Impact Assessment of Cluster Front Line Demonstration (CFLDs) on Popularization of Toria Cultivation in Majuli District of Assam, India

ABSTRACT

Krishi Vigyan Kendra, Assam Agricultural University, Jorhat conducted five hundred fifty Cluster Front Line Demonstrations (CFLDs) on toria covering 577 nos. of beneficiary in 32 villages at two development blocks of Majuli district of Assam during 2015-16 to 2020-21. The study was conducted to study the impact of Cluster Front Line Demonstrations conducted by KVK, Jorhat on socio-economic condition, technology adoption and technology gap, adoption pattern of the improved technology among beneficiaries and non-beneficiaries of the district. The results showed that the Cluster Front Line Demonstrations of the new technologies increased crop yield and net income of the participating farmers from toria cultivation. The average yield of toria varieties under the demonstration was 1007 kg/ha as compared to 674 kg/ha in the farmers practices. The highest mean yield of toria under the technology demonstrated was 1057 kg/ha and the lowest was 956 kg/ha. The mean technology gap (TG), extension gap (EG) and technology index (TI) was 1.93 q/ha, 3.32 q/ha and 16.12 percent respectively which indicates need for improvement of the extension services in educating the farmers for dissemination and adoption of the improved technologies. Lower technology index in the study indicates the efficient performance of the technology. The technology index has reduced from 17.67% to 12.67% from the year 2016-17 to 2020-21 which indicates the adoption as well as feasibility of the technology demonstrated at location specific farmers' field. The mean gross return (Rs.32, 617.60/ha), net return (Rs. 16,636.00/ha), additional return (Rs. 10,764.52/ha) and benefit cost ratio (1.97) were found higher under improved technology demonstrated as compared to farmers practice. Thus, higher benefit cost ratio proved economic feasibility of the improved technology demonstrated in both the blocks of Majuli district of Assam.

K E Y W O R D S: Toria, Cluster front line demonstration, Extension gap, Technology gap, Technology index, improved technology, farmers practice, Benefit-cost ratio

INTRODUCTION:

Oilseed crops are the second most important determinant of agricultural economy,

next only to cereals within the segment of field crops. The self-sufficiency in oilseeds attained through "Yellow Revolution" during early 1990's, could not be sustained beyond a short period. Despite being the fifth largest oilseed crop producing country in the world, India is also one of the largest importers of vegetable oils today. "Despite commendable performance of domestic oilseeds production of the nine annual crops (Compound Annual Growth Rate of 3.89%), it could not match with the galloping rate of per capita demand (~6%) due to enhanced per capita consumption (18 kg oil per annum) driven by increase in population and enhanced per capita income" (https://www.nfsm.gov.in/StatusPaper/NMOOP2018.pdf).

"Rapeseed - mustard (*Brassica juncea*) is third important oilseeds crops in the world after the soybean (*Glycine max*) and Palm (*Elaeis guineensia*) oil. Among the seven edible oilseeds cultivated in India, rapeseed mustard contribute 28.6 per cent in total oilseed production and rank second after groundnut 27.8 per cent in the Indian oilseed economy. 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" (https://www.nfsm.gov.in/StatusPaper/NMOOP2018.pdf). Major oilseeds in the country include rapeseed (toria) and mustard, ground nut, linseed, sesamum, niger, soybean, sunflower and castor. Rapeseed and mustard is the principal oilseed crop grown in the State of Assam which occupies about 8.46% of the total crop area (Statistical Handbook of Assam). However, the productivity of rape and mustard in the state has not achieved to the desired level and is significantly lower than the major oilseed producing states of the country. This lower productivity is mainly due to non adoption of improved production technology, use of seeds of traditional varieties, low use of chemical fertilizer and poor fertility status of soils.

