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**Mary Sadhana Sarma**
Subject Matter Specialist (PBG), KVK, Darrang, Assam, India

**Ipsita Ojha**
Subject Matter Specialist, Soil Science, KVK, Darrang, Assam, India

**Amrita Khound**
Subject Matter Specialist, Department of Horticulture, KVK, Darrang, Assam, India

**Bipul Kr. Das**
Subject Matter Specialist, Department of Plant Protection, KVK, Darrang, Assam, India

**Abdul Hafiz**
Senior Scientist & Head, KVK, Darrang, Assam, India

**Corresponding Author:**
**Mary Sadhana Sarma**
Subject Matter Specialist (PBG), KVK, Darrang, Assam, India

# Yield enhancement of toria through cluster frontline demonstration in Darrang district of Assam

**Mary Sadhana Sarma, Ipsita Ojha, Amrita Khound, Bipul Kr. Das and Abdul Hafiz**

**Abstract**
Toria (*Brassica campestris*) is the most important rabi oilseed crop grown in different parts of Darrang district covering around 18267 ha of land and mostly grown after harvest of Sali paddy. Although it is a major oilseed crop, there are some lacuna in the cultivation of toria such as non-availability of high yielding varieties, non-adoption of new technology, its productivity (5.5 q/ha) is far below the average national productivity (9.7 q/ha) and state average of 6.5 q/ha. Keeping this point in view, Krishi Vigyan Kendra Darrang had conducted Cluster Frontline demonstration (CFLD) on improved technologies and high yielding variety TS-38 at 50ha & 30ha of land covering 122 framers'& 78 farmer's fields of Darrang district during Rabi season of 2022-23 and 2023-24 respectively. Improved crop management practices recorded the highest mean seed yield of 9.1 q ha-1 and 9.8 which was 35.36 and 36.11 per cent higher than the yield obtained with farmers practice (6.4 q $ha^{-1}$) & (7.2q $ha^{-1}$) in the year 2022-23 & 2023-24 respectively. The average technology gap was recorded 0.9 q/ha and 0.2 q/ha in case of Toria var. TS 38 in 2022-23 & 2023-24 respectively while average extension gap was recorded 2.7 q/ha and 2.6 q/ha. Average technology index of toria var. TS-38 was recorded 9 and 2 percent respectively. Due to adoption of improved package of practices, demonstration plots recorded higher average seed yield over local check.

**Keywords:** Cluster frontline demonstration, toria, yield, enrichment, yield gap

## 1. Introduction
In the perspective of the agricultural economy in India, oilseed crops have an important role and are considered as the second most important determinant crop next to cereals. India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in area (5.76 m ha) and second in production (6.82 m tonnes) after China. The self-sufficiency in oilseeds attained through "Yellow Revolution" during early 1990's, could not be sustained beyond a short period. Rapeseed-mustard (*Brassica spp*.) is the third largest vegetable oilseed crop in the world after soybean and palm oil. India is also one of the largest importers of vegetable oils today. There is a spurt in the vegetable oil consumption in recent years in respect of both edible as well as industrial usages.

Among the seven annual edible oilseeds cultivated in India, rapeseed-mustard contributed 28.6 percent in the total production of oilseeds. It is a wonder crop which could be grown from sea level to the snowline. Toria is mostly grown as rainfed crop in NE India. Farmers of the region prefer short duration oilseed crop (Borah and Sharma, 2005) [1] like toria as the region receives early pre-monsoon rainfall. Darrang district of Assam has a sizeable area under rapeseed-mustard cultivation with area 18267 ha and production and 13608.93 MT and productivity of 745 kg $ha^{-1}$ (DAO, Darrang, 2021-2022). Productivity of the crop is lower in farmer's field due to several constraints. One of the major constraints for such low yield is the non-availability of high yielding varieties. Besides that, faulty sowing practices, improper crop geometry, indiscriminate use of fertilizers, other intercultural operations (Tiwari *et al*., 2017) [4], lack of water management and climatic variability are predominant reasons for limiting the potential yield of the crop. Keeping in view the present investigation attempts to study the yield gap between cluster front line demonstration technology and farmers yield, extent of technology adoption and benefit cost ratio.

## 2. Materials and Methods
The study was carried out during rabi season on 2022-23 and 2023-24 by Krishi Vigyan Kendra, Darrang, Assam Agricultural University.

The demonstrations were being conducted in farmers' field at 17 different villages of Darrang district during 2022-23 and in 13 villages in the year 2023-24. District Darrang comes under North Bank Plain agro climatic zone of Assam. The soil of the district ranges from old alluvial to new alluvial type. The soil is sandy to sandy loam in texture and acidic in reaction and is characterized by medium to high organic carbon, low to medium phosphorus and potash content.

