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Yield gap analysis of rapeseed through frontline demonstration under rainfed conditions in Bongaigaon district of Assam, India

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ABSTRACT

Indian rapeseed (*Brassica campestris* L. var. toria) is a major oilseed crop of Assam. Although rapeseed has a prominent place in the oilseeds scenario of the state, there is a vast yield difference between the potential yield and actual yield realized by the farmers. The productivity of the crop is very low due to poor transfer of technology. There is a tremendous opportunity for increasing area and the production of the crop by adopting the improved production technologies. To boost the production and productivity particularly in oilseed crops, Krishi Vigyan Kendras are playing important role in popularizing the improved technologies by demonstrating at farmers' fields in their farming situation through Front Line Demonstrations (FLDs). Keeping the importance of FLD on rapeseed for enhancing the acreage and production of the crop, Krishi Vigyan Kendra, Bongaigaon, Assam conducted 1039 nos. of cluster frontline demonstration (CFLD) on high yielding variety of rapeseed (TS-36) in fifty eight villages in 640 ha of land during *rabi* season of the years 2015-16, 2016-17, 2017-18, 2018-19 and 2019-20 (five consecutive years) to find out the impacts of FLDs on bridging the yield gap between the potential yield and the yield in the actual farming situation. The results revealed that per cent increase in yield over farmers' practice (local check) ranged from 18.03 to 26.90 per cent over five years. On an average, the technology gap, extension gap and technology index were recorded 1.92q/ha, 2.28q/ha and16.03%, respectively. The benefit cost ratio (BCR) of demonstration plots ranged from 1.94 to 2.97 in rapeseed crop.

Key words: *Cluster frontline demonstration, Extension gap, Technology gap, Technology index yield gap.*

Introduction

Edible oilseed crops have significant contribution in agriculture. After soybean and palm oil, rapeseed-mustard is the third most important edible oilseed crop worldwide. Globally, as per USDA during 2018-2019, it was grown over 36.6 million hectares and produced 72.4 million tonnes (MT) with a productivity of 19.8 q/ha. Globally, India is the third largest producer of rapeseed mustard which accounts 19.8% of total acreage and 9.8% of total production. However, productivity of rapeseed mus-

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tard in India is only 1,089 kg/ha. Next to groundnut, rapeseed-mustard is contributing to 20% of the total oilseed production in India (Meena *et al*., 2018). In India, rapeseed-mustard accounts for about 87 per cent of production of oilseeds in the country during 2018-19. Currently, share of oilseeds are 14% of the total area under major crops.

Among the oilseed crops, rapeseed-mustard is the major crop grown in Assam during *rabi* season. In Assam, rapeseed-mustard is covering 2.87 lakh ha area with a production and productivity of 1.8 lakh MT and 647 kg/ha, respectively (Anonymous, 2018-19). The yield level has also fluctuated over the last ten years from 525 kg/ha in 2009-10 to 647 kg/ha in 2019-20. Although rapeseed-mustard has a prominent place in the oilseeds scenario of the state, there is a vast yield difference between the potential yield and actual yield realized by the farmers. The yield gap can be minimized and the productivity can be increased up to the potential level (12.0 q/ha) through the intervention and adoption of existing improved technologies. In Bongaigaon district, rapeseed-mustard being one of the important oilseed crops is cultivated in 7786 ha area with production of 5380 MT (Anonymous, 2022). Considering the importance of the crop, various frontline demonstrations (FLD) on rapeseed using high yielding variety TS-36 developed by Assam Agricultural University has conducted by Krishi Vigyan Kendra (KVK), Bongaigaon. Keeping these in view, a study on the impacts of FLDs on bridging the yield gap between the potential yield and the yield in the actual farming situation was carried out in Bongaigaon district of Assam.

