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Research Article

Evaluation of production technologies of Indian mustard [*Brassica juncea* (L.) Czern & Coss] under front line demonstration

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SUMMARY : The Krishi Vigyan Kendra, Narendra Deva University of Agriculture and Technology, Azamgarh (UP) has conducted 45 demonstrations on Indian mustard variety Pusa Jai Kisan since 2009-10 to 2012-13 in four consecutive years. The critical inputs were identified in existing production technology through farmers meetings and group discussions with the farmers. Delayed sowing, use of higher seed rate resulting dense plant population, often uneven plant population, uncontrolled weeds, ignorance about fertilizer management and role of sulphur in synthesis of oil containing amino acids and lack of plant protection measures are predominant identified cause of low productivity of oilseeds in eastern Uttar Pradesh. Similarly, the other parameters like technology gap, extension gap and technology index were also analyzed for assessment of technology adoption rate with extension activities and feasibility of demonstrated technologies at gross root levels. The results of four years are presented on average basis and revealed that the yield obtained under demonstrated plots was 16.95 q ha^{-1} over traditional practices of 11.7 q ha^{-1}. However, an additional yield of 5.25 q ha^{-1} and the increase in average mustard productivity by 45 per cent is able to contribute present oilseed requirement on national basis. The average of technology gap and technological index were found to be 8.05 and 32.2 per cent, respectively. Moreover, the results clearly indicate the positive effects of FLDs over the existing practices towards the enhancing the productivity of rapeseed-mustard in the region of eastern UP. Profitability was also higher under demonstration against traditional system of mustard cultivation during all the years of technology demonstration.

KEY WORDS :
Mustard, Extension gap, Demonstration, Front line demonstration programme

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BACKGROUND AND OBJECTIVES

Indian mustard [*Brassica juncea* (L.) Czern & Coss] is premier oilseed crop in eastern Uttar Pradesh. Its oil is more palatable and consumed in daily diet to majority of people in every pocket of India. The problem of low productivity continues to be a major issue for agricultural planners, researchers along with extension agencies. The R and D of institution has developed number of location specific proven technologies suited micro climatic situations of different zones of India. Now it is the real time for all agro-based extension agencies to educate the growers by means of transfer of technologies, interactions, advisory services and other extension activities in participatory mode (Singh and Singh, 2005). The best way to increase the productivity of mustard is by improving crops' nutrition through balance fertilization. Besides NPK, mustard has an additional requirement of sulphur due to presence of several natural volatile sulphur and nitrogenous compounds (Seiji and Kameoka, 1985) and for normal growth of plants plays an important role in production of protein and activation of enzymatic and metabolic process during active plant growth.

In UP mustard was raised on the 604

Table A: Comparison between demonstration package and existing practices in mustard under demonstration

Particulars	Mustard crop	
	Demonstration	Farmers practice
Farming situation	Rainfed farming situation	Rainfed farming situation
Variety	Pusa Jai Kisan	Non descriptive
Time of sowing	20-28 October	10-22 November
Method of sowing	Line sowing through desi plough and slit open by cultivator	Broad casting of seed mixed with fertilizers
Thinning	Optimum crop geometry through thinning	Uneven high plant population
Seed treatment	Carbendazim 3g kg^{-1} seed	No seed treatment
Seed rate	5 kg ha^{-1}	6-7 kg ha^{-1}
Fertilizer dose (kg ha^{-1})	NPKS (80:40:40:40)	NPKS (50:40:00:00)
Irrigation	Two irrigation: at branching 30-35 DAS and siliqua formation stage 60-65 DAS	One irrigation in between flowering and siliqua formation stage
Plant protection	Need based pesticides applied (Mencozeb 2.5 g/litre of water)	Injudicious use of pesticides
Weed management	Pendimethalin 3.5 lt ha^{-1} as pre em followed by one hand weeding at 35 DAS if needed	Occasionally manual weeding at own interest.

thousand ha and total production of 717 thousand tones with productivity 1188 kg ha^{-1} during 2010-11. But, the productivity of mustard in Azamgarh is far lower than the several districts of other states. However, rapeseed-mustard group of crops occupy prominent position in the state oilseed production scenario but vast yield gap exists between potential yield and yield under real farming situation. District Azamgarh falls under the poor productivity zone because of resource poor farmers are very reluctant towards proper scientific management of the crop.

RESOURCES AND METHODS

The present study was carried by KVK Azamgarh during *Rabi* seasons of 2009-10 to 2012-13 in the farmers field of five adopted villages (Gopalpur, Sikraur, Bhagwanpur, Pandri, Newada) belonging to four blocks of Azamgarh district. During these four years of study, an area of 17.0 ha was covered under front line demonstration with active participation of 45 farmers. Before implementation of demonstrations, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of particular cultivation (Venkattakumar *et al.*, 2010). The difference between the demonstration package and existing farmers practices are enlisted in Table A.

