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Productivity enhancement of Toria in rice fallow: A success story of cluster front line demonstration in Dimapur district of Nagaland

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Abstract

Cluster Front Line Demonstration (CFLD) on toria was conducted by Krishi Vigyan Kendra (KVK), Dimapur District, Nagaland in seven villages *viz.*, Hakhizhe, Hovishe, Kiyezu-A, Khehoi, Toshiho, Viyito and Yevetoh for two consecutive years from 2021-22 and 2022-23. A total of 190 interested farmers were selected under CFLD for 100 hectares demonstration of toria variety TS-67 with recommended package of practices. The yield data of demonstration package and farmers practice were recorded and undertook the yield gap analysis. The results revealed that the average yield of toria under demonstration package was 8.42 q/ha against 6.09 q/ha of farmers practice. Hence, the average yield increase was recorded as 38.28 percent. The average technology gap, extension gap and technology index were found to be 1.58 q/ha, 2.33 q/ha and 15.85 percent respectively. An average net return of ₹ 19,227.00 per ha was recorded under demonstration package against ₹ 9394.00 per ha under farmers practice. Therefore, the results indicated that the use of improved varieties with recommended package of practices under contribute to the increase in productivity of toria in Dimapur District, Nagaland.

Keywords: Toria, rice fallow, cluster front line demonstration

Introduction

Oilseed crops have an important position in Indian agricultural economy. India is known as the fourth largest oilseed economy in the World. Among the seven edible oilseed crops cultivated in India, rapeseed and mustard contribute 28.6 percent of the total oilseed production and it is second most important oilseed after groundnut sharing 27.8 percent in the India's oilseed economy (Shekhawat *et al.*, 2012) [6]. In terms of acreage, oilseeds occupy 14.1 percent and rapeseed-mustard alone occupies 3 percent of the total cropped area in the country. The total rapeseed and mustard cultivated area, production and productivity in India during 2021-22 were 8.06 million hectares, 11.75 million tonnes and 1458 kg ha⁻¹ respectively (Anonymous, 2022) [1]. In the context of Nagaland, rapeseed and mustard occupy an area of 27,510 ha with a production of 28,060 tonnes and productivity of 1019 kg ha⁻¹ during 2020-21 (Nagaland statistical handbook, 2022) which is 43.08 percent productivity lower than that of the national average. The major reasons for low productivity are poor knowledge of the newly released crop varieties and their package of production practices e.g. seed rate, weed management, nutrient management, plant protection measures, etc. in farmers field.

The aim of the Cluster Front Line Demonstration (CFLD) is to convey the technical message to farmers that if they use proper varieties with recommended package of production practices then the yield of this crop can easily be increased considerably than their present level (Singh *et al.*, 2019) [3]. Keeping the above facts in view, the CFLD on toria was conducted to enhance the productivity and production of oilseed crop by utilizing improved variety TS-67 with recommended package of practices for growing a good crop of toria in farmers field.

Materials and Methods

Krishi Vigyan Kendra (KVK) Dimapur District, Nagaland conducted Cluster Front Line Demonstration (CFLD) on toria variety TS-67 with recommended package of practices under rainfed conditions during *rabi* season of 2021-22 and 2022-23 at seven different villages of Dimapur district, Nagaland *viz.*, Hakhizhe, Hovishe, Kiyezu-A, Khehoi, Toshiho, Viyito and Yevetoh under National Mission on Oilseeds and oil Palm (NMOOP).

A total of 75 and 115 numbers of interested farmers were selected under CFLD for demonstration of toria variety TS-67 with recommended package of practices (Table 1) in 50 ha and 50 ha during 2021-22 and 2022-23 respectively. In case of farmers practice, the traditional practices were followed by using existing farmers variety M-27. Toria was sown as second crop in residual soil moisture just after harvest of lowland rice during the second fortnight of October to second fortnight of November. The soil of farmers field was sandy loam in texture, low in organic carbon, low in available N and K with medium P content and pH 5.1. The selected farmers under the CFLD were guided by KVK scientists in performing field operations like land preparation, seed rate, sowing time, nutrient management, weed management, soil water management, plant protection, harvesting, threshing, storage, etc. The traditional production practices were followed in case of farmers practice. The data were collected both from demonstration plots as well as control plots (farmers practice) for both the years and finally the extension gap, technology gap, technology index and economics of production were worked out (Samui *et al.*, 2000) [4] as given below.

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmer's yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}}$$

B: C ratio= Gross return: Cost of cultivation expressed in term of unit.

Results and discussion

The results of the CFLD conducted at farmers field during two consecutive year 2021-22 and 2022-23 revealed that the yield of toria variety TS-67 with recommended package of practices was substantially higher than that of the farmers variety M-27 with traditional practices (Table 2). The mean yield of different demonstration plots during the year 2021-22 and 2022-23 were recorded as 8.29 q/ha and 8.54 q/ha for the toria variety TS-67 with recommended package of practices as against 6.05 q/ha and 6.12 q/ha for the farmers variety M-27 with traditional practices respectively. Hence, the average increase of yield by toria variety TS-67 with recommended package of practices was 38.28 percent over farmers variety M-27 with traditional practices. The results were in conformity with the findings of Sarma *et al.*, 2014 [5], Kumar *et al.*, 2020 [8] and Amonge *et al.*, 2021 [7]. The higher yield of toria under demonstration plots may be due to the utilization of improved variety along with recommended package of production practices. Whereas, the poor productivity in

farmers field may be due to the utilization of farmers variety with traditional practices. The result clearly depicted the positive effect of demonstration package over the farmers practice towards enhancing the yield of toria in Dimapur District.