During the study, total area of 50 ha & 30 ha was covered under cluster frontline demonstration and the same area adjacent to the demonstration plot was kept as farmer's practices with active participation of 122 & 78 farmers during 2022-23 & 2023-24 respectively. Before conducting CFLDs, 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 demonstrated (Table no. 01) in the district included cultivation of high yielding toria variety TS-38. It is short duration toria variety (90-95days) 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, lifesaving irrigation, plant protection measures, etc.

The need based inputs were supplied to the selected farmers and proper monitoring of the demonstration plots by KVK Scientists ensure proper guidance to the farmers. The sowing was done during mid-October-mid November under rain fed condition every year. The details of the technology interventions and farmer's practice were mentioned in Table no. 01. 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 (0.55 q $ha^{-1}$). 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.

The extension gap, technological gap and technological index along with the benefit cost ratio were worked out (Samui *et al*., 2000) [3] as given below:

Technology gap = Potential yield-Demonstration yield

Extension gap = Demonstration yield-Farmer's yield

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

**Table 1:** Details of technology followed in the demonstration

| Particulars | Technology interventions | Farmer's practices | Technology gap |
|---|---|---|---|
| Farming situation | Rainfed medium land | Rainfed medium land | No gap |
| Time of sowing | Mid November | 1st part of December | Partial gap |
| Method of sowing | Line-sowing | Broadcasting | Full gap |
| Seed rate (kg $ha^{-1}$) | 10 | 12 | Full gap |
| Variety | TS-38 | Local | Full gap |
| Manures & fertilizer | 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 | Farmers practice | Full gap |

## 3. Results and Discussion

### 3.1 Yield

Improved crop management practices recorded the highest mean seed yield of 9.1 q ha-1 which was 35.36per cent higher than the yield obtained with farmers practice (6.4 q $ha^{-1}$) in the year 2022-23 and in the next year mean seed yield recorded was 9.8 q $ha^{-1}$ which is 36.11 percent higher than the farmers practice (7.2q $ha^{-1}$). From the results it is observed that the demonstrated plot out yield the farmers practice under same farming situation. The poor productivity in farmers practice might be mainly due to factors like use of non-descript local variety, late sowing owing to late vacation of field after harvesting of medium to long duration winter paddy and low level of agronomic management in addition to non-availability of resources in time. The result clearly depicts the positive effects of demonstrations over the existing practices towards enhancing the yield of toria in Darrang district

**Table 2:** Influence of CFLD yield, technology gap, extension gap, technology index in toria variety TS-38

| Year | Potential yield (qha$^{-1}$) | CFLD (qha$^{-1}$) | FP (qha$^{-1}$) | Percent **increase in yield over check** | Tech gap (qha$^{-1}$) | Extension gap (qha$^{-1}$) | Technology index (%) |
|---|---|---|---|---|---|---|---|
| 2022-23 | 10 | 9.1 | 6.4 | 35.36 | 0.9 | 2.7 | 9 |
| 2023-24 | 10 | 9.8 | 7.2 | 36.11 | 0.2 | 2.6 | 2 |
| Mean | - | 9.45 | 6.8 | 35.74 | 0.55 | 2.65 | 5.5 |

### 3.2 Technology Gap

In the present study, technology gap is recorded to be 0.9 $qha^{-1}$ and 0.2 $qha^{-1}$ in the two subsequent year respectively. Technology gap noticed in this study is due to weather parameter, use of high yielding variety, use of recommended doses of fertilizer and plant protection measures.

### 3.4 Extension Gap

Extension gap is gap between yield of demonstrated plot and farmers practice. Extension gap is recorded to be 2.7 $qha^{-1}$ & 2.6 $qha^{-1}$ respectively which is solely due to non-adoption of high yielding varieties and delayed sowing (1st week of December).

### 3.5 Technology Index

Technology index indicates the feasibility of the evolved technology in the farmers' field. The lower value of technology index, higher is the feasibility of the improved technology. It was observed that the mean technology index of 9 per cent & 2 percent was recorded in CFLD programmes under the clusters, which showed the efficacy of good performance of technical interventions.

