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Impact Assessment of Cluster Front Line Demonstration on Popularization of Toria in Udalguri District of Assam

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Authors' contributions

This work was carried out in collaboration among all authors. Author PD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors HR, IO and PB managed the analyses of the study. Author DB managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The programme Cluster Front Line Demonstration (CFLD) was initiated by Ministry of Agriculture and Farmer's welfare, Government of India New Delhi implement CFLD on Oilseeds under National Mission on Oilseed and Oil Palm (NMOOP). During 2015-2020, KVK Udalguri had conducted CFLD on Toria on 270 ha covering 667 nos. of beneficiaries across 12 villages in the district selected purposively. The study was mainly based on primary data. The study is designed to analyse impact of Cluster Front Line Demonstration conducted by Krishi Vigyan Kendra, Udalguri on socio economic condition, adoption and technology gap, adoption pattern of beneficiaries and non-beneficiaries of the district. The study reveals that by conducting cluster front line demonstrations of proven technologies, yield potential and net income from oilseed cultivation can be enhanced to a great extent with increase in the income level of the participating farmers. The Cluster front line demonstrations recorded higher average gross returns (Rs. 25404 /ha) and net return (Rs. 7374/ ha) with cost: benefit ratio (1.43) compared to farmers practice as net return Rs. 2421/ ha which indicates the economic feasibility of the technology. After conducting Cluster Front Line Demonstration, the highest adoption was found in selection of varieties and time of harvesting.

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Keywords: CFLD; toria; impact; technology index; oilseed.

1. INTRODUCTION

Oilseed production in India assumes great importance because of the huge gap in demand and supply which has resulted in import of vegetables oil jumped 9% during November-December, 2020 to 24.59 lakh tonnes compared to 2019 (The Economic Times, 2021). Total oilseeds include Rapeseed (Toria) and Mustard, Linseed, Sesamum, Nizer, Soyabean, Ground nut, Sunflower (Rabi Oilseeds) and Sesamum, Castor, Soyabean, Ground nut (Kharif oilseeds). Rapeseed and Mustard is the principal oilseed crop grown in the State of Assam which, occupied about 8.46% of the total crop area (Statistical Handbook of Assam, [1]). The analysis indicates that area and productivity of rape and mustard had not increased to the desired level. It is significantly lower than the agriculturally advanced states like Punjab, Gujarat and Haryana. This lower productivity is mainly due to non adoption of improved method of cultivation, use of traditional seed varieties, low use of chemical fertilizer and other soil nutrients. Moreover, method of cultivation remains traditional and no technological breakthrough have been achieved and hence productivity of this crop has not increased. Udalguri district has a sizeable area under toria cultivation with an area and production of 5815 ha and 2452 tonne respectively (Statistical Handbook of Assam, Udalguri 2015-16). Toria (*Brassica campestris*) is high yielding rapeseed and mustard crop. It has some important varieties like TS-36, TS-46, TS-38 which are suitable for Assam agroclimatic conditions and has yield potentiality of 1200 kg/ha. It is the third most important edible oilseed crops of the world after soybean and oil palm. Toria is usually sown from mid-October to mid-November in Assam. However, in medium low land, clay loam to sandy loam soil the crop is sown late which sometimes goes up to December after harvesting of Sali rice (November) in rice-toria cropping system. The oil content varies from 37 to 49%. The seed and oil are used as condiment in the preparation of pickles, curries, vegetables, hair oils, medicines and manufacture of greases. The oil cake is used as feed and manure. The leaves of young plants are used as green vegetables and green stem and leaves are a good source of green fodder of cattle. In the tanning industry, mustard oil is used for softening leather.

The programme of Cluster Front Line Demonstration (CFLD) was initiated by Ministry of Agriculture and Farmer's welfare, GOI New Delhi under National Mission on Oilseeds and Oil Palm (NMOOP). Division of Agricultural Extension, Indian Council Agricultural Research (ICAR), New Delhi was given the responsibility to lay out the CFLD on important oilseed crops such as Sesamum, Mustard and rapeseed, Linseed to organize demonstrations through Krishi Vigyan Kendras throughout the country. Indian Council of Agricultural Research, New Delhi initiated National level CFLD on oilseeds with main objective to demonstrate production potential of new varieties and the related scientific production technologies. The programme also aimed at increasing the productivity of oilseeds throughout the country. To minimize the adoption gap and increase the productivity, CFLDs can play crucial role. The general objectives of Cluster Frontline Demonstration are to demonstrate under farmer's field condition, the superior production, potentials and benefits of the latest improved technologies in cluster mode. Therefore, efforts have been made through Cluster Front Line Demonstrations (CFLDs) to introduce innovative package of practices of oilseeds with a view to increase its productivity in the district of Udalguri, Assam.

