

Augmenting farmers' income through participatory seed production of toria in NEH region

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Toria is one of the most important oilseed crop that has been cultivated immediately after the harvest of kharif rice in rainfed areas to enable efficient utilization of residual soil moisture for enhancing the cropping intensity of the Nagaland state. The productivity of the crop is lower in the farmer's field due to non-adoption of improved varieties, timely unavailability of quality seed, water scarcity in rabi. Training on participatory seed production of toria was imparted and a field day was organized involving 30 farmers' of different villages of Dimapur district during the rabi season of 2021-22. Farmers were encouraged to adopt and cultivate TS-67 toria variety due to its high yield and short duration, making it an ideal rabi season crop immediately after harvesting lowland rice and continue the participatory seed production. The proper dissemination of scientific cultivation practices along with seed production techniques has increased the yield by 53.22% (9.5 q/ha) leading to a benefit-cost ratio of 2.5:1 over farmers' practice (1.8:1). This adoption has increased cropping intensity, boosted oilseed production and improved farmers' income and livelihoods.

Keywords: Farm income, Nagaland, Participatory seed production, Toria, Training

In India, annual oilseeds are grown on an area of 28.79 million hectares, with a production of 36.10 million tonnes. In contrast, in North East India, oilseeds are cultivated in an area of 0.67 million hectares with a production of 0.42 million tonnes. Among the different oilseed crops, soybean, rapeseed-mustard and groundnut account for about 80% of the area and 88% of oilseed production in the country. In the North East, rapeseed, mustard, and soybean contribute over 90% of total oilseed production. From 2016 to 2021, India's oilseed production increased by almost 43%, yet its production still lags behind consumption needs. India is the world's second-largest consumer and number-one importer of vegetable oil. India's cooking oil imports are projected to grow at a high growth rate of 3.4% per annum till 2030, unable to keep pace with the per capita demand growth of approximately 6%. This increase is driven by higher per

capita consumption (18 kg oil per annum) due to population growth and enhanced per capita incomes. In India, average yields of most oilseeds are extremely low as compared to those of other countries of the world, necessitating an increase in production and productivity. Oilseed production in the Northeast is low due to the non-availability of quality seed, water scarcity during the rabi season and short time lag after the rice crops harvest.

In Nagaland, toria is the most important oilseed crop, cultivated in an area of 27,490 hectares with a production of 27,820 tonnes and productivity of 1,013 kg per hectare. Most of the Nagaland farmers use their own saved seeds of local landraces for sowing the next crop, which has lower productivity as compared to high-yielding varieties (HYV), leading to reduced oilseed production in the state. Quality seed is a vital input in crop production



Visit of the Director (NRC on Mithun) and the Joint Director (ICAR Nagaland Centre) to the seed production field of the toria TS-67 variety

and plays a key role in agriculture progress. The genetic yield potential of a crop can be fully realized only by the use of quality seed material of a suitable HYV. It is estimated that good quality of improved varieties can contribute about a 20-25% increase in yield. Quality seed of suitable toria variety (TS-67) is not available in the state. This necessitates the quality seed production of toria in the state to ensure a sufficient amount of seed availability on time, which will assist in the improvement of the production and productivity of the toria for achieving the oilseed security of the state. ICAR Nagaland Centre has been promoting seed production and popularizing improved varieties of major crops among the farmers through a participatory seed production programme.

Background information on seed production in the region

Seed is a vital input for realizing the potential yield of any crop, and the consistent availability of quality seed is a prerequisite for a successful and sustainable production. Ensuring seed quality is vital to meet the expectations of both farmers and consumers. The advantages of agricultural research can only be fully achieved if farmers have access to high-quality seeds of new crop varieties. The farmers in the region are generally unaware of the improved varieties of toria and usually use the local varieties which are shared among themselves, which leads to a poor seed replacement rate in the state. Although there is a

high demand for improved varieties of toria seed among the farmers in Nagaland, however challenges such as timely availability and shortage of these seeds in the market persist. The landholding is mostly small and marginal, for which multiplication of quality seed material is a challenging task. To address this issue, a cluster approach, in a participatory mode among the farmers appears to be a viable solution for producing and enhancing the availability of quality seed in the region.

