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Impact of front line demonstration on productivity of fennel cv. AF 2 through drip and fertigation in tribal belt of Korea district (Chhattisgarh)

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Abstract
A front line demonstration was conducted at five farmers field comprising of 0.20 ha each in Korea district of Chhattisgarh during *Rabi* 2017-18 to 2019-20 to demonstrate the improved package of practice of Fennel var. AF 2. There were two treatments in which one was local check and second was cultivation of improved variety of fennel with full package of practice under drip and fertigation. Field diagnostic visits, regular surveys, farmer meetings and training programmes ensured application of balanced and optimum doses of nutrients through fertigation and timely plant protection measures. The result revealed that local check gives a yield of 4.12 q/ha. While fennel cultivation with full package of practices along with drip and fertigation gives a yield of 16.56 q/ha. which shows that by adopting package of practices there were 308.73 % increase in fennel seed yield. Similarly, net return was also calculated which shows that local check gives a net income of Rs. 7507/ ha with a B:C ratio of 1.44 against a net income of Rs. 38659/ha with B:C ratio of 1.62 in demonstration field. With frontline demonstration (FLD) of proven technology revealed that yield potential and net income from fennel cultivation could be enhanced to a great extent resulting in higher income to the farming community. By conducting front line demonstration (FLDs) of proven technologies, yield potential of fennel can be increased upto great extent. This will substantially increase the income as well as the livelihood of the farming community. The extension gap and technology gap ranged between 12.51 to 13.07 and 82.25 to 98.25 q/ha, respectively, with the technology index of 6.90 per cent during the demonstration years. Besides this, the demonstrated plots gave higher gross return, net return with higher benefit cost ratio when compared to farmer's practice.

Keywords: fennel, front line demonstration, farmers practice, drip irrigation, fertigation, yield

Introduction
India, the land of spices is the largest producer, consumer and exporter of spices in the world. In India, wide varieties of spices are grown and many of them are native to the subcontinent and also known as "Home of Spices". (Meena and Singh, 2012) [6]. Among the spices, seed spices are the group, which denotes all those annuals whose dried fruit or seeds are used as spices. The seed spices are aromatic vegetable products of tropical origin and are commonly used in pulverized form, primarily for seasoning or garnishing the foods and beverages. They are also used in preparation of various value added products *viz.*, spice oils, oleoresins and spice powders. Fennel (*Foeniculum vulgare* Mill.) plant is stout, aromatic, annual herb (with potency of regeneration) belongs to family Apiaceae. Fennel is mainly grown for its seeds which have pleasant fragrance, an aromatic taste and it is widely cultivated throughout the temperate and subtropical region of the world (Giana *et al*., 2019) [2]. In India, fennel is mainly grown in Gujarat and Rajasthan and to some extent in Utter Pradesh, Karnataka, Andhra Pradesh, Punjab, Madhya Pradesh, Bihar, Haryana and Jammu & Kashmir (Godara *et al*., 2013) [3]. It is used as condiment and culinary spice. The seeds contain about 9.5 per cent protein, 10.0 per cent fat, 42.3 per cent carbohydrates, 18.5 per cent fiber and 13.4 per cent minerals. Reduced agricultural productivity and water use efficiency are mainly due to conventional method of irrigation (flooding) and poor adoption of scientific water management practices. Availability of irrigation water is limited and therefore, it should be utilized most efficiently by adopting latest irrigation technologies (Patel *et al*., 2000) [10]. Therefore, drip method of irrigation is most suited for semi-arid and arid areas where water is scarce and where low water consuming and high value crops can be grown. Drip method of irrigation helps to reduce the over exploitation of ground water that partly occurs because of

inefficient use of water under surface method of irrigation (Meena *et al*., 2017) [7]. Fertigation is one important precision farming technique which can give better nutrient use efficiency as compared to surface irrigation method. Application of nutrients untimely, following inappropriate method of application leads to severe loss of nutrients by leaching and fixation (Harisha *et al*., 2017) [4]. Application of fertilizer in small quantities to the soil at any given time improves fertilizer use efficiency, helps to maintain nutritional balance and nutrient concentration at optimum level, saves energy and labour, provides opportunity to apply the nutrient at critical stages of crop growth and minimizes hazard of ground water. Information on water requirement by drilled *rabi* fennel and fertigation is lacking for Korea region. among the various factors contributing towards the attainment of potential yield and quality of fennel. With an objective to combat the causes of poor yield and low economic returns, dissemination of recommended technology through frontline demonstration was attempted in the Korea district of Chhattisgarh.

