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Impact of front line demonstrations on productivity enhancement of cumin in arid zone

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Abstract

A field study on impact assessment of Frontline Demonstrations on productivity enhancement of cumin was conducted in Bheenjwadia village of Jodhpur district of Rajasthan by Central Arid Zone Research Institute, Jodhpur during 2010-11 to 2014-15. Yield attributes of both demonstrations and farmers practices were recorded and percent yield enhancement, technology gap, extension gap, technology index, were analyzed. The average five years data revealed that average yield of demonstration plots was obtained 519.60 kg ha^{-1} over the local check (412.80 kg ha^{-1} and there is an increase in average yield by 25.87 per cent. The gross returns, and B : C ratios on demonstration plot were higher ` 61787/ha and 2.26 respectively as compared to farmer's practices ( ` 49075 and 1.90). The study suggests that for strengthening linkages with line department and converging the demonstration with Government schemes for large scale adoption of farmers' fields. This can be a good option for enhancing farmers' income.

Key words : Front line demonstration, technology gap, extension gap, technology index

Introduction

Cumin (*Cuminum cyminum* L.) is one of the important ingredients of human diet throughout the world. It is used in large number of processed food as well as in daily food recipes because of its agreeable flavor and aroma. Besides, it has medicinal importance and is used as a stimulant carminative, stoma-chic, astringent and useful against diarrhea and dyspepsia. Cumin seeds are also used in number of veterinary medicines. On distillation, the seed yielded about 3 per cent essential oil, which has a characteristics odour and little bitter taste. The cumin oil is used in perfumery, flavorings liquors and cordials. The aromatic odour of cumin seed is due to the presence of cuminaldehyde or cuminal which ranges from 2.5 to 4 per cent. Cumin seed contains moisture (11.9%), protein (18.7%), other extract (15%), carbohydrate (36%), minor matter (12%), calcium (1.08) and phosphorus (0.49%).

Cumin is an important condiments and spices crop of Rajasthan. It is grown in about 4.35 lakh ha area with a production of about 1.21 lakh tone in Rajasthan (Agricultural statistics of Rajasthan, 2014-15). Cumin productivity is very low (278kg ha^{-1}) in Rajasthan (2014-15) (Agricultural statistics of Rajasthan,2014-15). The yield levels of cumin crop are highly fluctuating due to rain/weather and infestation of insect pests. The Government of India and ICAR is operating various schemes for quick and effective transfer of technology to farmer's field. Among these schemes, Frontline demonstration (FLD) is one, which emphasizes to increase production by supplying critical inputs along with improved packages of practices tested by scientists of ICAR Institutes and State Agricultural Universities (SAUs). Use of improved seed, seed rate, seed treatment, sowing time, recommended dose of fertilizer, weed control and plant protection measure giving higher yield of cumin as compared to farmer's practices. Extending cultivation of improved varieties, getting feedback from farmers about constraints in adoption of recommended improved technologies for further research and to maximize the technology dissemination process among the farmers are some of the other important features of this programme (Nagarajan *et al.*, 2001). Keeping these in mind, the present study was conducted to assess the impact of frontline demonstration on yield and economics of cumin production.

Material and methods

The study was carried out by Central Arid Zone Research Institute, Jodhpur during 2010-11 to 2014-15 (five consecutive years) at farmer's fields of Bheejwadia village of Jodhpur district. In total 67 FLDs in 27 ha area in different locations were conducted. Primary data were collected from the Central Arid Zone Research Institute, Jodhpur (Rajasthan). The differences between the demonstration package and existing farmer's practices are mentioned in Table-1. All demonstrations were conducted under the supervision of CAZRI scientists. In

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demonstration plots, use of quality's seed of improved varieties (RZ-209 and GC-4), line sowing, seed treatment and timely weed control, as well as recommended dose of fertilizer (60 kg nitrogen+ 40 kg phosphorus) were emphasized. In case of farmer's practices, existing practices used by farmers were followed. Before conducting the demonstration, training to the framers of respective villages was imparted with respect to envisaged technology interventions, site selection, farmer's selection, lay out of demonstration, and farmer's participation etc were followed as suggested by Choudhary (1999) and Singh *et al.* (2007). Visits of scientists and the extension functionaries were organized at demonstration plots to disseminate the message at large. The farmers were selected on the criteria that they were involved in cumin cultivation since last 5 years. The data on output of cumin crop were collected from FLD plots as well as control plots and finally the yield attributes, seed yield, cost of cultivation, net returns with the benefit cost ration were worked out.

