

Enhancing sesame cultivation in Nagaland: A success story of agricultural innovation and farmer's empowerment

Harendra Verma^{1*}, Shisamen Pongen¹, Md. A. Aziz Qureshi² and H. Kalita¹

¹ICAR Research Complex for NEH Region, Nagaland Centre, Medziphema, Nagaland 797 106

²ICAR-Indian Institute of Oilseeds Research, Rajendranagar, Hyderabad, Telangana 500 030

To address low productivity in sesame caused by poor seed quality and underutilised summer fallows, ICAR Research Complex for NEH Region, Nagaland Centre identified Amrit and Prachi as ideal high-yielding, short-duration varieties. Through targeted capacity-building and adoption of improved management practices, farmers successfully integrated these cultivars into their zaid/summer seasons. The introduction of local oil extraction and processing further transformed the crop's profitability, boosting the benefit-cost (B:C) ratio from 1.37 to 4.83. This initiative has effectively revitalised sesame farming and increased cropping intensity and rural incomes.

Keywords: Farmers' empowerment, Nagaland, Oil extraction, Sesame, Success story

SESAME (*Sesamum indicum* L.), referred to as the 'Queen of Oilseeds', is renowned for its stability and high-quality oil content. The seeds, which contain approximately 44–55% oil, are valued for its unique flavour and health-promoting properties, largely attributed to natural antioxidants such as sesamin and sesamolin. The oil is widely used in manufacturing soaps, paints, perfumes, pharmaceuticals, and insecticides. Additionally, sesame meal serves as a high-quality protein feed (40%) for poultry and livestock.

Sesame holds substantial cultural, culinary, and agricultural significance in Nagaland, and is one of the important oilseed crops in the North-East (NE) region. It is a staple in local cuisines and traditional dishes and plays a vital role in the NE region's agriculture, supporting the livelihoods of many farmers. In 2020-21, the region cultivated a total of 3,750 hectares of sesame with a production of 2,320 tonnes. Sesame oil is extensively used in cooking as well as traditional medicine in the region. Beyond its economic impact, sesame cultivation exemplifies sustainable farming practices, thriving in the region's diverse agro-climatic conditions. This



Breeder seed production of sesame var. Amrit at ICAR Research Farm during *kharif*, 2021-22

versatile crop not only enhances local economies and generates employment opportunities, but also has the potential for expanded trade and export activities.

Nagaland has immense scope for oilseed crops like sesame, but are hindered by several production constraints, with key issues including lack of improved cultivars, an inadequate supply of high-quality seeds, inputs, and poor cultivation practices.

Additionally, sesame cultivation demands significant labour and time investment, especially during the harvesting and post-harvest stages, which can be challenging for small-scale farmers with limited resources.

Interventions made by ICAR Research Complex for NEH Region Nagaland centre

The ICAR Nagaland Centre, has identified Amrit and Prachi, as the two promising sesame varieties that are suitable for the region through

Table 1. Evaluation of 10 sesame varieties at ICAR, Nagaland Centre during 2021-22

Varieties	Plant height (cm)	No. of pods/plant	Pod length (cm)	No. of seeds/pod	Days to 50% flowering	Days to maturity	Yield (q/ha)
VRI-3	165.27	58.40	2.12	59.60	64.00	118.67	5.12
Prachi	173.10	80.27	2.19	62.33	52.67	114.67	7.08
DS-5	169.17	15.67	1.73	16.20	64.67	123.00	3.06
GT-10	151.00	62.47	2.06	55.67	48.00	109.33	4.09
Swetha	156.97	15.33	1.63	15.67	65.00	123.00	3.14
TMV-7	149.23	56.67	2.11	55.40	53.67	113.33	3.48
Amrit	171.57	92.93	2.20	64.87	50.67	112.67	9.05
DS-9	166.80	18.73	1.69	17.60	64.00	123.00	3.35
VRI (SV) 2	166.60	81.53	2.11	58.00	56.67	115.67	4.26
VRI (SV) 1	165.73	68.93	2.00	55.73	58.67	118.00	3.84
Mean	163.54	55.09	1.98	46.11	57.80	117.13	4.65

extensive research. Over the past few years, these two varieties have been popularised through various extension programmes to the farmers in the region.

In 2021-22, the centre evaluated the performance of 10 different sesame varieties at the ICAR Research Farm. Among these, Amrit and Prachi recorded the highest yields, with Amrit achieving 9.05 q/ha and Prachi 7.08 q/ha. Seed production of these two promising varieties were multiplied at the ICAR Research Farm.