Toria (*Brassica campestris*) is the main *rabi* crop in the district of Majuli. The popular high yielding varieties grown in the district are TS-36, TS-38, TS-46, TS-67 with a yield potential of 1200 kg/ha. Introduction of these HYVs through CFLDs have replaced the old farmers varieties like M-27, Manipuri etc. and at present more than 70% of the area of the district is under HYVs of Toria. The main objective of the CFLDs in oilseeds is to demonstrate and popularize the improved agro technology in the farmers' field. Indian Council of Agricultural Research, New Delhi initiated National level CFLD programme on oilseeds with main objective to demonstrate production potential

of new varieties and other scientific production technologies for enhancement of the productivity. 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 and profitability in both the development block in the district of Majuli. "The Cluster Front Line Demonstration (CFLD) is an applied approach to accelerate the dissemination of proven technologies at farmer's fields in a participatory mode with an objective to explore the maximum available resources of crop production and also to bridge the productivity gaps by enhancing the production in national basket". (Borah et. Al., 2020)

MATERIALS AND METHODS

Five hundred seventy seven numbers of Cluster Front Line Demonstrations (CFLDs) on toria were conducted during 2016-17 to 2020-21 at two different blocks *viz.*, Majuli and Ujoni Majuli development block of Majuli district of Assam covering a total of 32 nos. of villages. Before conducting the CFLD programme, baseline survey was conducted to gather the baseline information of the villages. For conducting the demonstrations, farmers were identified/ selected following the survey suggested by Choudhary (1999). The critical inputs were provided and regular monitoring of the demonstration fields by scientists was organized for onsite technological support to the participatory farmers. Trainings and group meetings were also organized to provide the opportunities for other farmers to witness the benefits of demonstrated technologies including field days for large scale publicity of the technology.

The sowing of seeds of toria was done during mid October-mid November under rain fed condition every year and up to the first week of December in case of late sown variety. The details of the technology interventions and farmer's practice are presented in Table 1. Crop yields were recorded from the demonstration and check plots by conducting crop cutting experiments to estimate the yield gaps between technology demonstrated and farmer practice (Table 4). The economic analysis (Gross return, net return and B-C ratio) was done on the basis of prevailing market prices of the inputs and minimum support prices of the produce for the demonstrated improved technology (IT) and farmers' practice (FP) (Rachhoya et al., 2018) The technology gap, extension gap and technology index were calculated using the formula as described by Samui *et al.*, (2000) as given below and benefit cost ratio were calculated using the

expression as given below:

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)

RESULTS AND DISCUSSION

Technological Gap

The details of technological intervention provided during conducting the demonstrations and practices followed by the farmer are presented in Table 1. Perusal of data revealed that 100% technology adoption gap was identified in terms of variety, seed treatment, method of sowing/ spacing, manures/ fertilizers and weed management, 80% gap in seed rate and 50% gap in plant protection and irrigation management which might be the reason for low yield in farmer's practice. However, no technology adoption gap was observed in case of time of sowing. Similar results were observed in pulses by Singh et al. (2020). It was also established from the feedback from the farmers that they generally go for the local varieties due to non availability of the HYVs as well as due to lack of awareness about the HYVs. It was also found that farmers in general practice broadcasting method of sowing and thus use higher seed rate than the recommended seed rate. Farmers also do not go for seed treatment with bio-fertilizer due to lack of awareness as well as non-availability of the bio-fertilizer locally. Thus, in the demonstration plots the main reason for achieving higher yield were due to use of improved varieties, recommended seed rate, line sowing, balanced use of fertilizer and weed management.

Table1. Details of technologies followed in the Cluster Front Line Demonstration

Particulars	**Technology interventions**	**Farmer's practices**	**% Gap**
Variety	Improved varieties (TS-38, TS-67, TS-46)	Local traditional variety. (M-27, Manipuri)	100
Seed rate	10 kg/ha	15-20 kg/ha	80
Seed treatment	Seed treatment with bio-fertilizer (Azotobacter and PSB@ 50g/kg seed)	No seed treatment	100
Time of	Mid November	Mid November	Nil

sowing			
Method of sowing/ spacing	Sowing crops in 30 cm rows and thinning as per need at 15-20 DAS	Broadcasting	100
Manures/ Fertilizers	Fertilizers: 75 % of recommended Dose of Fertilizer i.e. 30 Kg N, 26.25 Kg P_2O_5, 11.25 K_2O/ha (Farmers contribution) + Vermicompost / Compost @ 1.5 q/ha + FYM @ 2.5 t/ha + S @ 20 kg/ha + Borax @ 10kg/ha	Non-judicious use of fertilizers, No use of B and S.	100
Weed management	Pre-emergence application of Pendamethalin @ 1.0 kg a.i ha^{-1}. Hand weeding at 15–20 DAS	No practice of hand weeding and no application of herbicide	100
Plant protection	Dimethoate 30 EC @ 0.5 l /ha against Aphid Mancozeb @ 0.2 % for Alternaria blight	No application of insecticide. Application of Mancozeb @ 0.2 % for Alternaria blight by some progressive farmers only	50
Irrigation management	Life saving Irrigation at critical growth stages	No Irrigation	50

