Short Research Article

IMPACT OF CLUSTER FRONT LINE DEMONSTRATION (CFLD) ON YIELD & ECONOMICS OF TORIA IN RAIN-FED NORTH EASTERN COASTAL PLAIN ZONE OF ODISHA

ABSTRACT

Toria is one of the most important oilseeds crop after harvest of *Kharif* rice in rainfed areas of Balasore district of Odisha.Krishi Vigyan Kendra, Balasore conducted Cluster Front Line Demonstration programmeon Toria during *Rabi*2019-20 to assess its impact in terms of change in yield and income gap through scientific cultivation practices. The study was conducted in four villages of the district covering 180 farmers to find out the extension gap, technology gap, technology index and economic indexes of thecrop before and after the intervention of cluster front line demonstration. The study revealed that, average yield of 8.5q/ha was obtained in the CFLD plot which was 44.06 per cent higher than the farmer's practice. Similarly, the technology gap, extension gap and technology index were found to be 1.5q/ha, 2.6q/ha and 15 per cent, respectively. The average gross income in demonstrated plot was found to be Rs.34840/ ha as compared to Rs.23420/ha in farmers practice. Likewise, average net income of Rs.17040/ha was found in demonstration plot while it was Rs.8420/ha in farmer's plot. The Benefit-cost ratio was found to be 1.96 in the demonstration plot which is higher as compared to 1.56 at farmer's practices. It clearly indicates that the production and economic efficiency of the demonstrated technology of Toria in the study area. There was technology gap and extension gap due to the non-adoption of high yielding varieties, proper time of sowing, seed rate, seed treatment, fertility management, and lack of awareness about the recommended package of practices. The study revealed that cluster frontline demonstration programme (CFLD) may play a significant role in disseminating the technologies to the farmer's field and thereby enhancing crop yield and farmer's income.The Study was conducted by Krishi Vigyan Kendra, Balasore to analyse the yield gap of Toria (*Brassica campestris* var. toria) through Cluster frontline demonstration in North Eastern Coastal Plain Zone of Odisha.

KEY WORDS: Oilseed**,** Toria, Cluster, CFLD, Extension gap, yield, Economics

INTRODUCTION

India is the 4th largest oilseeds producer in the world. It has 20.8% of the total area under cultivation globally, accounting for 10% of global production. Traditional indigenous species of Rapeseed-mustard crops in India comprise oftoria (*Brassica campestris*L. var. toria), brown sarson (*Brassica campestris*L. var. brown sarson), yellow sarson (*Brassica campestris*L. var. yellow sarson), Indian mustard [*Brassica juncea*(L.) Czernj&Cosson], black mustard (*Brassica nigra*) and taramira (*Eruca sativa*) (DRMR, 2012).Toria ((*Brassica campestris*L. var. toria)) a member of family Brassicaceae., is the 3rd most important oilseed crop and cultivated in 6.26 m ha area with production of 8.68mt with productivity of 1387 kg ha-1 (AGRICULTURAL STATISTICS AT A GLANCE 2022) should mentioned Anon., 2022 like that

In Odisha, rapeseed mustard is cultivated in an area of 106.30 thousand hectares with production of 46.35 thousand MTand productivity of 436 kg ha^{-1}(Odisha AGRISTAT 2018-19) which is much lower than national average. Among rapeseed mustard, toria (*Brassica campestris*L. var. toria) is second most important oilseed crop after Indian mustard cultivated in the state. It is gown as rainfed crop in North Eastern Coastal Plain zoneduring *rabi* season after harvesting of *Kharif* rice. In Balasore district, Toria is cultivated in an area of 4000ha area with production of 1.92thousand MT & productivity of 480kg ha^{-1}1 (Odisha AGRISTAT 2018-19). Lower productivity of Toria may be due to use of low yielding variety, low seed replacement, faulty sowing of seed without seed treatment, indiscriminate use of fertilizer without soil testing, no foliar nutrition provided, lack of water management and high disease pest incidence are predominant factors for limiting the potential yield of the crop. The concept of frontline demonstration (FLDs) creates direct interface between scientists and farmers, in which improved technologies are demonstrated for increasing crop yield.Therefore, efforts have been made through Cluster Front Line Demonstrations (CFLDs) to introduce improved package of practices of oilseeds with a view to increase its productivity and profitability in Balasore district of Odisha. 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 andalso to bridge the productivity gaps by enhancing the production.

