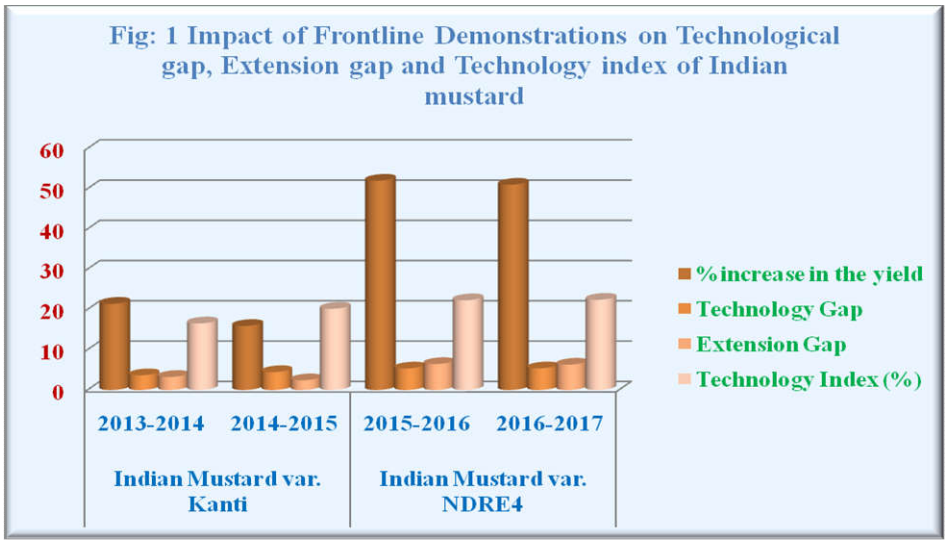
Data on technology index presented in Table 3. The technology index shows the feasibility of the demonstrated technology at the farmer's field. The technology index varied from 16.55 to 22.42 per cent (Table-3). On an average technology index was observed 18.36 per cent with variety Kanti and 22.35 per cent for the variety NDRE – 4 during the four experimental years of mustard in the district Unnao of Uttar Pradesh which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of Indian mustard at farmer's field.

Table 2 Effect of Frontline Demonstrations on Yield and Economics of Indian mustard.

	Year	No of farmer	Total area (ha.)	Yield (q./Ha)		% In-crease in Yield	Economics of demonstration (Rs./ha)				Economics of Farmer Practice (Rs./ha)				Potential Yield
				Demonstration	Farmer Practice		Gross Cost	Gross Return	Net Re-turn	B:C Ra-tio	Gross Cost	Gross Return	Net Re-turn	B:C Ra-tio	
Kanti	2013-14	35	13	18.36	15.12	21.4	27598	51400	23801	1.86:1	26320	42336	16106	1.61:1	22.0
	2014-15	15	06	17.56	15.15	15.9	27430	49448	22018	1.80:1	26520	41480	14960	1.56:1	22.0
NDRE4	2015-16	75	30	18.65	12.20	52.0	21600	55950	34350	2.59:1	20600	36600	16000	1.70:1	24.0
	2016-17	25	10	18.62	12.33	51.0	21814	56114	34300	2.57:1	20490	35125	14635	1.17:1	24.0
Average	--	38	15	18.30	13.70	35.0	24610	53228	28617	2.21:1	23482	38885	15425	1.51:1	23.0

Table 3 Effect of Frontline Demonstrations on Technological gap, Extension gap and Technology index of Indian mustard.

Parameter	Indian Mustard *var*. Kanti		Indian Mustard *var*. NDRE4		Average
Year→	2013-2014	2014-2015	2015-2016	2016-2017	
%increase in the yield	21.42	15.91	52.0	51.0	35.08
Technology Gap	3.64	4.44	5.35	5.38	4.70
Extension Gap	3.24	2.41	6.45	6.29	4.60
Technology Index (%)	16.55	20.18	22.29	22.42	20.36



CONCLUSION

This study on Effect of front line demonstration on Production, Profitability, and social impact on mustard cultivation was conducted to assess the average status of mustard production in district Unnao of Uttar Pradesh, average cost of cultivation, net return, benefit cost ratio, challenges faced by mustard farmer and to suggest agronomical and technical measures for higher mustard production. The main issue reported by the mustard growers was non recommended varieties for the area and poor quality of seed. The mustard in important commercial oils seed crop in Unnao district, therefore its cultivation need to be enhanced, so the KVK Unnao started the front line demonstration at farmer fields in entire district. In conclusion, cultivation of Rapeseed -mustard with improved variety NDRE4 and Kanti have higher yield in comparison to the farmer practices in all the year of the evaluation. Within these two varieties of Indian mustard variety NDRE4 performed very well in the Unnao district in comparison to the variety Kanti. Farmers income can be enhanced by the variety NDRE4 as require less managerial practice. Whereas Variety Kanti performed well in comparison to the farmer practices but its performance was far below the its potential yield, this may be due poor response of the variety to soil nutrient as majority of the soil in Unnao district in Usar land with alkaline PH. The potentials of the improved mustard variety for higher yield and income were disseminated to the farmers through demonstrations. Concerted efforts must be made for promotion of such varieties of the benefit of the farmers. With the efforts made by KVK, many farmers has adopted new technology and this is acceptable by the farming community in the Unnao district of Uttar Pradesh and variety has spread in more then 2000 hectare area.

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