Material and methods

Krishi Vigyan Kendra, Korea carried the technology to the farmers field through frontline demonstrations in the villages *viz* Pusla, Umjher and Dudhaniya between 2017-18 and 2019-20. The average area under each demonstration was 0.20 ha with 5 beneficiaries in each demonstration. Through field diagnostic visits, surveys, farmer meetings etc the factors contributing to low productivity like varietal issues, faulty management practices, lack of irrigation, poor nutrient management, negligent plant protection measures were identified. The genuine seed of fennel variety A.F.-2 was procured and distributed to selected farmers. All the participating farmers were trained on various aspects of fennel production technologies. The field was prepared by deep ploughing and harrowing after *Kharif* crops. The seeds were sown in well prepared field during first week of October. All the recommended practices *i.e.* seed treatment by carbandazim @ 2-3g/kg seed, sowing by seed cum fertilizer drill maintaining row spacing of 40-50cm and by thinning keep plants at 25-30 cm spacing with in rows. Locally cultivated variety of fennel as practiced by the farmers with their own management system was taken as the farmers practice The data related to cost of cultivation, production, productivity, total return and net return were collected in both treatments as per schedule from all selected farmers. An average of cost of cultivation, yield, net returns of different farmers was analyzed by the formula. The drip irrigation system was installed and operated daily except on rainy days to provide the sufficient moisture to the plants. The lateral lines were laid parallel to the crop rows and each lateral served two rows of crop. The laterals were provided with on line emitters of 4 lt hr^{-1} discharge capacity. Emitters were fixed 0.3m apart to serve the irrigation water requirement of four plants. Inline drippers with a discharge rate of 4 lt hr^{-1} was followed for all the plants spaced at 30x 15cm. Fertigation is done as per the recommended dose with 60:50:120 NPK kg of NPK/ha and is applied throughout the cropping period once in three days. Water soluble fertilizers like 19:19:19, 0: 0:50 and urea are used. The scheduling interval of fertigation was followed at weekly intervals for 13 weeks starting from 5^{th} to 17^{th} week after planting in the field. All other steps like site and farmer selection, layout of demonstration, farmers' participation etc were followed as suggested by Choudhary (1999) [1]. In case of local check (control plots) no change was made in the existing practices of imbalanced use of organic and inorganic fertilizers and little or no use of fungicides and pesticides. Well before the demonstrations training was imparted to the farmers and their exposure visits to the KVK instructional-cum demonstration farms were conducted. Visits of the farmers and the extension functionaries were also organized to demonstration plots to disseminate the message at large. Yield data were collected from the control and demonstration plots and cost of cultivation, net income and benefit/cost ratio were computed.

Results and discussion

Performance of Fennel var AF 2 under drip and fertigation was found to be substantially higher under the demonstration plots than under control during all the demonstration years (Table 1). The seed yield under demonstrations was 16.56, 16.94, 17.02
q/ha during 2017-18, 2018-19, and 2019-20 respectively. The findings are confirmed with the
findings of Godara *et al*., 2013 [3], Meena *et al*., 2017 [7], Harish *et al*., 2017, Giana *et al*., 2019 [2] The yield enhancement due to technological intervention was to the tune of 308.88, 289.42 and 330.89 per cent over control. The cumulative effect of technological intervention over three years revealed an average yield of 16.56 q/ha *i.e* 308.73 per cent higher over local check. The year-to-year fluctuations in yield and cost of cultivation can be explained based on variations in microclimatic conditions and marketability price. Mukherjee (2003) [9] also reported that depending on identification and use of farming situation specific interventions may have greater implications in enhancing systems productivity. Similar variations in results have been documented Tiwari and Saxena (2001) [13], Tiwari *et al* (2003) [14], Tomar *et al* (2003) [15], Mishra *et al* (2009) [8], Rajaraman *et al*., 2010 [11] and Kumar *et al* (2012) [5] in different crops. The data clearly reveal that the net returns from the demonstration plots were substantially higher than control plots during all the years. An average net return was observed to be Rs 38659 in comparison to control plot *i.e* Rs 7507. Thus, on an average additional income of Rs 31153 is attributed to the technological intervention provided in demonstration plots. Economic analysis revealed that benefit/cost ratio in demonstration plots was comparatively higher than control plots. The highest benefit cost ratio (1.63) was observed in the year 2017-18 followed by 1.62 in the year 2018-19. The variation in B:C ratio could be due to price variation during the study years. The average B:C ratio of demonstration and control plots was 1.62 and 1.44 respectively during the study period. Hence, favourable B:C ratio proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. Similar findings were reported by Godara *et al*., 2013 [3], Meena *et al*., 2017 [7], Harish *et al*., 2017, Solanki *et al*., 2017 [12] and Giana *et al*., 2019 [2] in fennel.

Technology gap, Extension gap and Technology index

It is evident from data (Table 1) that the on an average technology gap, the differences between potential yield and yield of demonstration plots was 1.16q/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agricultural practices and local climatic situation. On an average extension gap of 12.72q/ha was observed during the trial which emphasized the need to educate the farmers through various extension means i.e. front line demonstration for adoption of improved production and

protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with improved variety, drip and fertigation will subsequently change this alarming trend of galloping extension gap. The technology index shows the feasibility of the demonstrated technology at the farmers field. The average technology index recorded 6.90 per cent during FLDs programme, which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of fennel.