Impact of CFLD programme on technology adoption in Toria Production:

The extent of technology adoption after implementation of the CFLD on Toria is presented in Table 2. Data presented in Table 2 revealed that the numbers of adopter in selection of improved varieties like TS-36, TS-38, TS-67 increased significantly from 16.81% to 82.84 % after conducting the demonstrations. Similarly, in maintaining seed rate number of farmers increased from 17.15% to 68.80%. The farmers have shifted from broadcasting method of sowing to line sowing and number of farmers adopting line sowing has increased to 59.96%. The number of farmers in adopting recommended dose and method of fertilizer application has increased to 57.88% and in case of weed management increased to 34.48%. The farmers adopting disease management technology after CFLD activities has increased to 71.92% and the CFLD intervention made highly positive impact on disease management in toria in the selected villages. In irrigation management the no of farmers have changed from 1.38% to 7.27%. It may be mentioned that in general farmers of Majuli growing rapeseed and mustard are highly

dependent on precipitation and they do not have irrigation facilities. However, after conducting the demonstration farmers have started adopting the technology for irrigation management in both the block of the district. It was also observed that non-participating farmers had low rate of adoption of these improved technologies and gradually they are coming forward for adopting these technologies mostly the HYVs. The overall adoption level of production technology of toria has increased by 151.80 % due to implementation of the CFLD programme. These results are in agreement with the findings of Singh et al. (2014), Mahale (2014), and Deka et al. (2019) in rapeseed crop.

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	97 (16.81)	478 (82.84)	381	392.78
Seed treatment	0 (0.00)	86 (14.90)	86	86.00
Time of sowing	345 (59.79)	435 (75.38)	90	26.08
Maintaining seed rate	99 (17.15)	397 (68.80)	298	301.01
Sowing method	121 (20.97)	346 (59.96)	225	185.95
Application of fertilizer	138 (23.91)	334 (57.88)	196	142.02
Irrigation management	8 (1.38)	42 (7.27)	34	425.00
Weed management	115 (19.93)	199 (34.48)	84	73.04
Disease management	162 (28.07)	415 (71.92)	253	156.17
Overall Impact	1085/9=120.55	2732/9=303.55	1647/9=183	151.80

Table 3. Economic impact of improved technology (IT) on toria over farmers practice (FP) in Majuli district, Assam from 2016-17 to 2020-21

Year	No. of Farmer	Area	Variety	Demonstration Yield (Qt/Ha)			Yield of local Check (Qt/Ha)	% increase Over control	Gross Cost (Rs/Ha)/	Gross Return (Rs/Ha)	Net Return (Rs/Ha)	Additional income (Rs./ha)	B:C Ratio (Farmers Practice) (GR/GC)	B:C Ratio (Demo) (GR/GC)
				H	L	A								
2016-17	57	20	TS-36/ TS-38	10.32	9.43	9.88	6.79	45.50	15,198.00	29,670.00	14,970.00	9279.38	1.05	1.95
2017-18	140	50	TS-38	10.29	9.21	9.75	6.71	45.30	15,970.00	31,584.00	16,314.00	9847.73	1.08	1.97
2018-19	65	30	TS-38, TS-67	10.78	8.95	9.87	6.78	45.57	16,250.00	31,648.00	15,398.00	9908.04	1.05	1.94
2019-20	240	150	TS-36, TS-38, TS-67	10.50	10.20	10.35	6.69	54.70	17,505.00	34,254.00	16,749.00	12113.01	1.01	1.96
2020-21	75	30	TS-38	10.97	10.00	10.48	6.75	55.25	17,662.00	35,932.00	19,749.00	12788.77	1.15	2.03
Total/ Mean	**577**	**280**	-	**10.57**	**9.56**	**10.07**	**6.74**	**49.26**	**16,517.00**	**32,617.60**	**16,636.00**	**10764.52**	**1.07**	**1.97**

Table 4. Yield gaps analysis of Cluster Frontline Demonstrations (CFLDs) on toria in Majuli district of Assam from 2016-17 to 2020-21.

