Himachal Journal of Agricultural Research 33 (2):257-261, 2007

Demonstration- an effective tool for increasing the productivity of rapeseed-mustard in Kangra district of Himachal Pradesh

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Abstract

The impact of improved technology on the productivity of rapeseed- mustard against the farmer's practice and the economic feasibility of technology transfer was studied for three consecutive years (2002 -2005). The study revealed a wide gap between the potential and demonstration yields in rapeseed- mustard due to technology and extension gaps. The extension gaps were higher in general, resulting into poor adoption of technology. This highlighted the strong need to educate the farmers in the adoption of improved technology. The maximum extension gap was recorded in *karan rai* followed by *gobhi sarson* (irrigated). The analysis revealed that by adopting the improved production technology, the yield levels could be raised by 37-67 % in mustard, 74-120 % in *gobhi sarson* and 156-192 % in *karan rai* in comparison to the yields obtained under farmer's fields. The highest IBCR was recorded in *karan rai* followed by *gobhi sarson* and mustard. In *gobhi sarson*, more economic returns were observed under irrigated conditions as compared to rain fed conditions. The order of profitability was *karan rai* > *gobhi sarson* > mustard.

Introduction

Oilseeds occupy a prominent place in the agricultural economy of India as they are next only to food grains in terms of acreage, production and value. India accounts for about 12-13 % of world's oilseeds area, 6-7 % of world's oilseeds production and 10 % of the world's edible oil consumption (Hegde, 2005). The diverse agro-ecological conditions in the country are favourable for growing nine annual oilseeds. India is the second largest rapeseed-mustard growing country in the world after China and is third in production after China and Canada (Kumar, 2005). In Himachal Pradesh, rapeseed- mustard is grown over an area of 8.7 thousand hectares with a total production of 4.7 thousand tonnes and average productivity of 540 kg/ha. The crop accounts for about 57 % of the total oilseeds area and contributes 60 % to the total oilseeds production in the state. Among various *Brassica* species, much of the area is occupied by the mustard followed by *gobhi sarson* and brown *sarson* while yellow *sarson* and *taramira* crops are grown in some niches. *Toria* is grown as a catch crop in maize- wheat and maize- potato cropping sequences. Although, Ethiopian mustard or *karan rai* is a new emerging oilseed crop having less area under cultivation, yet, gaining much popularity especially among farmers of rainfed areas.

The front line demonstration programme (FLDs) is an outcome of 'Technology Mission on Oilseed crops'. Theses are the demonstrations conducted on farmer's fields under the close supervision of the scientists. The main objective of Front Line Demonstrations is to demonstrate the performance of newly released crop variety, crop production and protection technologies on the farmer's fields under varied farming conditions for effective transmission of generated technology.The present study was undertaken to analyse the impact of technology transfer for sustainable productivity of rapeseed- mustard by adopting the farmer's fields of Kangra district of Himachal Pradesh.

Material and Methods

Front line demonstrations on mustard (rainfed and irrigated), *gobhi sarson* (rainfed and irrigated) and *karan rai* (rainfed) were conducted by CSKHPKV, SAREC, Kangra in 9, 9 and 7 villages during the period 2002-03, 2003-04 and 2004-05, respectively. A total of 45 farmers were associated with this programme in all the three years. The improved technology was demonstrated on an area of 7.98 hectare in all three years out of which 1.82 hectare was in

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2002-03, 3.36 in 2003-04 and 2.8 hectare in 2004-05. A total of 4.60 ha area under rainfed and 3.38 ha under irrigated conditions was covered. In FLD's plot, full package of practices were adopted whereas in the adjoining farmer's field which served as a control, the crop was grown according to farmer's practice (Table 1).