Conclusion

The results of front line demonstration convincingly proved that the seed yield of fennel could be increased by 308.73 per cent with the better technological intervention with drip and fertigation. Favourable benefit/cost ratio is self-explanatory of economic viability of the demonstration. The technology is suitable for enhancing the productivity of fennel crop and appropriate time for area expansion under fennel production in Korea dist. The suitable climate for its growth can transform lives of many rural growers if more interventions are conducted and technical knowledge is given to the growers with bottom up policy.

Table 1: Yield performance and technology gap, technology index and extension gap in fennel var AF 2 production under FLD

Year	No. of FLDs	Seed yield (q/ha)			% increase over FP	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
		PY	RP	FP				
2017-18	5	18	16.56	4.05	308.88	1.44	12.51	8.70
2018-19	5	18	16.94	4.35	289.42	1.06	12.59	6.26
2019-20	5	18	17.02	3.95	330.89	0.98	13.07	5.76
Average	5	18	16.56	4.12	308.73	1.16	12.72	6.90

PY = Potential yield, RP = Recommended practice, FP = Farmers practice, B:C ratio = Benefit/cost ratio

Table 2: Comparative economics of fennel var. AF 2 production under FLD and farmers practice

Year	Gross expenditure (Rs)/ha		Gross return (Rs)/ha		Net return (Rs)/ha		B:C ratio	
	RP	FP	RP	FP	RP	FP	RP	FP
2017-18	61000	16850	99360	24300	38360	7450	1.63	1.44
2018-19	62897	17170	101640	26100	38743	8930	1.62	1.52
2019-20	63245	17560	102120	23700	38875	6140	1.61	1.35
Average	62380.67	17193.3	101040	24700	38659.3	7506.67	1.62	1.44

PY = Potential yield, RP = Recommended practice, FP = Farmers practice, B:C ratio = Benefit/cost ratio

References

1. Choudhary BN. Krishi Vigyan Kendra - a guide for KVK managers. Publication Division of Agricultural Extension, ICAR, 1999,73-78p.
2. Giana GK, Shivran AC, Verma HP. Effect of drip irrigation and fertigation on yield and economics of fennel International Journal of Chemical Studies 2019;7(6):52-54.
3. Godara SR, Verma IM, Gaur JK, Bairwa S, Yadav PK. Effect of different levels of drip irrigation along with various fertigation levels on growth, yield and water use efficiency in fennel (*Foeniculum vulgare* Mill.). Asian J. Hort 2013;8(2):758-762.
4. Harisha CB, Asangi H, Singh R. Impact of Drip Irrigation and Fertigation on Residual Soil Nutrient Status, Nutrient Uptake and Nutrient Use Efficiency of Fenugreek under Semi Arid Conditions. Int. J. Pure App. Bio sci 2017;5(2):661-667.
5. Kumar A, Avasthe RK, Lepcha B, Mohanty AK, Shukla G. Impact of frontline demonstration on yield enhancement of ginger (var Majauley) in tribal reserve biosphere of Sikkim Himalaya. Journal of Agricultural Sciences 2012;3(2):121-123.
6. Meena ML, Singh D. On-farm assessment of technological innovation of fennel (*Foeniculum vulgare* mill) cultivation. International J. Seed Spices 2012;2(2),:60-63.
7. Meena M, Sagarka BK, Man MK. Influence of drip irrigation along with nitrogen levels on yield attributes, yield and quality parameters of rabi drill fennel (*Foeniculum vulgare* Mill). International Journal of Current Microbiology and Applied Sciences 2017;6(5):2115-2121.
8. Mishra DK, Paliwal DK, Tailor RS, Deshwal AK. Impact of frontline demonstrations on yield enhancement of potato. Indian Research Journal of Extension Education 2009;9(3):26-28.
9. Mukherjee N. Participatory learning and action. Concept Publishing Company, New Delhi, India 2003,63-65p.
10. Patel, BS, Patel KP, Patel ID, Patel MI. Response of fennel (*Foeniculam vulgare* Mill) to irrigation, nitrogen and phosphorus. Indian Journal of Agronomy 2000;45:429-432.
11. Rajaraman G, Paramaguru P, Aruna P, Sudagar IP. Effect of fertigation on growth and physiology in coriander. The Asian Journal of Horticulture 2010;5(1):85-88.
12. Solanki RM, Vasava MS, Gohil BS. Influence of drip irrigation and fertility levels on growth, yield and water use efficiency of drilled rabi Fennel (*Foeniculum vulgare* Mill.) International Journal of Science, Environment and Technology 2017;6(3):1972-1978.
13. Tiwari KB, Saxena A. Economic analysis of FLD of oilseeds in Chindwara. Bhartiya Krishi Anusandhan Patrika 2001;16(3 & 4):185-189.
14. Tiwari RB, Singh V, Parihar P. Role of frontline demonstration in transfer of gram production technology. Maharashtra Journal of Extension Education 2003;22(3):19-23.
15. Tomar LS, Sharma PB, Joshi K. Study on yield gap and adaptation level of potato production technology in grid region. Maharashtra Journal of Extension Education 2003;22(1):15-18.