2. MATERIALS AND METHODS

The study was conducted in the Udalguri District of Assam during rabi season for last 5 years from 2015-2016 to 2019-2020 at the farmers field in different villages. Krishi Vigyan Kendra, Udalguri conducted cluster front line demonstration on oilseed crops *viz.,* Toria during 2015-2016, 2016-2017, 2017-2018, 2018-2019 and 2019-2020 in total 12 nos. of villages covering a total 667 nos. of beneficiaries. The study was mainly based on primary data. Before conducting the CFLD programme, KVK Scientists had collected baseline information of the villages. During 2015-2020, KVK had conducted CFLD on Toria on 270 ha covering 667 nos. of beneficiaries in Udalguri district. Therefore, the present study was conducted in villages Teliapara, Kacharital, Dewrigaon, Bhutiasang, Panishali, Nalbari, Patala, Dhupguri, Khoirabari, Nalkhamara, Ganakpara, Sapkhaity purposively. A list of farmers was prepared through group meeting and selected farmers were trained to follow the package of practices of Toria recommended by Assam Agricultural University. The need based inputs were supplied to the selected farmers and proper monitoring of the demonstration plots by

the KVK Scientists ensure proper guidance to the farmers. The sowing was done during mid October-mid November under rainfed condition every year. The details of the technology interventions and farmer's practice were mentioned in Table 1. Crop yields were recorded from the demonstration and check plots at the time of harvest to identify the yield gaps between demonstration and check plots (Table 4). The economic-parameters (Gross return, net return and B:C ratio) were worked out on the basis of prevailing market prices of inputs and Minimum Support prices of outputs [2]. The Percentage change to see the impact, benefit cost ratio, technology gap, extension gap and technology index were worked out as given below:

Impact change (%) = Change in No. of adapters/ No. of adapters before demonstrations X 100

Technology Gap = Potential Yield – Demonstrated Yield

Extension Gap = Demonstration Yield – Farmer's practice Yield

Technology Index = Potential Yield – Demonstrated Yield/ Potential Yield X 100

Benefit Cost Ratio = Gross Return (Rs./ha) / Gross Cost (Rs./ha)

3. RESULTS AND DISCUSSION

3.1 Technological Adoption Gap

The details of technological intervention and farmer's practice were presented in Table 1. From the Table, it was observed that the full gap was identified in seed rate, method of sowing, seed treatment, and use of variety and fertilizers application. Whereas, plant protection measures showed partial adoption gap which might be the result of low yield in farmer's practice. Similar results were found in oilseeds by Patil et al. [3], in Pulses by Singh et al. [4]. Farmers in general use local varieties due to non availability and lack of awareness about high yielding varieties. Farmers usually follow broadcasting method of sowing and use higher seed rate than recommended rate. Farmers were not using seed treatment technique for major diseases like downy mildew and dumping off due to lack of knowledge and interest. However, in demonstration plots, factors achieving better yield were proper time sowing, balanced use of fertilizer and use of improved varieties.

Table 1. Details of technologies followed in the Cluster Front Line Demonstration

Particulars	Technology interventions	Farmer's practices	Technology gap
Farming situation	Rainfed medium land	Rainfed medium land	No gap
Time of sowing	Mid November	Mid November	No gap
Method of sowing	Line-sowing	Broadcasting	Full gap
Seed rate	10 kg / ha	12 kg /ha	Full gap
Seed treatment	Metalaxyl 35 WS @ 6 g /kg of seeds	Nil	Full gap
Variety	Improved varieties (TS-38, TS-67, TS-46)	Local traditional variety. Local Behar	Full gap
Manures/ Fertilizers	Fertilizers: 75 % of recommended Dose of Fertilizer i.e. 30 Kg N, 26.25 Kg P2O5, 11.25 K2O/ha (Farmers contribution) + Vermicompost / Compost @ 1.5 q/ha + FYM @ 2.5 t/ha + S @ 20 kg/ha	Uncontrolled and imbalanced application of fertilizers mainly DAP with no application of sulphur were under consideration.	Full gap
Plant protection	Dimethoate 30 EC @ 0.5 l /ha against Aphid	Nil	Partial gap
	Mancozeb @ 0.2 % for Alternaria blight	Mancozeb @ 0.2 % for Alternaria blight	