Table 1. Demonstration package and farmer's practice under Front Line demonstrations in rapeseed- mustard

n = 45

Sr. No.	Technology component	Demonstration package	Farmer's practice
1.	Variety		
	Mustard Gobhi sarson	Varuna, RCC-4 HPN-1	Local Local
	Karan rai	JTC-1	Local
2.	Seed rate	5-6 kg/ha	9-10 kg/ha
3.	Sowing method	Line sowing (30x10 cm)	Broadcasting
4.	Fertilizer dose	90:60:40 (N:P:K) kg/ha	N@ 20-30 kg/ha, no use of P & K
5.	Technical guidance	Time to time	Nil
6.	Plant protection	Need based insecticides and fungicides spray	Nil

The primary data was collected from the selected farmers through personal interview with the interview schedule. The qualitative data was converted into quantitative form and expressed in terms of percent increase in the yield calculated by using the formula as given below;

$$\% \text{ increase in the yield} = \frac{\text{Demonstration yield - Farmer's plot yield}}{\text{Farmer's plot yield}} \times 100$$

To estimate the technology, extension gap and technology index, the following formulae were used:

Technology gap = (Potential yield) – (Demonstration plot yield)

Extension gap= (Demonstration plot yield) – (Farmer's plot yield)

$$\text{Technology Index} = \left(\frac{Pi - Di}{Pi}\right) \times 100$$

Where

Pi = Potential yield of i^{th} crop

Di= Demonstration plot yield of i^{th} crop

(Kadian *et al.*, 1997)

Results and Discussion

In general, the yields of demonstration plots were invariably higher than the farmer's plot yields (Table 2) in all years which were due to the adoption of recommended practices in Front Line Demonstrations.

Yield gaps: The yield gaps were categorized into technological and extension gaps. Technology gap was the highest in *gobhi sarson* variety HPN-1 (988 kg/ha) under rainfed conditions followed by 882 kg/ha under irrigated conditions during the year 2004-05 while the lowest gap was observed in mustard variety Varuna (80 kg/ ha) in 2002-03. The technology gap appears even if the front line demonstrations are conducted under the strict supervision of the scientists in the farmer's fields. This may be attributed mainly due to variation in the soil fertility, non-congenial weather conditions and local specific management problems faced for the attainment of potential and demonstration yields (Vaghasia *et al.*, 2005). Therefore, location specific recommendations are necessary to abridge the gap. The higher extension gap indicated that there is a strong need to motivate the farmers in the adoption of improved technology. The maximum extension gap of 767 and 700 kg/ha was observed in *karan rai* (JTC-1) during 2003-04 and 2002-03 respectively. This was followed by an extension gap of 678 and 669 kg/ha in *gobhi sarson* variety HPN-1 (irrigated conditions) during the years 2003-04 and 2002-03 respectively. The technology gap in HPN-1 variety of *gobhi sarson* (170 kg/ha) was also reported earlier while an extension gap of 300 kg/ha was observed in RL-1359 variety of mustard (Kadian *et al.*,1997). Zaman *et al.* (2000) in their evaluation in mustard FLD's , also revealed a serious gap between potential and on-farm yields mainly due to lack of awareness in the adoption of proper and improved technology in rapeseed- mustard production.

Technology Index: Technology Index indicates the feasibility of the evolved technology in the farmer's fields. Lower the value of technology index, higher is the feasibility of improved technology. Technology Index varied from 5.7 to 61.8 % during all the three years of study. The highest Technology Index was recorded in HPN-1 (61.8%) under rain fed conditions followed by 49.0 % under irrigated conditions in 2004-05. This indicates that a strong gap exists between the technology evolved at the research station and disseminated at the farmer's fields (Kadian *et al.*, 1997; Thakral and Bhatnagar, 2002; Vaghasia *et al.*, 2005). Technology Index was comparatively lower in mustard

Table 2. Technology gap, Extension gap and Technology Index in rapeseed- mustard in Kangra district of H.P.

n = 45

Crop/ variety	Year	Area (ha)	Farming situation	Yield (kg/ha)		% YIOFP	Technology gap (kg/ha)	Extension gap (kg/ha	Technology Index (%)
				DP	FP				
Mustard									
Varuna	2002-03	0.10	Irrigated	1320	790	67.1	80	530	5.7
RCC-4	2002-03	0.16	Rain fed	1150	840	36.9	150	310	11.5
Gobhi sarson									
HPN-1	2002-03	0.20	Rain fed	990	450	120.0	610	540	38.1
HPN-1	2002-03	1.16	Irrigated	1318	649	107.1	482	669	26.8
Karan rai									
JTC-1	2002-03	0.20	Rain fed	1150	450	155.6	850	700	42.5
Gobhi sarson									
HPN-1	2003-04	1.32	Rain fed	900	439	105.0	700	461	43.8
HPN-1	2003-04	1.44	Irrigated	1256	578	117.3	544	678	30.2
Karan rai									
JTC-1	2003-04	0.6	Rain fed	1167	400	192.0	633	767	35.2
Gobhi sarson									
HPN-1	2004-05	2.12	Rain fed	612	351	74.4	988	261	61.8
HPN-1	2004-05	0.68	Irrigated	918	490	87.3	882	428	49.0

