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EFFECT ON PRODUCTIVITY AND PROFITABILITY OF MUSTARD THROUGH CLUSTER FRONTLINE DEMONSTRATIONS (CFLDs) IN DEOGHAR DISTRICT

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ABSTRACT
Cluster Frontline Demonstrations were conducted by Krishi Vigyan Kendra, Deoghar, Jharkhand to evaluate the impact of interventions like improved cultivars, seed treatment, lime application, sulphur application, diseases and pest management on production and productivity of mustard during 2016 – 17, 2017 – 18 to 2019 – 20. Due to less adoption of scientific cultivation practices and unavailability of improved variety is the possible major reasons for lower productivity in the district. By conducting CFLDs on Mustard crop. It was observed that Mustard (NDR - 8501) variety performed very well as compared to local variety. In the same manner, mustard gave 43.67 % higher yield in comparison to the Farmer's practice (FP). It was also found that the yield of mustard in CFLDs ranged from 8.98 to 9.21 q ha^{-1} whereas in FPs ranged between 6.17 to 6.49 q ha^{-1}. Trend of technology gap indicated the farmer's cooperation in carrying out demonstrations with encouraging results in subsequent years. The extension gap and technological index were varying between 2.79 to 3.02 q ha^{-1} 23.45 to 25.16 %, respectively. Benefit cost ratio was ranged from 2.06 to 2.17 under Cluster Frontline Demonstrations whereas it was 1.73 to 1.92 under Farmer's practice. The study clearly indicates that the use of improved variety of mustard with scientific package and practices under Cluster Frontline Demonstration programme play a major role in improving the quantity & quality of oilseeds production and may contribute significantly in national oilseeds production programme.

KEY WORD: Yield, CFLDs, Extension gap, Technology index, Production and Productivity.

INTRODUCTION

India is the largest producer of oilseeds in world and accounts for about 14.0 per cent of the global oilseeds area, 7.0 % of the total vegetable oils production and 10.0 % of the total edible oil's consumption. Oilseed crops are the second most important determinant of agricultural economy, next only to cereals. In India, oilseeds account for 3.0 % to the Gross National Products and 10.0 % to the total value of all agricultural products. In India, total production of mustard is 8.32 million ton from in an area of 5.96 million hectares with productivity of 1392 kg/ha. In Jharkhand mustard occupy main position in terms of area, production and productivity among the oilseeds. According to the annual report 2018-19, GOI, Ministry of Agriculture & Farmer's Welfare (Department of Agriculture, Cooperation and Farmers Welfare) Oilseed cultivation is undertaken across the country in about 26.00 million ha, covering 72% under rainfed areas and producing around 30.00 million tons of oilseeds. Nine oilseeds are the primary sources of vegetable oil in the country. Among the nine Rapeseed-Mustard contribute 24% of total oilseeds production in the country. However, in terms of vegetable oil production Rapeseed Mustard contribute 31%. Pusa Mahak (JD-6) is highly suitable for sown in September, It fits well in rice fallows of NER & Eastern regions. It takes about 118 days to mature with 40 % oil content in its seed. Cluster front line demonstration (CFLD) is a novel approach to provide a direct interface between researcher and farmer for the transfer of technologies developed by them and to get direct feedback from farming community. The concept of Cluster Frontline Demonstration was put forth under the mission. The aim of CFLD is to spread technical knowledge, recommended packages and practices among farmers to improve the yield of crop. Nowadays, mustard crop is maintaining its increasing trend in productivity while, the area registered shows a declining trend resulting in its stagnant production. The decrease in area might be due to socio-economic factors as per capita holding is shrinking owing to population increase as well as poor interaction and adoption of technology. Technology transfer spread the new ideas among farmers, thereby encouraging the growers to grow mustard by scientific method is needed. Deoghar district have limited area under mustard production. Farmers unaware and reluctant to adopt new crop for cultivation. Majority of field having no irrigation facility left barren during rabi season and those have irrigation facility didn't focus on mustard cultivation. CFLD on rapeseed mustard significantly induce an impact on farmers to shift monocropping to multiple cropping system as well as strengthen their livelihood. Keeping all these points in mind CFLD was conducted on rapeseed mustard with the aim of transfer of technology, enhance scientific knowledge improving their practices as well as improve yield potential and area of mustard. This will ultimately improve their financial condition.

MATERIALS AND METHODS

Cluster Frontline Demonstration programme was conducted by Krishi Vigyan Kendra, Deoghar, Jharkhand on farmer's field which were traditionally oilseed producing area. In this study, all total 212 farmers were involved for cluster demonstration on mustard crop in 70.0 ha area. Number of beneficiaries (farmers/farmwomen) during 2017-18, 2018-19 and 2019-20 were 82, 91 and 34 respectively. Beneficiaries were identified through their participation and feedback received during the survey, awareness programmes and training. Farmers were trained to follow the package and practices of mustard cultivation and critical inputs like improved seed, fungicides, biofertilizers, sulphur were distributed to the farmers, however fertilizers were applied on the basis of soil test values by the farmers from their own cost. Seed rate for mustard crop 5.0 kg ha^{-1} was used. Seed treatment was done in supervision of KVK scientist with Carbendazim 50% soluble powder @ 2.5 gm/kg seed and Chlorpyriphos 20 E.C. @ 6.0 ml/Kg seed. Farmers were facilitated by KVK scientists under the programme for performing field operations like sowing, spraying, weed management, harvesting etc. Technological interventions are presented in table 1.