3.2 Impact of CFLD on Adoption Technology of Toria Production

The adoption technologies of CFLD on Toria are presented in Table 2. It was found that a number of adopters for time of harvesting were 81.26% before demonstrations, which was increased to 98.95% after cluster frontline demonstrations in the selected villages. The numbers of adopter selection of improved varieties like TS-67, TS-38, TS-46 increased significantly from 15.59% to 89.96% after demonstrations. Similarly, 77.51% of farmers adopted disease management technology after CFLD activities. The CFLD intervention made highly positive impact on disease management in Toria i.e. use of IPM and IDM technology during disease and pest infestation (77.51%) and adoption of seed treatment technologies like seed treatment with Thiram, Captan, Carbendazim increase from 0% to 15.29% in study area. After CFLD intervention, seed rate and proper time of sowing also maintained by 85.31% and 75.11% farmers respectively. Besides, the percentage of adopters for the use of recommended dose of fertilizer and manure also increased from 23.84% before to 56.22% after cluster frontline demonstrations in the selected village. In case of suitable land selection and weed management 53.82% and 25.34% farmers follow the practices before CFLD respectively, whereas, after CFLD activities 85.31% and 56.97% farmers were adopting the practices. Regarding crop rotation and precaution before storage percentage of adopters increased significantly. In addition, adoption of improved practices *viz.,* sowing method, land preparation and irrigation management increased significantly. However, observed that non-participating farmers had low adoption in the case of above improved practices of Toria. The overall adoption level of Toria production technology was increased by 184.96% due to CFLD programme organized by KVK Udalguri. These results are in close conformity with the findings recorded in the case of oilseed crops by Singh et al. [5], Mahale [6], Jute by Chapke [7] and Deka et al. [8].

Table 2. Extent of technology adoption of Rapeseed under CFLD

Technology	Before CFLD	After CFLD	Change in no. of adaptors	Impact change (%)
Selection of varieties	104 (15.59)	600 (89.96)	496	476.92
Time of harvesting	542 (81.26)	660 (98.95)	118	21.77
Precaution before storage	26 (3.90)	111 (16.64)	85	326.92
Application of fertilizer	159 (23.84)	375 (56.22)	216	135.85
Disease management	238 (35.68)	517 (77.51)	279	117.23
Sowing method	153 (22.94)	353 (52.92)	200	130.72
Selection of land	359 (53.82)	569 (85.31)	210	58.50
Seed treatment	0 (0.00)	102 (15.29)	102	102
Time of sowing	385 (57.72)	501 (75.11)	116	30.13
Maintaining seed rate	111 (16.64)	475 (71.21)	364	327.93
Land preparation	285 (42.73)	401 (60.12)	116	40.70
Crop rotation	63 (9.45)	275 (41.23)	212	336.51
Irrigation management	9 (1.35)	50 (7.50)	41	455.56
Weed management	169 (25.34)	380 (56.97)	211	124.85
Overall Impact				184.96

**Figures in parentheses indicate percentage (%)*

Table 3. Performance of oilseeds under CFLD and farmer's practices during Rabi Season from 2015-16 to 2019-20

Year	No. of farmers	Area (ha)	Yield (q/ha)		% increase over control	Cost of cultivation (Rs./ha)		Gross Return (Rs./ha)	Net return (Rs./ha)		Additional income (Rs./ha)	B:C ratio
			Demo	Control		Demo	Control		Demo	Control`		
2015-2016	42	20	8.45	6.20	36.29	15440	14540	23660	8220	2820	5400	1.53
2016-2017	50	20	7.23	4.22	71.33	15440	14540	23660	8220	2820	5400	1.53
2017-2018	125	50	7.53	4.71	59.87	16600	15200	24850	7399	2043	5356	1.50
2018-2019 TS-67	75	30	8.10	6.80	19.10	21410	19600	30350	8940	4200	4740	1.40
2019-2020	375	150	7.00	5.80	20.69	20410	18600	24500	4090	1700	2390	1.20
Mean	**667**		**7.66**	**5.55**	**41.46**	**17860**	**16496**	**25404**	**7374**	**2421**	**4657**	**1.43**

Table 4. Gap in grain yield production of Toria under Cluster Front Line Demonstration