Technology gap

Technology gap means the differences between potential yield and demonstration yield. The technology gap was recorded as 1.71 q/ha and 1.46 q/ha during the years 2021-22 and 2022-23 respectively. The average technology gap was estimated as 1.58 q/ha. The difference of technology gap noticed in different years may be due to dissimilarity in environmental parameters of different years under study.

Extension gap

Extension gap means the differences between demonstration yield and farmers yield. The extension gap was recorded as 2.24 q/ha and 2.42 q/ha during the year 2021-22 and 2022-23 respectively. An average extension gap was estimated as 2.33 q/ha and therefore, emphasized the need to educate the farmers through various extension means for adoption of improved toria production technologies to bridge the extension gap.

Technology index

Technology Index indicates the feasibility of the evolved technology in the farmers field. Lower the value of technology index means higher the feasibility of the improved technology. The technology index was recorded as 17.1 percent and 14.6 percent during the year 2021-22 and 2022-23 respectively. An average technology index was estimated as 15.85 percent in the CFLD programme and therefore showed the possibilities of further increase in yield performance through technological intervention.

Economics of Cluster Front Line Demonstration (CFLD) vs Farmers practice

The average gross and net returns of toria production under CFLD for two years i.e. 2021-22 and 2022-23 were estimated as ₹42,916.00 and ₹ 19,227.00 per ha for demonstration package and ₹31,034.00 and ₹ 9,394.00 per ha for farmers practice respectively (Table 3). The average Benefit: Cost (B: C) ratio of demonstration package and farmers practice were 1.81:1 and 1.43:1 respectively (Table 3). The higher B: C ratio of demonstration package over the farmers practice might be due to the utilization of improved toria variety TS-67 with recommended package of practices against the farmers variety M-27 with traditional practices.

Table 1: Comparison of demonstration package and farmers practice under CFLD on toria

Particulars	Demonstration package	Farmer's practices
Variety	TS-67	M-27
Seed rate	8 kg/ha	10 kg/ha
Sowing method	Broadcasting	Broadcasting
Seed treatment	Azotobacter @ 20g/kg seed and PSB @ 20 g/kg seed	No seed treatment
Sowing time	Second fortnight of October to second fortnight of November	Second fortnight of October to the second fortnight of November
Fertilizers doses	FYM or compost @ 2 ton/ha, 40:35:15 kg NPK /ha as basal application and micronutrient liquid fertilizer sulphur as foliar spray @ 2.5 ml/l water at 20 & 40 DAS.	Improper use of balance fertilizers
Weeding	One hand weeding	No weeding
Plant protection	Neem oil and Yellow sticky trap	No plant protection

Table 2: Year-wise grain yield and yield gap analysis of Cluster Front Line Demonstrations on toria

Year	No. of demo	Area (ha)	Potential yield	Demo yield q/ha	Farmer's yield q/ha	Increase yield (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2021-22	75	50	10	8.29	6.05	37.02	1.71	2.24	17.1
2022-23	110	50	10	8.54	6.12	39.54	1.46	2.42	14.6
Average	-	-	10.0	8.42	6.09	38.28	1.58	2.33	15.85

Table 3: Economic Analysis of Cluster Front Line Demonstrations on toria

Year	Cost of cultivation (₹/ha)		Gross return (₹/ha)		Net return (₹/ha)		B:C ratio	
	Demo plot	Farmer's practice	Demo plot	Farmer's practice	Demo plot	Farmer's practice	Demo plot	Farmer's practice
2021-2022	23690	21640	42279	30855	18589	9215	1.78:1	1.42:1
2022-2023	23690	21640	43554	31212	19864	9572	1.83:1	1.44:1
Average	23690	22640	42916	31034	19227	9394	1.81:1	1.43:1



Training cum input distribution Programme under CFLD Rabi oilseeds

Biofertilizer application as a seed treatment



Multiplex sulphur foliar application at 20 and 40 DAS Demonstration plot at farmers field



Demonstration plot at farmers field

Scientist visit to farmers' field with ATMA Dimapur

Farmers scientist interaction

		
Field day on Toria with ATMA Staffs	Harvested Toria for threshing	Packed in gunny bags for sale on market

Conclusion

The average yield of toria increased by 38.28 percent over the farmers practice by adopting improved toria variety TS-67 with recommended package of practices. Economic analysis revealed that the average net return of ₹ 19,227.00 per ha was obtainable with recommended practices under CFLD. Further, by adopting such a demonstration package, the B: C ratio of toria production is achievable as high as 1.81:1.

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