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Yield Gap Analysis of Toria *(Brassica campestris)* through Front Line Demonstrations in Kandhamal District of Odisha

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ABSTRACT

The present study was carried out at Krishi Vigyan Kendra, Kandhamal to know the yield gaps between improved package and practices (IP) under Front Line Demonstration (FLD) and farmer's practice (FP) of toria crop. Yield attributes of both demonstration and farmers' practice were recorded and their yield gap, technology gap, extension gap and technology index were analyzed. The average five years data revealed that an average yield of demonstrated plot was obtained 10.01 q/ha over local check (6.55 q/ha.) and there is an increase in average productivity by 52.97 per cent. On an average technology gap was recorded to be 1.99 q/ha. While average extension gap was observed to be 3.46 q/ha. Average technology index was recorded as 16.63 per cent. The average cost benefit ratio was 2.55 under demonstration, while it was 1.75 under control plots. The trend of technology gap reflected the farmer's cooperation in carrying out demonstrations with encouraging results in subsequent years. By conducting front line demonstration of proven technologies, yield potential of rapeseed-mustard crop could be enhanced with increase in the income level of the farming community.

Key words: Extension gap; front line demonstration; technology gap; technology index; yield gap;

INTRODUCTION

The global production of rapeseed-mustard and its oil is around 38-42 million tonns and 12-14 million tonns, respectively. India is the fourth largest oilseed economy in the world. Oilseeds form the second largest agricultural commodity in India after cereals sharing 14 per cent of the gross cropped area and accounting for nearly 3 per cent of gross national product and 10 per cent value of all agricultural products (Shekhawat *et al.,* 2012). The continuous increase in import of oilseed is a matter of great concern today. Among the seven edible oilseed crops cultivated in India, rapeseed-mustard (Brassica spp.) contributes 28.6 per cent in the total production of oilseeds. In India, it is the second most important edible oilseed after groundnut sharing 27.8 per cent in the of the nation oilseed economy. The total area under rapeseed-mustard was 6.70 million ha with a total production of 7.96 million tonns with the average productivity of 1188 Kg/ha during 2013-14 (Agricultural Statistics at a Glance 2014, Directorate of Economics and Statistics, Ministry of Agriculture, DAC). The rapeseed-mustard group broadly includes Indian mustard, yellow sarson, brown sarson, raya, and toria crops.

In Odisha, rapeseed-mustard is cultivated in 126.67 thousand ha with a total production of 52.66 thousand MT, average productivity being 416 Kg/ha (2013-14), which is 64.98 per cent lower than the national average (1188 Kg/ha). Again, in Kandhamal district of Odisha, the average productivity of toria is 598 Kg/ha, which is 49.66 per cent lower than the national average(Odisha Economic Survey 2014). However, with the available improved technologies it is possible to bridge the yield gap and increase the productivity up to the potential level (12.0q/ha). Rapeseed-mustard is an important oilseed crop of Kandhamal district of Odisha state. Kandhamal district has been considered as productively potential region of rapeseed-mustard crop due to favourable soil and climatic conditions. However there is still a wide gap between the production potential and actual production realized by the farmers. This may be due to partial adoption of recommended package of practices by the rapeseed-mustard growers.

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In this context, it deserves to mention that Front Line Demonstration (FLD) is an efficient approach for reducing gap between potential yield and farmers yield, dissemination of technology, generation of primary data and collection of feedback for subsequent use in the process of large scale adoption of technology in farmers' field. As Toria is the major oilseed crop in Kandhamal district of Odisha, KVK Kandhamal has conducted various FLDs on toria variety Parvati from last five years to increase the productivity and production. Obviously those FLDs need to be evaluated. Hence the study was undertaken to find out effects of FLDs on bridging the yield gap in terms of technology gap, extension gap and technology index.

METHODOLOGY

The present study was undertaken in the villages of Kandhamal district of Odisha where on toria var. Parvati was conducted by KVK, Kandhamal during Rabi season from 2010-11 to 2014-15 (five consecutive years) in the farmers' fields in fifteen adopted villages *viz.,* Belikala Chanehedi, Dubakia, Gassaguda, Gotamaha, Jakamaha, Kambanaju, Kelamaha, Lamungia, Penala, Pradhanpada, Redhangia, Sakali, Sisapanga and Tadungia. During these five years of study, an area of 100.0 ha was covered with plot size 0.40 ha (1 acre) under front line demonstration with active participation of 250 farmers. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation *etc.* were followed as suggested by Choudhary, 1999 and Venkattakumar *et al,* 2010. Out of the total participating farmers, 100 respondents were selected by random sampling method. Data on yield and yield attributes from both the demonstration and farmers practice were recorded and their technology gap, extension gap and the technology index were worked out using methods developed by Samui *et al.* (2000) as stated below:

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers yield

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

RESULTS AND DISCUSSION

The differences between the demonstration package including Toria var. Parvati and existing farmers practice are presented in Table 1.