The collected data were tabulated and analyzed by using statistical tools like frequency and percentage.

To estimate the extension gap, technology gap and technology Index following formulae were considered as suggested by Samui *et al.* (2000), Kadian, *et al.* (2004) and Sagar and Chandra (2004).

Technology gap = Pi (Potential yield) – Di (Demonstration yield)

Extension gap = Di (Demonstration yield) – Fi (Farmers yield)

$$\text{Technology Index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

Client Satisfaction Index (CSI) was calculated by using formula as developed by Kumaran and Vijayragavan (2005).

$$\text{Client Satisfaction Index (CSI)} = \frac{\text{Individual obtained score}}{\text{Maximum score possible}}$$

Results and discussion

Performance of FLD

Results of frontline demonstrations indicated that the improved cultivation practices comprised under FLD produced on an average of 25.87 per cent more yield of cumin as compared to farmer's practices (Table 2). Highest seed in yield was recorded (653 kg ha^{-1}) during 2010-11 and lowest (327 kg ha^{-1}) during 2012-13. Average seed yield of cumin under demonstration plot was 519.60 kg ha^{-1}) which is 25.87 per cent more than control (412.80 kg ha^{-1}). The results clearly indicated that the yield of cumin could be increased by 15.17 to 47.07 per cent over the yield obtained under farmer's practices of cumin cultivation due to adoption of appropriate production technology. The similar results of yield enhancement in cumin crop in frontline demonstrations has been documented by Jeenangar *et al.* (2006), Hiremath *et al.* (2007), Dhaka *et al.* (2010), Dudi and Meena 2012; Patel *et al.* (2013), Singh and Sharma (2016) and Singh *et al.*, (2016). The results indicated that the front line demonstration has given a good impact on farming community as they were motivated by the new agricultural technology applied in the FLD plots.

The extension gap which ranged from 52 kg ha^{-1} to 135 kg ha^{-1} during the period of study emphasized the need to educate the farmers through various means for adoption of improved agricultural practices to reverse this trend of wide extension gap. Yield potential of the non- descriptive varieties may be lost due to continuous use of these varieties year after year. To increase the productivity and production of cumin, 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

Table 1. Comparison of demonstration package and farmers practices under FLD on cumin

Parameters	Demonstration package	Farmers practices
Variety	RZ-209,GC-4	Local and old
Seed rate	4-5 kg ha^{-1}	6-8 kg ha^{-1}
Seed treatment	Seed treatment with trichoderma 4 gm/kg seed	Nil
Time of sowing	1-25 November	1-15December
Method of sowing	Line sowing proper crop geometry	Broad casting
Fertilizer dose	5 ton enriched compost with bio-fertilizers	No use of fertilizer
Plant protection measures	Need based application of neem oil to protect the crop against insect	Nil
Irrigation	4-5 irrigations	6-7 irrigations
Weed management	Two hand weeding 30 and 50 days after sowing (DAS)	One hand weeding

of cumin in the study area.

The technology gap shows the gap in the demonstration yield over the potential yield. The maximum technology gap was found in the year 2012-13 (573 kg ha^{-1}) and lowest in the year 2010-11 (147 kg ha^{-1}). However, overall average technology gap in the study was 350.40kg ha^{-1} (Table2). This may be due to the soil fertility and weather conditions. Hence, location specific recommendations are necessary to bridge the gap. These findings are similar to the findings of Sharma and Sharma (2004), Mitra and Samajdar (2010) and Khatare *et al*. (2011) and Patel *et al*. (2013).

On the basis of five years study, the overall technology index 40.27% was recorded, whereas highest technology 63.66% was recorded during 2012-13 and lowest (18.37%) during 2010-11. Hence, it can be inferred that awareness and adoption of improved varieties with the recommended scientific package of practices have increased during the advancement of the study period. Results of the present study are in consonance with the findings of Singh *et al*. (2007), Hiremath and Nagaraju (2009), Dayanand *et al*. (2012), Raj *et al*. (2013), Meena and Singh (2014), Bhargav *et al*. (2015), Singh and Sharma (2016) and Singh et al. (2016).