Materials and Methods

Krishi Vigyan Kendra, Bongaigaon, Assam carried out cluster FLD (CFLD) in the farmers' fields in fifty eight adopted villages of Bongaigaon district during *rabi* season during 2015-16 to 2019-20 (five consecutive years). An area of 640 ha was covered with active participation of 1039 nos. of farmers selected from adopted villages under CFLDs. Before conducting CFLDs, Several group meeting were arranged and farmers were selected for the demonstration. The skill training programmes were also arranged to impart the knowledge regarding different aspects of scientific production technology of rapeseed. Use of improved seeds of high yielding varieties (TS-36), line sowing method, timely weeding, use of balanced fertilization (using micronutrient sulphur and boron), need based of pesticides, use of appropriate fungicides for seed treatment was used as technological interventions in demonstration plots and comparison has been made with the existing farmer's practices (Table 1). The yield data were collected both from the demonstration and farmer's practices by random crop cutting. The extension gap, technology gap and technology index were calculated according to the methods developed by Samui *et al.* (2000) as stated below:

Technological gap (q/ha) = Potential yield (q/ha) – Demonstration yield (q/ha)

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

$$\text{Technological index (\%)} = \frac{\text{Potential yield (q/ha)} - \text{Demonstration yield (q/ha)}}{\text{Potential yield (q/ha)}} \times 100$$

Results and Discussion

Yield analysis

Results of 1039 front line demonstrations (Table 2) conducted during *rabi* seasons of 2015-16 to 2019-20 in 640 hectares area on farmers' fields of 58 villages of Bongaigaon district under rainfed conditions indicated that average rapeseed yield was recorded 10.1 q/ha under demonstrated plots as compared to existing farmers practice of 7.84 q/ha. The highest yield of 10.8 q/ha was recorded in plots of FLDs and lowest of 7.2 q/ha was recorded in farmer's practice. The highest yield in demonstration plot was due to knowledge and adoption of improved production technologies. However, the yield of rapeseed varied successively over the years in demonstration plots. The variation in yield in the successive years could be attributed to variation in climatic condition prevailing during the crop growth period. The findings of Dutta (2014), Sarmah *et al*. (2014), and Ahmed *et al.* (2017) are in agreement with the present findings. The use of traditional variety, late sowing because of late vacation of field owing to cultivation of long duration winter paddy, poor crop management and non-availability of resources in time may contribute to poor productivity of the crop in farmer's practice.

Technology gap analysis

The data depicted in Table 3 revealed that the rape-

seed variety TS-36 and TS-46 produced an average yield of 10.07 q/ha under demonstration as against potential yield of 12.0 q/ha. Thus, there is an average technology gap of 1.92 q/ha between the demonstration yield and potential yield. This might be due to varied agro-ecosystems, soil fertility status and weather conditions of the area. Moreover, the technology gap decreased from 2.64 to 1.74 q/ha in due course of demonstration reflects more participation of the farmer's in conducting FLDs. Mitra *et al.* (2010) and Katare *et al.* (2011) also reported similar findings.

The extension gap exhibited an increasing trend in the present study. The extension gap range varied from 1.76 to 2.76q/ha over the years indicates that there is a gap existed between the yield of demonstrations and local check (farmers' practice). The extension gap in the yield indicates that there is big scope to increase the yield of rapeseed under rainfed conditions at farmers' fields by adopting the recommended package of practices. Therefore, to bridge the extension gap, there is a need to give due emphasis on transfer of improved technologies and management practices of rapeseed through strengthening of extension network.

During the study period, a diminishing trend in technology index from 22.0 per cent during 2015-16 to 10.0 per cent during 2017-18 was observed. This reduction exhibited the feasibility of different technology demonstrated in the study areas (Table 2). The lower value of technology index means more feasibility of the demonstrated technology. Also, in some villages, there was greater variation in the technology index during the study period (ranging from 10.0 to 22.0 percent) indicates of higher scope for further improvement in productivity of rapeseed in the district. Deka et al (2021) also reported similar finding in rapeseed and mustard.

Economic analysis

The higher benefit cost ratio (1.94 to 2.97) was observed in demonstration plots compared to farmer's plot (1.61 to 2.61) in all the year of study (Table 3). The results showed that investment on improved production technologies is more profitable and economic viability of different technological interventions made under FLDs. Dutta (2014) and Sarmah *et al*. (2014) also reported similar finding in rapeseed and mustard. Therefore, there has to be more awareness among farmers in order to fully utilise the po-

Table 1. Comparison of package of practices adopted under demonstration and farmer's practice

Particulars	Demonstration plot	Farmer's plot
Land selection	Rainfed medium land	Rainfed medium land
Variety used	TS-36	Local
Sowing time	Mid October to Mid November	Last week of November to 1st week of December
Sowing method	Line sowing	Broadcasting
Seed rate	10 $kgha^{-1}$	12 $kgha^{-1}$
Nutrient management	40:35:15 ($N:P_2O_5:K_2O$) kg/ha	only FYM application
Boron application	Borax @10 kg/ha^{-}	Not applied
Plant protection measures taken	Need based application	Not taken
Interculture operation	Weeding at 15-20 DAS	Not done