DP- Demonstration Plot FP- Farmer's Plot YIOFP- Yield increase over Farmer's Plot

Table 3. Additional cost and returns in rapeseed- mustard under Front Line Demonstration programme in district Kangra (Himachal Pradesh)

n = 45

Crop/ variety	Cost of cultivation (Rs)		Gross returns (Rs)		Net returns (Rs)		Additional cost (Rs)	Additional returns (Rs)	IBCR
	DP	FP	DP	FP	DP	FP			
Mustard									
Varuna	7250	4890	19460	11640	12210	6750	2360	5460	2.3
RCC-4	6450	4290	16950	12390	10500	8100	2160	2400	1.1
Gobhi sarson									
HPN-1	6450	4290	14600	6640	8150	2350	2160	5800	2.7
HPN-1	7250	4890	19432	9564	12182	4674	2360	7508	3.2
Karan rai									
JTC-1	6450	4290	16969	6640	10519	2350	2160	8169	3.8
Gobhi sarson									
HPN-1	6650	4390	13354	6537	6704	2147	2260	4557	2.0
HPN-1	7500	5040	18635	8592	11135	3552	2460	7583	3.1
Karan rai									
JTC-1	6650	4390	17297	5953	10647	1563	2260	9084	4.0
Gobhi sarson									
HPN-1	6150	4284	10114	5807	3964	1523	1866	2441	1.3
HPN-1	7000	4910	14982	8060	7982	3150	2090	4832	2.3

varieties like Varuna and RCC-4 (5.7 to 11.5%) than *gobhi sarson* and *karan rai*. Hence, it advocates that the mustard crop is more popular among the farmers in comparison to *gobhi sarson* and *karan rai* as the farmers are habitual of growing mustard crop (pure and mixed crop) since many years whereas *gobhi sarson* and *karan rai* crops are recent introductions-so still not popular among the farmers of the state. The highest technology index was also reported by Kadian *et al.* (1997) in HPN-1 variety of *gobhi sarson* among different oilseed crops studied.

Comparison of yields, input cost and returns: The adoption of improved practices followed under front line demonstration programme has resulted into invariable increase in the yields over the farmer's fields (Kadian *et al.*, 1997; Suryawanshi and Prakash, 1993 ; Vaghasia *et al.*, 2005). The increase in yield varied from 36.9 % (RCC-4) to 192.0 % (karan rai). This clearly indicated that with the adoption of appropriate production technology, the yield levels could be raised by 36.9 to 67.1% in mustard, 74.4 to 120.0 % in *gobhi sarson* (rainfed), 87.3 to 117.3 % in *gobhi sarson* (irrigated) and 155.6 to 192.0 % in *karan rai* over the yields obtained under farmer's fields. The yield advantage of 12 to 108 % has been reported earlier also in oilseed crops (Kiresur and Prasad, 1994).

The comparative profitability of different *brassica* crops has also been studied by estimating the additional benefit- cost ratio (IBCR) and the results are presented in Table 3. The highest IBCR up to 4.0 was recorded in *karan rai* followed by 3.8 during the years 2003-04 and 2002-03 respectively. The IBCR up to the range of 1.37 to 13.40 has been reported by Kiresur and Prasad (1994) while studying the potential of improved oilseed production technologies in safflower, sunflower, sesame, rapeseed- mustard and groundnut. The IBCR was more under irrigated conditions in comparison to rainfed conditions in gobhi sarson which indicated that the variety HPN-1 is more suitable under irrigated conditions. The profitability in general, was in the order of *karan rai* > *gobhi sarson* >mustard.

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