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			
2016-17	12	9.88	6.79	2.12	3.09	17.67
2017-18	12	9.75	6.71	2.25	3.04	18.75
2018-19	12	9.87	6.78	2.13	3.09	17.75
2019-20	12	10.35	6.69	1.65	3.66	13.75
2020-21	12	10.48	6.75	1.52	3.73	12.67
Mean	**12**	**10.07**	**6.74**	**1.93**	**3.32**	**16.12**

Economic analysis

The results of the economic analysis of toria cultivation under the CFLD programme in Majuli district are presented in Table 3. The results revealed that the yield of the demonstration plot was higher than the farmers practice in all the years under study and per cent increase in yield varied from 45.30% to 55.25 % with an average of 49.26%. The results are in conformity with the findings of Mokidue et al. (2011) and Veni et al. (2018) in pulses. The mean gross return (Rs.32, 617.60/ha), net return (Rs. 16, 636.00/ha), additional return (Rs. 10, 764.52/ha) and benefit cost ratio (1.97) were found higher under improved technology demonstrated as compared to farmers practice (Table 3). Thus, higher benefit cost ratio under the technology demonstrated proved economic feasibility of the improved technology in both the blocks of Majuli district of Assam. The findings are in agreement with the results of Kiresur (2001), Kumar and Chauhan (2005), Hiremath and Nagaraju (2007) and Saikia et al. (2018). The increase in yield in the demonstration plot might be due to the improved variety, correct seed rate, line sowing, proper fertility management, irrigation management, weed management and pest and disease management. Thus, there is a great scope for increasing the productivity of toria in Majuli district by large scale adoption of these improved technologies.

The yield gaps analysis of Cluster Frontline Demonstrations (CFLDs) on toria in Majuli district of Assam from 2016-17 to 2020-21 is presented in Table 4. The mean technology gap recorded was 1.93 q/ha. It indicates that there is still gap in the technology demonstrations for which potential yield level of the demonstrated variety

could not be achieved by the participating farmers. The factors influencing the technology gap may be differences in climatic situation of the district, soil fertility status and proper adoption of the other improved technologies. The difference between yield of the demonstration plots and farmer's practice is the extension gap. The mean extension gap was 3.32 q/ha and this gap must be reduced by using various extension methodologies like awareness programmes on improved varieties, cultivation technologies, pest and disease management technologies as well as hands on trainings, timely dissemination of technological information through different media. The increased awareness by the extension functionaries would encourage the farmers to adopt improved technologies and thus reduce the extension gap (Singh et al., 2020). The technology index shows the feasibility of the improved technology in the farmer's field. Lower technology index indicates the efficient performance of the technology. The technology index has reduced from 17.67% to 12.67% from the year 2016-17 to 2020-21 which indicates the adoption as well as feasibility of the technology demonstrated. The results are in conformity with the findings of Kirar et al. (2016) in Urd bean, Mitra and Samajdar (2012) in Rape & Mustard, Saikia, et al. (2018) in blackgram, Chaudhury, et al.(2018) in mustard, Singh, et al. (2020) in pulse crop, Ojah et al. (2020) in Toria and Bora et al. (2020) in toria.

CONCLUSION

The results of the present study indicated that the CFLD programme on toria has given a positive and significant impact on productivity and profitability of toria cultivation in Majuli district of Assam. The demonstrated technologies were found to be superior over the existing practices followed by the farmers. Although productivity of toria has increased up to 49.26% due to the CFLD programme and increased the income level of the participating farmers, still there is scope for further improvement in the productivity level. The existing technology gap and extension gap should be minimized through imparting scientific knowledge and technology back stopping by the extension functionaries of the district. The highest extension gap indicate the need to educate the farmers through various means for adoption of improved technologies to reverse the trend of wide extension gap. It is worth mentioning that the participating farmers play an important role in technology dissemination to the farmers of the neighbouring areas. The CFLD showed a great impact on the horizontal spread of the

improved varieties in the district and most of the low yielding local varieties have been replaced by the high yielding varieties like TS-36, TS-38 TS-67 etc.

Thus, it can be concluded that the technologies demonstrated under Cluster Line Demonstrations (CFLDs) had been exploited to obtain the maximum yield, net profit and additional income from toria cultivation which lead to the economic viability of toria cultivation in Majuli district. The difference in yield and profit margin between the technology demonstrated and farmers practice might be due to socio-economic, biophysical, management, institutional, and policy factors.

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