MATERIALS AND METHODS

The present study was carried out by Krishi Vigyan Kendra, Balasore under sustainable agriculture practice (SAP) during *rabi*season of 2019-20 in the farmers field of

four villages (Gadasahi, Bishnupur, Nuagan, Nilakanthapur) of Balasore district. The demonstration was conducted on alluvial soils with low to medium fertility status and moderately acidic in soil reaction under rice-based cropping system. Soil organic carbon and available nitrogen was high, medium in available phosphorus and potassium whereas boron was below the critical limit (data need to be mentioned) During the study, total area of 70 ha was covered under frontline demonstration and the same area adjacent to the demonstration plot was kept as farmer's practices with active participation of 180nos. of farmers. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was given to the selected farmers regarding package of practices of toria. The improved technology (Table 1) included cultivation of Toria variety Uttara which has high yield potential (10 q/ha) and oil content (42%) with moderately resistant to white rust, downy and powdery mildew; seed treatment, timely sowing, line sowing, maintenance of optimum plant population, recommended fertilizer application, life saving irrigation, plant protection measures, etc. The sowing was done in the month of November with a spacing of 30 cm (R-R) x 10 cm (P-P) and the seed rate of toria was 8 kg ha-1. The soil test based dose of fertilizer applied in the demo plot was 50:30:25 kg $ha^{-1}$of N, P_2O_5 and K_2O respectively. Half dose of N and full dose of P_2O_5 and K_2O, Boron 1 @ kg/ha and Sulfur @ 30kg ha-1 were applied at the time of sowing and the remaining N was applied after thinning at 15-20 DAS. Post emergence herbicide Quizalofop ethyl 5% EC @ 0.75 kg ha-1 was applied at 20-25 DAS. The crops were harvested at physiological maturity stage with suitable method to avoid shattering of siliqua.

The yield of demonstration plot as well as local check were recorded using random crop cutting. Qualitative data was converted into quantitative form and expressed in terms of per cent increase in yield (NarasimhaRao et al., 2007) [7]. The extension gap, technological gap and technological index along with the benefit cost ratio were worked out (Samui et al., 2000) [8] as given below:

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmer's yield

Technology index = (Technology gap/potential yield) x 100

Standard agronomic practices were followed for cultivating the crop. Findings on different parameters like days to germination, growth and yield attributes were recordedand economic analysis was done. Three pickings were done and the final crop yield was recorded. The gross return was calculated on the basis of prevailing market price of the produce. Net return and benefit-cost ratio was calculated using the following formula:

Net return = Gross return (ha^{-1}) – Cost of cultivation (ha^{-1})

$$\text{Benefit Cost Ratio} = \frac{\text{Gross return (ha}^{-1})}{\text{Cost of cultivation (ha}^{-1})} \times 100$$

Statistical analysis of the recorded data was conducted by using the online computer program 'OPSTAT' developed by Sheoran et al., 1998. The results are presented at 5% level of significance (p = 0.05).

RESULTS AND DISCUSSION

Yield

Frontline demonstrations are effective extension tools fortransfer of latest technologies to boost the farmer's confidence & yield improvement. The performance of toria under frontline demonstration programme was assessed with adoption of improved technologies. Results (Table 2) revealed that the demonstration plot recorded 45.2 per cent increase in the yield (8.5q/ha) as compared to the farmers practice (5.9 q/ha). This may be attributed due to higher level of adoption and medium soil fertility status of the cluster. The higher yield of toria under improved technology was due to use of latest yielding varieties, integrated nutrient management and integrated pest management as per Table-1 & in corroboration with the findings of Veeramani*et al.*, 2017 and Ghosh*et al.*, 2019.

Technology Gap

The technology gap refers to the differences between potential yield and yield of demonstration plot. The technology gap of demonstration plots was 1.5 q/ha. The technology gap noticed may be due to dissimilarity in fertility status of soil, integrated crop management, protection measures and local weather variability.(Mentioned similar results with recent references)

Extension Gap

Extension gap means the differences between yield of demonstration plot and farmer yield. On an average extension gap of 2.6 q ha-1 was found in demonstration field. It emphasized the farmers to educate more through various extension programmes *i.e.*, frontline demonstration for adoption of improved production and protection technologies to minimize the range of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap and help in improving socio-economic condition of farmers as suggested by Mandal *et. al.*, 2020.

Technology Index

Technology Index refers the feasibility of the evolved technology in the farmers' field. Lower the value of technology index means higher the feasibility of the improved technology. It was observed that the mean technology index of 15 per cent was recorded in CFLD programmes under four clusters, which showed the efficacy of good performance of

technical interventions. This will accelerate the adoption of demonstrated technical intervention to enhance productivity in toria cultivation in rain fed areas.(Mentioned similar results with recent references)

Economic Return

The economic data (Table 4) reveals that the cost involved in the adoption of improved technology in toria varied and profitable almost twice. The cultivation of toria under improved technologies recorded the higher net return and B:C of Rs17,040/- per ha and 1.96 respectively as compared to farmers practice. Similar findings were reported by Mandi *et al.*(2020). The benefit cost ratio of demonstration plot under improved cultivation practices was higher than farmer's practices may be due to higher yield obtained from yielding variety Uttara under improved technologies compared to farmers practice. The same trend was observed by Mokidue*et. al.*(2011) and Anuratha*et. al*.(2019).