Year	Potential yield (q/ha)	Average yield (q/ha)		Technology Gap (TG) (q/ha)	Extension Gap (EG) (q/ha)	Technology Index (TI) (%)
		Demo Plots	Farmer's practice			
2015-2016	10	8.45	6.20	1.55	2.25	15.50
2016-2017	10	7.23	4.22	2.77	3.01	27.70
2017-2018	10	7.53	4.71	2.47	2.82	24.70
2018-2019	10	8.10	6.80	1.90	1.30	19.00
2019-2020	10	7.00	5.80	3.00	1.20	30.00
Mean				**2.34**	**2.12**	**23.38**

3.3 Economic Performance

The economics (Average yield of the crop, Cost of cultivation, gross & net return) of Toria under Cluster front line demonstrations were estimated and the results have been presented in Table 3. The analysis depicted in the study showed the average yield of toria in the demonstrated plots were 8.45 q/ha, 7.23 q/ha, 7.53 q/ha, 8.1 q/ha, 7.00 q/ha during 2015-16 to 2019-20 respectively which were compared to prevailing farmer's practice. Hence, it is evident that under the demonstrated plots, performance of toria was comparatively higher than local practice. The result is in line with the result of Tiwari and Saxena [9] in oilseeds, Tiwari et al. [10] in gram, Mokidue et al. [11] in Urd bean, Balai et al. [12] in rape and mustard and Padma Veni et al. [13] in pulses. The Cluster front line demonstrations recorded higher average gross returns (Rs. 25404 /ha) and net return (Rs. 7374/ ha) with cost: benefit ratio (1.43) compared to farmers practice as net return Rs. 2421/ ha which indicates the economic feasibility of the technology. From the Table 4, it was revealed that cost of cultivation was cost incurred in case of demonstration plots was higher compared to farmer's practice but yield obtained in demonstration plots was higher compared to farmer's plot due to additional cost involved. The present findings are in accordance with study of Hiremath and Nagaraju [14], Kiresur [15], Kumar and Chauhan [16] and Saikia et al. [17]. The huge differences in yield might be due to varietal characteristics and changes in weather during condition cropping period. Thus, there is a scope to increase the sustainable productivity of the crop by using improved technology to greater extent.

The data on technology gap, extension gap and technology index were presented in Table 4. Technology is the differences between potential and demonstration yield. The average technology gap recorded in Toria was 2.34 q/ha. It indicates that still there is gap in technology demonstrations as a result of which potential yield of demonstrated variety could not be reaped by the participating farmers. The factors influencing the technology gap may be differences in climatic situation of the district, soil fertility status and mismanagement of the crop. The difference between yield of demonstration plot and farmer's practice was extension gap. The average extension gap in Toria was observed as 2.12 q/ha and the gap should be lessen by using various extension methods like training and awareness programmes by extension personnel, timely dissemination of information through print or electronic media etc. The increased awareness created by the extension functionaries would motivate the farmers to adopt improved practices and thereby reduce the extension gap [4]. The technology index shows the feasibility of the evolved technology at the farmer's field. Lower technological index indicates the efficient performance of the technology. The average technological index recorded in Toria was 23.38 per cent. The variations may be due to the dissimilarity in soil fertility status, local weather conditions, disease pest infestations, mismanagement in following proper agricultural practices. Similar findings were reported by Tomer [18] in Potato, Kirar et al. [19] in Urd bean, Mitra and Samajdar [20] in Rape & Mustard, Poonia TC and Pithia MS [21] in chickpea, Saikia, et al. [17] in blackgram, Chaudhury, et al. [22] in mustard, Singh, et al. [4] in pulse crop, Ojah et al. [23] in Toria and Sonowal Bora et al. [24] in toria.

4. CONCLUSION

The results indicated that the Cluster front line demonstration has given a positive and significant impact over the farming community of Udalguri district as they were motivated by the

new agricultural technologies applied in the demonstrations. The demonstrated technologies were superior in every aspect compared to existing practices. Through CFLD programme productivity of toria has been increased up to 41.46 per cent hence increases income. The existing technology and extension gap should be minimized through imparting scientific knowledge to the farmers by extension personnel. However, the yield level under CFLD was superior over local toria variety and performance & potentiality of this variety could be further improved by adopting recommended management practices. The participating farmers plays an important role in disseminating technologies to the neighboring farmers. The CFLD shows great impact on the use of improved varieties. Most of the low yielding local varieties were replaced by the high yielding varieties like TS-67, TS-38 etc. due to CFLD programmes conducted by KVK in the district which may help in increasing productivity of oilseed crops art micro, meso and macro level.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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