Economics of front line demonstrations

The economics of cumin production under front line demonstrations were estimated and the results of the study have been presented in Table 3. The results of economic analysis of cumin production over the study period revealed that front line demonstrations recorded higher gross returns (` 61787 ha$^{-1}$) and net return (` 42831 ha^{-1}) with higher benefit ratio (2.26) as compared to local checks. The results are in accordance with the findings of Hiremath *et al*. (2007), Hiremath and Nagaraju (2009) and Patel *et al*. (2013). Further, additional cost of ` 2056 per hectare in demonstration has increased additional net returns

Table 2. Seed yield, extension gap, technology gap and technology index of cumin as grown under FLD and existing package of practices

Year	No. of demo.	Area (ha)	Yield (Kg ha^{-1})			% increase in yield over FP	Extension gap (Kg ha^{-1})	Technology gap (Kg ha^{-1})	Technology Index (%)
			Potential	IP	FP				
2010-11	10	4.00	800	653	518	26.06	135	147	18.37
2011-12	18	7.40	850	645	560	15.17	85	205	24.14
2012-13	12	4.80	900	327	275	18.90	52	573	63.66
2013-14	15	6.00	900	495	386	28.24	109	405	45.00
2014-15	12	4.80	900	478	325	47.07	153	422	46.88
Total/ Average	67	27	870	520	413	25.87	107	350	40.27

IP- Improved practices, FP- Farmers practices

Table 3. Economics analysis of demonstration and farmers practices

Year	Cost of cultivation (` ha^{-1})		Gross return (` ha^{-1})		Net return (` ha^{-1})		B:C ratio	
	FP	IP	FP	IP	FP	IP	FP	IP
2010-11	15500	17400	63046	79476	47546	62076	3.06	3.56
2011-12	17600	18900	67536	77787	50336	58887	2.86	3.12
2012-13	15400	16800	31730	37730	16330	20930	1.06	1.24
2013-14	17800	20640	43656	55985	25856	35345	1.45	1.71
2014-15	18200	21040	39407	57957	21207	36917	1.16	1.75
Mean	16900	18956	49075	61787	32255	42831	1.90	2.26

IP- Improved practices, FP- Farmers practices

Table 4. Extent of farmer's satisfaction of extension services rendered

S.No.	Satisfaction	Frequency	Percentage
1.	Low	9	13.43
2.	Medium	24	35.82
3.	High	34	50.75

` 10576 per hectare with incremental benefit cost ratio 5.14 suggesting its higher profitability and economic viability of the demonstration. More and less similar results were also reported by Nagaraju et al (2001), Dhaka *et al.* (2010), Meena *et al.* (2012), Patel *et al.* (2013), Rajni *et al.*(2014) and Bhargav *et al.*(2015) and Meena and Singh (2016).

Farmers Satisfaction

The extent of satisfaction level of farmers over extension services and performance of improved practices of cumin was measured by Client Satisfaction Index (CSI). The results of which are presented in Table 4. It was observed from table 4 that majority of the respondent's expressed high (50.75%) to medium (35.82 %) level satisfaction for extension services and performance of improved practices under demonstrations, whereas, only 13.43 per cent of respondents expressed low level of satisfaction. The medium to higher level of satisfaction with respect to improved cultivation practices of cumin, linkages with farmers, services rendered etc. indicated stronger conviction, physical and mental involvement in the front line demonstration. It is resulted that FLD had good preference among the farmers. The results are conformity with the results of Narayanswamy and Eshwarappa (1998), Kumaran and Vijayaraghavan (2005), Tomar (2010), Dudi and Meena (2012), Khajuria *et al.* (2016) and Kushwah *et al.* (2016).

Conclusion

From the above findings it can be concluded that the yield of cumin was increased by 15.17 to 47.07 per cent by different technological interventions. The results clearly established the facts that the adoption of improved technology improves the cumin productivity and profitability. In vicinity of the CAZRI, farmers in large number adopt and followed the recommended practices under demonstrations and got benefitted with higher production. The study suggests that extension agencies in the arid zone need to provide more intensive technical support to the farmers through different educational and extension methods to reduce the extension gap for higher productivity of cumin. This can be one approach for enhancing farmer's income with existing resources.

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