Intervention made by ICAR, Nagaland Centre

To enhance the availability of quality seeds to farmers suitable for this region, a farmers' participatory seed production programme was conceptualized among the interested stakeholders. Dhansiripar village, a low-lying plain area in the foothills of the Chumoukedima district of Nagaland was selected for this programme during the year 2021. The centre facilitated this initiative by providing technical backstopping and distributing an improved variety of toria TS-67 seeds. TS-67 is a popular high-yielding toria variety developed by Regional Agricultural Research Station (RARS), Jorhat. The maturity duration of the TS-67 variety is 90 days and suitable for the late sowing up to 1st week of December. The oil content of the toria seed ranges from 40-42%, with a yield potential of 10-12 q/ha under timely sown conditions. Farmers' skills were honed through various practices of training and demonstrations at the field level especially maintenance of

genetic purity through maintaining isolation distance, roguing and continuous monitoring of various package of practices viz., weed management, insect and disease management, in addition to harvesting at physiological maturity stage, segregated threshing and post-harvest handling of the toria seed.

The ICAR Nagaland Centre and KVK Dimapur imparted training on participatory quality toria seed production on 26th October 2021, at Dhansiripar village. During this training, the farmers were trained about the identification of off-type plants and their removal before flowering (roguing), maintenance of an isolation distance of 50 meters from other varieties of toria, seed treatment, timely removal of weeds, integrated nutrient management, phytosanitary management practices, improved cultural practices such as the importance of line sowing, with a spacing of 30 × 30 cm between rows and 10 × 10 cm among plants in a row to avoid pest and disease infestations. The farmers were provided with 200 kg seed of TS-67 toria variety to cover an area of 40 hectares. Inspection and monitoring of the seed production fields were conducted regularly before flowering and during flowering stages, by instructing farmers to remove off-type and unwanted plants in the fields. Approximately 300 quintals of quality toria seeds were harvested from the farmers' field. During the maturity stage, ICAR Nagaland Centre in association with KVK Dimapur conducted a field day for popularization of 'participatory toria seed production' in other parts of the state, with a total of 38 farmers participating in the programme from Dhansiripar and its neighbouring villages. The centre also acted as a catalyst for marketing of the seeds to various stakeholders such as state agricultural department agencies, NGOs, and progressive farmers. The details of seed production technology disseminated to farmers are given in Table 1.

The economics of seed production



Popularization of toria TS-67 variety in Dhansiripar village of Dimapur (Nagaland)

Table 1. Package of seed production of toria

Particular	Demonstration
Variety	TS 67
Farming situation	Rainfed medium land
Planting spacing	30 × 10 cm
Time of sowing	Mid-November
Isolation distance with other varieties of toria	50 meter
Seed rate	5 kg/ha
Seed treatment	Metalaxyl 35 WS @ 6 g/kg of seeds
Nutrient management	Nitrogen (N): Phosphorus (P): Potash (K) @ 40:35:15 kg/ha + compost @ 5 q/ha Split application of fertilizers: Half dose of Nitrogen (Urea) + Full dose of phosphorus (SSP) + a full dose of K (MOP) was applied as basal dose and the remaining dose of N was applied at 30 DAS
Disease and pest management	Apply Dimethoate 30 EC @ 0.5 L/ha against aphid Mancozeb @ 0.2% for Alternaria blight
Duration	90 days



Training on participatory toria seed production in Dhansiripar village (Dimapur)



Field day on participatory toria seed production in Dhansiripar village (Dimapur)

per hectare (average) in the farmers' field is given Table 2.

The proper dissemination of scientific cultivation practices has increased the yield by 53.22% (9.5 q/ha) coupled with farmers' 'participatory seed production'

leading to a benefit-cost ratio of 2.5:1 over farmers' practice (1.8:1). An additional net income of ₹ 27,131 per hectare was obtained through scientific seed production.

Table 2. Economics of seed production

Item	Before ICAR intervention			After ICAR intervention		
	Quantity (kg)	Rate ₹	Total amount ₹	Quantity (kg)	Rate ₹	Total amount ₹
Land preparation		70	7800			7800
Seed cost (kg)	12.5		875	5	90	450
Compost (q)				5000	4	2000
Urea (kg)		No application		87	12	1044
SSP (kg)				220	20	4400
MOP (kg)		30		25	30	750
DAP (kg)	50		1500			
Weedicide and pesticide		350				800
Labour (Field cleaning, sowing, harvesting, threshing) (days)	20		7000	28	350	9800
Total cost			17175			26244
seed yield (kg)	-	50		750	80	60000
grain yield (kg)	620		31000	200	40	8000
Cost-benefit ratio			1.8:1			2.5:1

SUMMARY

The demonstration of TS-67 toria variety by ICAR Nagaland Centre, along with its good field performance, received a positive response and led to its adoption in the subsequent years. Farmers were encouraged to adopt and cultivate TS-67 toria variety for participatory seed production due to its high yielding and short duration, making it an ideal *rabi* season crop immediately after harvesting lowland rice. This adoption has increased cropping intensity, boosted oilseed production and improved farmers' income and livelihoods.

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