In general, the soils under study were usually clay loam in texture with neutral in reaction that ranging between 7.2 to 7.6 pH. The available nitrogen, phosphorus and potassium were low to medium only and also highly deficient in sulphur status. In demonstration plots, use of quality seeds of improved variety Pusa Jai Kisan, optimum crop geometry, sowing within second fortnight of October, weeding, irrigation, need based of pesticide as well as balanced fertilization including sulphur were emphasized and comparison has been made with existing practices. The necessary step for selection of site and farmers, layout of demonstration etc. were followed as suggested by Choudhary (1999). The traditional practices were maintained in case of local checks. The data outputs were collected from both Front line demonstration and control plots and finally the extension gap, technology gap, technology index as per the formula suggested by Samui *et al.* (2000). The economics of demonstration were worked out as per the standard procedures for different aspects of demonstration and also helpful for making location specific recommendations. The following formulae were used to analyze qualitative parameters of activities:

Technology gap = Potential yield - Demonstrated yield
Extension gap = Demonstrated yield – Yield under existing practice

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstrated yield}}{\text{Potential yield}} \text{x100}$$

Additional benefits = Demonstrated yield – Yield under local due to demonstration check x Present sale rate (Rs. q^{-1})

OBSERVATIONS AND ANALYSIS

It is clearly evident from the results presented in Table 1 that the seed yields of mustard were fluctuated successively over the years in demonstration plot. The maximum yield was recorded (17.8 q ha^{-1}) during 2011-12 and minimum yield was recorded in year 2009-10 (16.1 q ha^{-1}) while, the average

Table 1: Effect of adoption of proven technologies on productivity, technology gap, extension gap and technological index (%) in mustard

Years	Area (ha)	No. of farmers	Seed yield ($q\ ha^{-1}$)			% change in yield over control	Extension gap ($q\ ha^{-1}$)	Technoloy gap ($q\ ha^{-1}$)	Technology index (%)	Benefit due to demonstration ($Rs\ ha^{-1}$)	Net returns ($Rs\ ha^{-1}$)	Benefit: cost ratio
			Potential	Demo	Control							
2009-10	5.0	13	25.0	16.1	11.2	43.8	4.9	8.9	35.6	11760	26960	3.31
2010-11	2.0	7	25.0	16.9	11.5	47.0	5.4	8.1	32.4	12960	28880	3.12
2011-12	5.0	13	25.0	17.8	12.6	41.2	5.2	7.2	28.8	13000	32920	3.84
2012-13	5.0	12	25.0	17.1	11.5	48.7	5.6	7.9	31.6	14560	31480	3.42
Total/Mean	17.0	45	25.0	16.95	11.7	44.95	5.25	8.05	32.2	13070	30060	3.42

yield of four years was registered 16.95 q ha^{-1} to that of local check (11.7 q ha^{-1}) and it is equivalent to average productivity state. The increase in per cent of yield was ranging between 41.2 to 48.7 q ha^{-1} during four years of study. On an average basis 45 per cent increase in yield was registered as considerable bonus yield over traditional practices and also helpful for productivity enhancement of the district. The results are in conformity with the findings of Tomar *et al.* (2003). The results clearly indicated the positive effects of FLDs over the existing practices towards the enhancing the productivity of rapeseed-mustard in the region of eastern UP. It might be due to better exploitation of biotic and abiotic crop growth resources and also established efficient translocation of photosynthates from source to sink under the demonstration.

As per gap analysis of demonstrations reflected in Table 1 that extension gap showed an increase trend and also ranged from 4.9-5.6 q ha^{-1} during the period of study emphasizes the need to educate the farmers through various means for adoption of improved production technology to minimize the extension gap. The trend of technology gap (ranging between 7.2-8.9 q ha^{-1}) reflected the farmers' cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed may be attributing to the dissimilarity in soil fertility status and weather conditions. Similar finding was also recorded by Mitra and Samajdar (2010). Technology index showed the feasibility of the evolved technology at the farmer's fields. The lower value of technology index indicates more is the feasibility of technology. As such fluctuation in technology index (ranging between 28.8 35.6) during the study period in certain region, may be attributed to the dissimilarity in soil fertility status, weather condition, improper intercultural operations and pest management etc. The ultimate findings are determined on economic parameters and that leads to long term sustainability in system. On an average the farmers obtained Rs. 13070 ha^{-1} as additional income under demonstration only by adoption of scientific production approaches. Net returns and benefit–cost ratio were quite higher and found almost double under demonstration over control during all the years of study.

Conclusion:

On the basis of above findings, it can be concluded that use of scientific methods of mustard cultivation can reduce the technology gap to a considerable extent, thus, leading to increased productivity of rapeseed-mustard 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 better oilseed production in district. The productivity gain under demonstration over conventional practices created greater awareness and motivated the other farmers to adopt appropriate recent production and protection technologies of mustard. It shows that effective involvement of farmers can help to determine appropriate criteria for cropping system evaluation, farmer needs and preferences, improved methods of dissemination, extension and feedback. Such participatory elements can provide improved linkage and overlap between the planning, research, dissemination and adoption- adaptation phases. It was observed that participatory research may be best suited to farmers because demonstrations provided a best platform to compare the own activities over improved production technologies evolved by the particular crop based research institutions for different agro-climatic conditions in India.

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