Table 1: Comparison of demonstration package and farmers practices under FLD on toria

Parameters	Demo. package	Farmers' practice
Farming situation	Irrigated medium land	Rainfed medium land
Variety	Parvati	Traiditional/non- descriptive
Seed treatment	Thiram @ 3g/Kg. of seed	Nill
Time of sowing	End of Sept. to Mid of October	1st fortnight of December
Spacing	30X10 cm	No spacing maintained
Sowing method	Line sowing	Broadcasting
Seed rate	10 kg/ha	15 kg/ha
Ferti. Dose(NPKS)	60:30:30:40	20:20:00
Borax (kg/ha)	10	Nil
Irrigation	First at branching stage (30 DAS) and the second at pod formation stage (60 - 65 DAS)	No scheduled irrigation
Weed management	Pendamethalin @ 1.0 Kg./ha as pre emergence followed by one hand weeding at 35 DAS	One hand weeding at 30 DAS
Plant Prot. measures	• Against aphid *(Lipaphis erysimi) :* Foliar spray of 625ml Dimethoate30Ecin200 litre water per ha	Nil
	• Against saw-fly (*Athalia proxima):* 1 litre of Malathion 50EC in 200 litre of water per ha.	Nil

The data of table 2 revealed that the yield of toria variety Parvati under FLDs was substantially higher than the variety grown by farmers during all the years. The maximum yield was recorded (10.31 q/ha) during 2013-14 and minimum yield was recorded in year 2011-12 (9.48 q/ha) and the average yield of five years study period was recorded 10.01 q/ha over local practices (6.55 q/ha). The increase in per cent of yield was ranging between 49.20 to 60.23 during five years of study. On an average 52.97 per cent increase in yield was registered in the demonstration plots.

The similar results of yield enhancement in rapeseed-mustard crop in front line demonstrations has been documented by Mitra and Samajdar (2010) in tarai zone of West Bengal. The results are also in conformity with the findings of Tiwari and Saxena (2001), Tiwari *et al* (2003), Tomer et al (2003), Singh *et al* (2007) and Katare *et al* (2011).

The results indicated that the Front Line Demonstrations has given a good impact on the farming community of this district as they were motivated by the improved agricultural technologies used in the Front Line Demonstrations. The results clearly indicates the positive effects of FLDs over the existing practices toward in enhancing the yield of toria in Kandhamal area. The

average technology gap was 1.99 q/ha during the period of study. The trend of technology gap (ranging between 1.69 - 2.52 q/ha) reflects the farmers cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed might be attributing to the dissimilarity in soil fertility status and weather conditions. Mukharjee (2003) have also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing system productivity. Similar findings were also recorded by Mitra *et al* (2010) and Katare *et al* (2011).

The extension gap ranging between 3.25 – 3.71 q/ha during the study period emphasizes the need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend of wide extension gap. Yield potential of the non-descriptive varieties may be lost due to contiguous use of those varieties year after years. To increase the productivity and production of toria, seed replacement of non-descriptive varieties by HYVs is very much essential. In this context, FLD are playing an important role in popularizing the HYV of Toria in the study area.

The technology index showed the feasibility of the evolved technology at the farmer's fields. The lower the value of technology index, the more is the feasibility of technology. The wider gap in technology index (ranging between 14.08 – 21.00) during the study period in certain region, may be attributed to the difference in soil fertility status, weather conditions, non-availability of irrigation water and insect-pests attack in the crop. Benefit-cost Ratio was recorded higher under demonstration against control in all the years of study.

These results were also supported by Singh *et al* (2008) who found that the improved technologies of mustard crop have significant effect in higher productivity of mustard. The findings revealed that a gap exists between the actual farmer's yield and realizable yield potential of the variety.

Use of improved variety carry potential to enhance the present level of toria productivity which is not percolating down at desired pace due to lack of confidence among the farmers. Hence, to exploit the potential of improved production and protection technologies efforts through FLDs ought to be increased awareness among the farmers.

Table 2: Productivity, technology gap, extension gap and technology index in toria (var. Parvati) under FLDs

Year	Area (ha)	No of farmers	Seed yield (q./ha)			% increasing over control	Tech. gap (q./ha)	Ext. gap (q./ha)	Tech. index (%)	B:C Ratio	
			P	D	FP					D	FP
2010-11	20	50	12.00	9.48	6.23	52.16	2.52	3.25	21.00	2.23	1.70
2011-12	20	50	12.00	9.87	6.16	60.23	2.13	3.71	17.75	2.36	1.64
2012-13	20	50	12.00	10.12	6.61	53.10	1.88	3.51	15.67	2.62	1.81
2013-14	20	50	12.00	10.24	6.82	50.15	1.76	3.42	14.67	2.74	1.86
2014-15	20	50	12.00	10.31	6.91	49.20	1.69	3.40	14.08	2.79	1.73
Average			**12.00**	**10.01**	**6.55**	**52.97**	**1.99**	**3.46**	**16.63**	**2.55**	**1.75**

CONCLUSION

The results of front line demonstrations convincingly brought out that the yield of toria could be increased by 49.20 per cent to 60.23 per cent with the intervention on balanced nutrition coupled with the improved seed and disease management in the Kandhamal district. From the above findings, it can also be concluded that use of scientific methods of toria cultivation can reduce the technology gap to a considerable extent thus leading to increased productivity in the district. Moreover, extension agencies in the district need to provide proper technical support to the farmers through different educational and extension methods to reduce the extension gap for higher oilseed production in the district. Favourable benefit cost ratio itself is an explanatory of economic viability of the demonstration and convinced the farmers for adoption of intervention imparted.

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