Table 2. Yield performance of rapeseed variety TS-36 under FLD and farmer's practice

Years	Area covered (ha)	No. of farmers	No. of demo.	Potential yield (q/ha)	Average yield of CFLD (q/ha)	Yield of local check (q/ha)	Increase in yield (%)
2015-16	20	48	48	12.0	9.36	7.20	23.08
2016-17	40	75	75	12.0	9.76	8.00	18.03
2017-18	45	182	182	12.0	**10.80**	8.80	18.52
2018-19	225	342	342	12.0	10.20	7.50	26.47
2019-20	310	392	392	12.0	10.26	7.50	26.90
Total	640	1039	1039	-	-	-	-
Mean				12.0	10.07	7.8	22.6

Table 3. Technology gap, extension gap, technology index and cost benefit ratio of rapeseed (TS-36) grown under FLDs and farmer's practice

Year	Technology gap (q/ha)	Extension gap (q/ha)	Technological index (%)	Benefit Cost ratio	
				D	FP
2015-16	2.64	2.16	22.0	2.97	2.61
2016-17	2.24	1.76	18.7	2.82	2.13
2017-18	1.20	2.00	10.0	2.89	2.48
2018-19	1.80	2.70	15.0	1.94	1.80
2019-20	1.74	2.76	14.5	2.05	1.61
Total	-	-	-	-	-
Mean	**1.92**	**2.28**	**16.03**	**2.5**	**2.1**

tential of improved production and protection technologies efforts though FLDs.

Conclusion

Thus, it may be concluded that the yield and returns in rapeseed-mustard crop increased substantially with the improved agro-techniques. However, the grain yield level under FLDs was better than the farmer's practice and performance of the variety could be further improved by adopting recommended agro-techniques. So, there is need to disseminate the improved agro-techniques among the farmers with effective extension methods like training and field demonstrations. The farmers should be encouraged to adopt the recommended agro-techniques for getting maximum returns in specific locations.

Conflict of interest: None

References

Ahmed, P., Nath, R.K., Sarmah, A.C. and Deka, P.C. 2017. Yield gap analysis of Toria (*Brassica campestris*) in Tinsukia district of Assam. *Indian Res. J. Ext. Edu*. 17(3): 44- 46.

Anonymous, 2018-19. Annual report 2018-19, Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India

Anonymous, 2022. *Statistical Handbook Assam*, Directorate of Economics and Statistics, Government of Assam.

Deka, P., Baishya, B.K., Bhagawati, G., Bhuyan, M.K. and Nath, R.K. 2021. Yield Gap Analysis of Rapeseed (*Brassica campestris* var. Toria) in Kokrajhar District of Assam, India. *Asian J. Agric. Ext. Economics Sociol*. 39(10): 425–428.

Dutta, R. 2014. Yield gap analysis of rapeseed-mustard in North Bank Plain Zone of Assam. *Indian Res. J. Ext.Edu.* 14 (3): 122-124

Katare, S., Pandey, S.K. and Mustafa, M. 2011. Yield gap analysis of Rapeseed-mustard through front line demonstrations. *Agric. Update.* 6: 5-7.

Meena, M., David, A.A. and Kumar, S. 2018. Effect of different levels of NPK and zinc sulphate on yield and oil content in mustard (*Brassica juncea* L.) Var. Jai Kisan. *Int. J. Pure App. Biosci*. 6: 722–727.

Mitra, B. and Samajdar, T. 2010. Yield gap analysis of rapeseed-mustard through Front Line Demonstration. *Agri. Ext. Review* (Arpil-June): 16-17.

Samui, S.K., Maitra, S., Roy, D.K., Mandal, A.K. and Saha, D. 2000. Evaluation of front line demonstration on groundnut. *J. Indian Soc. Coastal Agri. Res*. 18 (2): 180-183.

Sarmah, H., Sarma, R., Sarmah, A.K., Upamanya, G.K. and Kalita, N. 2014. Yield gap analysis of toria (*Brassica campestris*) in Barpeta district of Assam. *Indian Res. J. Ext. Edu.* 14 (2): 127-129.