TABLE 1. Difference between technological intervention and farmer's practice of Demonstration

Particulars	Technological interventions	Farmers practice	Gap
Variety	Pusa 28 and NDR - 8501	Rohini	Fully gap
Seed rate	5 kg ha^{-1}	8 kg ha^{-1}	More seed rate
Spacing	30 cm x 10 cm	Broadcasting, uneven plant population	Partial gap
Sowing time	15 October – 15 November	1 – 30 November	Partial gap
Seed treatment	Seed treatment was done with 2.0 g of carbendazim.	No seed treatment	Full gap
Fertilizer	Balanced application as per soil test values, 60 kg of Urea, 225 kg of SSP and 28 kg of MOP as basal dose ha^{-1}	Imbalanced use of fertilizer 40 kg urea as top dressing and 30 kg of DAP as basal dose ha^{-1}	Full gap
Weed management	Application of Imazethapyr 10 SL 75 g a.i ha^{-1} at 15-20 DAS	No weeding	Full gap
Plant protection	Integrated pest management	Indiscriminate application	Full gap

Regular monitoring and need based advisories were provided by the scientists, demonstration were conducted with an objective to demonstration the improved technologies of mustard production. Soil sample of the selected cluster field was analysed for pH, Organic carbon, N, P, K. In general, soil of the demonstration plots were sandy loam in texture, soil pH varies from 5.6 to 6.3 with acidic nature, containing organic carbon low to medium varies from (0.47 to 0.65 %), available nitrogen varies from low to medium (270 to 350 kg ha^{-1}), available phosphorus varies from low to medium (7.6 to 13.2 kg ha^{-1}) and available potassium were also varies from low to medium (102 to 143 kg ha^{-1}). On the basis of soil test result, fertilizers were applied as N:P:K:S:: 50:25:25:20 kg ha^{-1} in mustard crop. N was applied in two split half as basal and remaining half after 30 days of sowing after irrigation. Field day was conducted involving demonstration holding farmers, other farmers, KVK scientist, officials from Deprtment of Agriculture, local extension functionaries to demonstrate the superiority of of technology. Basic information was recorded from the demonstration and control plots and analyzed for comparative performance of CFLDs and farmer's practice. Yield data were collected by random crop cutting method and analyzed by using statistical tools. The technology gap and technological index (Yadav *et al.*, 2004) along with benefit cost ratio (Samui *et al.*, 2000) were calculated by using following given formula as below mentioned.

Technology gap = Potential Yield – Demonstration Yield
Extension gap = Demonstration Yield – Farmer's Practice Yield
Technology Index = $Potential\ Yield - Demonstration\ Yield/Potential\ Yield\ x\ 100$
% increase of yield= $Demonstration\ Yield - Farmer's/Farmer's\ Practice\ Yield\ x100$

RESULT AND DISCUSSION

Results of Cluster Frontline Demonstrations revealed that the improved package and practices is more effective with technological interventions for production and productivity of mustard crop. Cultivation practices of CFLDs like using improved seed variety, seed treatment, balanced use of fertilizers, weed & pest management, economically proved that, it was superior over farmer's practices (Table 2). Similar observations were noticed by Jha *et al.* (2020).

Gap Analysis of existing and recommended practices

Existing Farmers practiced were compared with improved method demonstrated during CFLD in Deoghar district. Table 1 depicting that full gap in case of variety where Pusa 28 and NDR-8501 most suitable for area and farmers were using Rohini variety. Recommended variety require less seed for sowing. Partial gap was observed in spacing and sowing time where as full gap was observed in seed treatment, fertilizer, weed management, plant protection. It was observed that due to poor knowledge they were not following seed treatment procedure before sowing nor

they were adopting weed management and integrated pest management practices for rapeseed mustard cultivation.

TABLE 2: Grain yield and Gap analysis of cluster frontline demonstrations

Year	Area (ha)	No. of Beneficiaries	Average yield (q ha^{-1})			% increase over FP	Technology gap (q ha^{-1})	Extension gap (q ha^{-1})	Technology Index (%)
			Potential	Demon.	FP				
2017-18	30	82	12	9.10	6.34	43.5	2.90	2.76	24.17
2018-19	30	91	12	8.98	6.17	45.6	3.02	2.81	25.16
2019-20	10	34	12	9.21	6.49	41.9	2.79	2.72	23.25
Average	-	-	12	9.08	6.33	43.67	2.92	2.76	24.33

TABLE 3:- Economic analysis of the cluster frontline demonstration.