Conclusion

The study revealed that the wide gap between the demonstration and local check yield were observed due to technology & extension gaps. Due to the lack of awareness regarding improved technologies on INM & IPM, potential of toriacrop is not fully realized in Balasore district of Odisha. The productivity level gain and higher returnfrom CFLD plot over conventional practices created greater awareness and motivated other farmers to adopt improved production technology of toria in the Balasore district. Rewrite the conclusion part, based on your findings/surveyed and add feed back of farmers

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Table 1. Details of technologies followed for improved practices and farmer practices under FLD

Particulars	Technology interventions	Farmer's practices	% Gap
Variety	Uttara	Local Toria (Baliapal Rai)	**100**
Land Preparation	Ploughing and Levelling	Ploughing	**50**
Soil Testing	Grid based soil sample collected, tested & SHC issued	No soil testing	**100**
Weed Management	Post emergence use of Quizalofop-p-ethyl 5% EC @1ltr/ha Hand weeding at 15–20 DAS	No herbicide application No practice of hand weeding	**100**
Seed rate	8kg/ha	12kg/ha	**50**
Seed treatment	Vitavax Power@ 2g/kg seed	Carbendazim @ 2 g/kg seed	**50**
Time of sowing	1st Week of November	Mid November	50
Method of sowing	Line Sowing (Sowing crops in 30 cm rows and thinning at 15-20DAS	Broadcasting	100
Organic input application	FYM @ 2.5 t/ha	FYM@ 1.5t/ha	**67**
Fertilizer application	Soil test based fertilizer application $N:P_2O_5:K_2O$@50:30:25kg/ha (Farmers contribution)	Indiscriminate use of fertilizers without soil testing $N:P_2O_5:K_2O$@60:30:30kg/ha	**25**
Micronutrient application	Foliar application Boron (10.5%) @ 1.25kg/ha	No micronutrient applied	**100**
Irrigation	2Nos. Life-saving Irrigation at critical growth stages	Rainfed	**50**

Pest population monitoring	Installation of pheromone trap@ 5nos./ha for monitoring of Spodoptera population	No pheromone trap use	**100**
Plant Protection	Application of Flonicamid 50 WG@ 0.3g/ltr for Aphid, EmamectinBenzoate 5%SG @ 0.4g/ltrfor spodoptera pod borer &Hexaconazole 5%@ 2ml/ltr for stem rot& leaf spot management	Application of Profenophos 50 EC@2ml/ltr for pod borer &Carbendazim 50WP@ 1g/ltr for stem rot by some progressive farmers only	**50**
Harvesting	Physiological maturity stage toavoid shattering	Harvestmaturity	**50**

Table.2 Effect of improved production technology on yield of Toria

Cluster No.	Village	Demo (Nos.)	Area (ha)	Yield (q/ha)				Increase in yield over local check (%)
				Demonstration Yield			Traditional practice	
				High	Low	Average	Local check	
I	Gadasahi	57	16.0	9.42	7.61	8.52	5.75	48.2
II	Nuagan	33	14.0	9.25	7.86	8.56	5.82	47.1
III	Bishnupur	60	20.0	9.19	7.82	8.51	5.91	44.0
IV	Nilakanthapur	30	20.0	9.13	7.67	8.40	5.94	41.4
Mean				**9.2**	**7.7**	**8.5**	**5.9**	**45.2**

Table 3: Economic impact of improved technology (IT) on toria over farmers practice (FP) in Balasore district, Odisha

Cluster No.	Village	Cost of Cultivation (Rs/ha)		Gross Return (q/ha)		Net return (Rs/ha)		BC Ratio		Additional Net return over FP (Rs/ha)
		Demo	Check	Demo	Check	Demo	Check	Demo	Check	
I	Gadasahi	17700	14800	34932	23000	17232	8200	1.97	1.55	9032
II	Nuagan	17950	15300	35096	23280	17146	7980	1.96	1.52	9166
III	Bishnupur	17800	14700	34891	23640	17091	8940	1.96	1.61	8151
IV	Nilakanthapur	17750	15200	34440	23760	16690	8560	1.94	1.56	8130
Mean		**17800**	**15000**	**34840**	**23420**	**17040**	**8420**	**1.96**	**1.56**	**8620**

Table 4: Yield gaps analysis of cluster frontline demonstrations (CFLDs) on Toria in Balasore district, Odisha

Cluster No.	Village	Potential Yield (q/ha)	Demonstration Yield (q/ha)	Farmer's Practice (q/ha)	Technology gap (TG) (q/ha)	Extension Gap (EG) (q/ha)	Technology Index (TI) (%)
I	Gadasahi	10	8.52	5.75	1.48	2.77	14.8
II	Nuagan	10	8.56	5.82	1.44	2.74	14.4
III	Bishnupur	10	8.51	5.91	1.49	2.60	14.9
IV	Nilakanthapur	10	8.40	5.94	1.60	2.46	16.0

Mean	**10.0**	**8.5**	**5.9**	**1.5**	**2.6**	**15.0**

Fig 1. Toria is at flowering stage

Fig 2. Toria is at harvesting stage

Fig 3. Successful farmer of CFLD Toria 2019-20