### 3.6 Other Morphological Traits

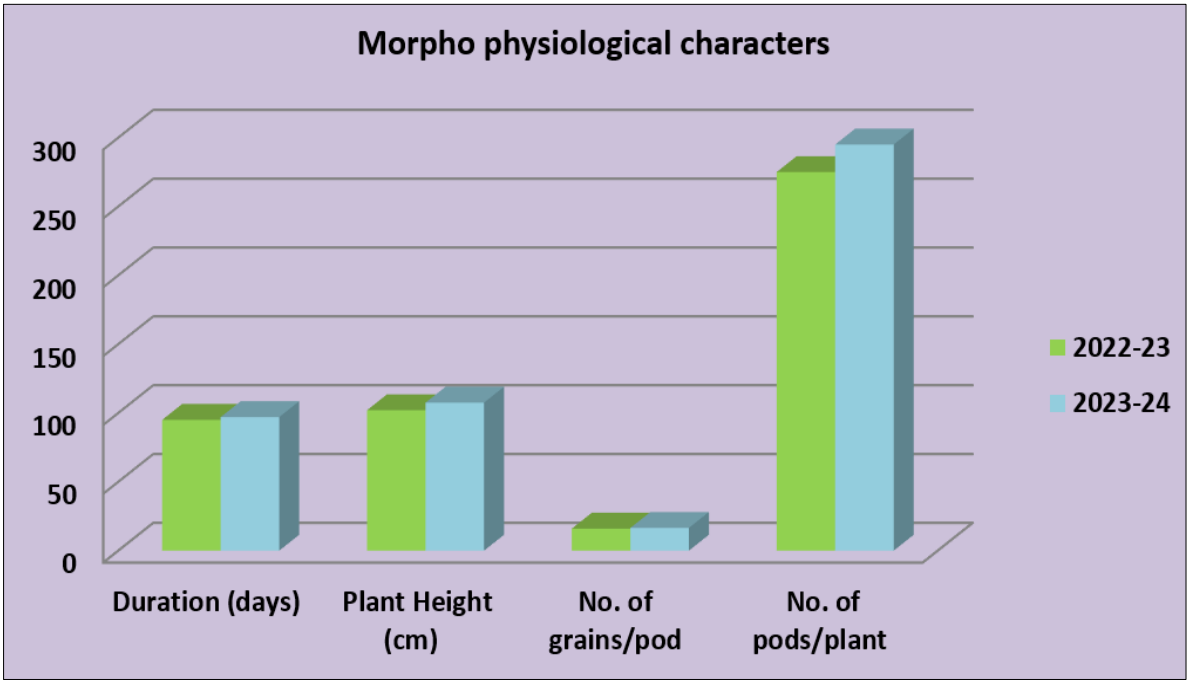


**Fig 1:** Chart representing morphological characters

**Table 3:** Morpho physiological characters of Toria variety TS-38 under CFLD programme for the year 2022-23 & 2023-24.

| Year | Date of sowing | Date of harvesting | Duration (days) | Plant Height (cm) | No of grains/pod | No of pods/plant |
|---|---|---|---|---|---|---|
| 2022-23 | 06.11.2022 | 11.02.2023 | 95 | 102 | 16 | 275 |
| 2023-24 | 13.11.2023 | 20.02.2024 | 97 | 107.5 | 16.5 | 295 |

### 4. Economics of the study

The details of economics of toria cultivation have been presented in Table 4. The gross cost involved in the demonstration plot during 2022-23 is recorded to be Rs. 17000.00 as compared to Rs. 16500.00 under farmers plot and during the year 2023-24 it is Rs.19100.00 for demonstration plot and Rs.18750.00 for farmers plot.

The gross return, net return and B.C ratio of the study for the last two years is recorded to be Rs. 36400.00,Rs. 19400.00, 2.11(2022-23) & Rs. 55,370.00, Rs. 36,270.00 & 2.89(2023-24) respectively. While in farmers plot the results obtained are Gross return (Rs. 25,600.00), Net return (Rs. 9100.00), B:C ratio 1.55 (2022-23) and Gross return Rs. 40680.00, Net return Rs. 21,930.00 and B:C ratio 2.16 for the year 2023-24.(Table no. 04)

If we look at the economic part, beneficiary farmers were more profit making as compared to the non-beneficiaries which indicates that incorporation of scientific farm technology practices along with active participation of farmers had positive effect on increasing the yield and economic return which in turn will help to motivate the other farmers towards adoption of technologies demonstrated at farmer's field.

**Table 4:** Economics of rapeseed-mustard under CFLD on Toria var. TS 38 vs farmers practice

| Year | Area | No. of demo | Cost of Cultivation (Rs ha$^{-1}$) | | Gross Return (Rs ha$^{-1}$) | | Net Return (Rs ha$^{-1}$) | | B.C ratio | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | CFLD | FP | CFLD | FP | CFLD | FP | CFLD | FP |
| 2022-23 | 50 | 122 | 17000.00 | 16500.00 | 36400.00 | 25,600.00 | 19400.00 | 9100.00 | 2.11 | 1.55 |
| 2023-24 | 30 | 78 | 19,100.00 | 18,750.00 | 55,370.00 | 40680.00 | 36,270.00 | 21,930.00 | 2.89 | 2.16 |


**Fig 2:** Action Photographs of Demonstration, Training and Field Day on CFLD Oilseeds (Toria var. TS-38)

## 5. Conclusion

It is concluded from the study that there exist a wide gap between the potential and demonstrated yield in mustard mainly due to technology and extension gaps and also due to the lack of awareness about the technology of mustard in Darrang district. Based on the analysis of two years data on CFLDs conducted by KVK, Darrang, the results indicated that the CFLDs has given a positive and significant impact over the farming community as they were motivated by the new agricultural technologies applied in the demonstrations which were superior in every aspect compared to existing practices.

## 6. Acknowledgement

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