Year	Cost of production (Rs. ha^{-1})		Total Return (Rs. ha^{-1})		Net Return (Rs. ha^{-1})		B: C Ratio	
	Demonstration	Farmer's Practice	Demonstration	Farmer's Practice	Demonstration	Farmer's Practice	Demonstration	Farmer's Practice
2017-18	16700	13100	36,400	25,360	19700	12260	2.17	1.93
2018-19	18300	14900	37,716	25,914	18316	11014	2.06	1.73
2019-20	19500	15200	40,754	28,718	21254	13518	2.08	1.89
Average	18167	14400	38290	26664	19757	12264	2.10	1.85

Note: MSP of Mustard @ Rs 4,000 qt^{-1} in 2017 – 18, Rs 4,200 qt^{-1} in 2018 – 19 and Rs 4,425 qt^{-1} in 2019 – 20

Yield Analysis

The perusal of data given in the table 2 depict that yield of mustard was observed maximum in the year 2019-20 (9.21 q ha^{-1}), and minimum yield observed in year 2018-19 (8.98 q ha^{-1}) and average yield in this period was 9.08 q ha^{-1}. However, in case of Farmer's practice yield range from 6.17 to 6.49 q ha^{-1} during 2017 – 18 to 2019 – 20 and average yield during this period was 6.33q ha^{-1}. CFLD results showed 43.67 per cent yield advantage under demonstration over farmer practices. Similar findings were also documented by Kumar et al., (2010) in Bajra; Dhaka *et al.*, (2015) in Coriander; Results are also supported by Hiremath and Nagaraju (2010) in Chilli crop and Jha *et al.*, (2020) in black gram. Result clearly depicted the improvement in yield of mustard crop under CFLD compare to existing practices.

Technology Gap

Trend of technology gap varying from 2.79 to 3.02 q ha^{-1} which reflects the farmer's cooperation in carrying the demonstration with encouraging results of subsequent years. Technology gap may be attributed to variations in soil nutrient status, disease & pest infestation, rainfall distribution, weed intensity, location changes of demonstrations. However, result observed is an evidence of the better performance in varied environmental condition over farmers' practice.

Extension Gap

The extension gap varying between 2.72 to 2.81q ha^{-1} over the years of demonstrations emphasizes the need to educate the farmers through various means for adoption of improved practices to reverse the trend of wide extension gap. Similar findings were observed by Karate *et al.*, (2011) in oilseeds and Saikia *et al.*, (2018) and Jha *et al.*, (2020) in black gram. KVK is working continuously imparting knowledge and motivating farmers to increase oilseeds cultivation. More and more use of improved and area specific variety of rapeseed mustard by the farmers subsequently change the production trend of mustard and overcome the extension gap.

Technology Index

Technology index varying between 23.25 to 25.16 during the demonstration years, it showed the feasibility of the evolved technology at the farmers field, which may be attributed to the dissimilarity in weather condition, unavailability of water in the crop and soil nutrient status. Technology index value is lower indicates that more feasibility of technology.

Economic Performance

Results of economic parameters presented in Table 3 revealed that the cluster frontline demonstrations on mustard during 2017 – 18, 2018 – 19, 2019 – 20 recorded total return (Rs ha^{-1}) Rs.36,400/-, Rs.37,716/- and Rs.40,754/- respectively as compared to farmer's practice Rs.25,360/-, Rs.25,914/- and Rs.28,718/-, respectively. Net return and benefit cost ratio (B: C Ratio) also had influenced by technologies demonstrated under CFLDs programme. Net return earned between Rs. 18316/- to 21254/- per hectare under demonstrations as compared to Rs. 11014/- to Rs.13518/- per hectare. Benefit cost ratio was also observed during 2017 – 18, 2018 – 19 and 2019 – 20 under demonstrations was 2.17, 2.06 and 2.08 respectively as compared to was 1.93, 1.73 & 1.89, respectively under farmer's practice. These results are supported by findings of Singh *et al.*, (2018), Jayalakshmi *et al.*,(2018) and Jha *et al.*, (2020).

CONCLUSION

Cluster Frontline Demonstration (CFLD) of mustard crop in Deoghar play a great role in reducing the yield gap of oil seeds in this region. This data clearly depicted the significant contribution in enhancing the yield of Mustard and ensured for rapid spread of technological interventions among the farmers. It is evident that mustard potential source of vegetable oil after soyabean. Positive approach towards promoting mustard crop through implementation of various extension activities like training programme, field days and exposure visits *etc*. in farmer's field. Demonstration of mustard cv. NDR – 8501 with scientific package and practice performed very well as compared to local variety grown by farmers was 43.67 %. This implies that scientific practices to the farmers, by providing quality seed, need based inputs, their proper utilization and constant technical support from scientific body of KVK can helpful in reducing yield gap at considerable extent and potential yield of mustard can be achieved. But production cannot be increased single handedly by farmers

only. It requires combine effort from all extension agencies working in the field of agriculture to promote farmers and facilitated them at every step of cultivation to harvesting. Therefore, Government and policy maker should provide financial assistance and technological support for conducting such type of Cluster Frontline Demonstration programme under the supervision scientists and extension professionals to enhance the yield potential and income level of the farming community.

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