The Amrit variety of sesame, has light brown seeds, tolerant to powdery mildew and *Alternaria* leaf spot, with an oil content of about 43–46%, whereas the Prachi variety characterised by black seeds, and resistant to *Cercospora* and powdery mildew with an oil content

of 42–45%. Both varieties have a crop duration of about 120 days, an average yield of 8–9.5 q/ha and are highly suited for the agro-climatic condition of the region.

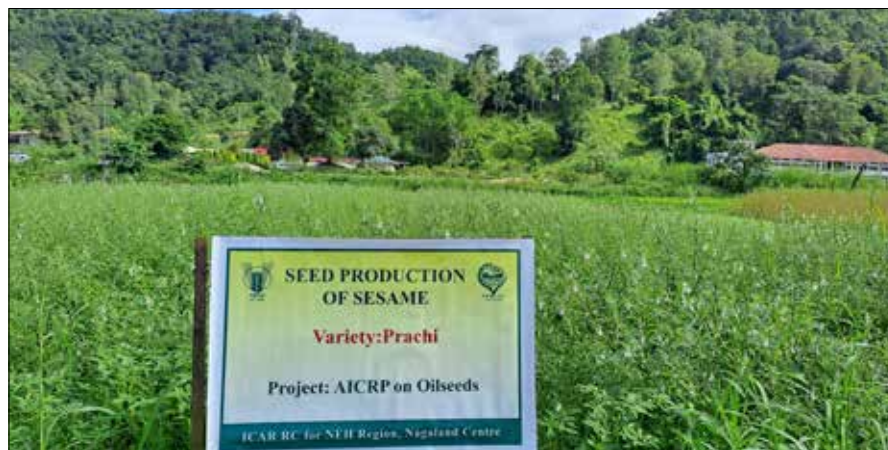
To promote and popularise these promising sesame varieties, the centre collaborated with KVKs. The training on 'Participatory Seed Production of Sesame' focused on seed production of Amrit and Prachi varieties of sesame was conducted at Beisumpuikam village of Peren, Nagaland on the 23 March, 2023.

On 6 June 2023, an event was organised by the centre in collaboration with KVK Dimapur to promote and strengthen sesame seed production in the state. This event, titled 'Field Day cum Farmers'-Scientist Interaction on Participatory Sesame Seed Production,' was organised to highlight the

remarkable performance of Amrit variety of sesame and explore its production potential in the region. The event served as a crucial platform for farmers and scientists to engage in discussions regarding the challenges and opportunities surrounding sesame seed production in Nagaland. The discussions focused on the profitability of sesame cultivation, cost-effective farming practices, and strategies to enhance market access for sesame products. In addition, the event also supported the farmers by distributing essential agricultural inputs like spades for farm operations.

In 2024, the centre continued its efforts to promote sesame cultivation by distributing seeds of Amrit and Prachi varieties to different villages in Niuland district of Nagaland, is an initiative aimed at boosting sesame production in the district by providing farmers with access to improved seed varieties known for their higher yield potential and resilience to local growing conditions.

Following the seed distribution, the centre organised a 'Field Day on Sesame' at Hakhizhe village in the Niuland district of Nagaland on 9 August 2024. This event was a continuation of the centre's efforts to promote sesame cultivation and support farmers in the region. The event allowed farmers to observe the performance of Amrit and Prachi varieties in real field conditions, engaging them with practical insights into effective cultivation practices. Additionally, the event facilitated further interaction with the farmers on the progress and challenges encountered since the initial seed distribution. The importance of seed quality was a key theme during the event, with discussions focussing on the role of high-quality seeds in achieving optimal crop yields and the constraints the farmers face in accessing such seeds. In addition to promoting better farming techniques, the centre has provided the facility for oil extraction to support the farmers in maximising the value of their harvests. This has empowered farmers to process



Breeder seed production of sesame var. Prachi at ICAR Research Farm during *kharif*, 2021-22

Table 2. Package of practices for seed production of sesame

Particulars	Seed production technology
Variety	Amrit and Prachi
Climate and soil	24–30°C for optimal growth, flowering, and capsule ripeness with an average annual rainfall of 300–600mm. Well-drained, loose, fertile and sandy alluvial soils with pH 5.4–6.7
Land preparation	Fine seed bed for proper germination by deep ploughing in summer, followed by 1–2 cross harrowings and planking. For <i>rabi</i> crop, 2-3 harrowings followed by planking. Levelling of land is important to prevent water logging.
Seed rate	5 kg/ha
Spacing	<i>Kharif</i> 30 cm × 15 cm; <i>Rabi</i> 30 cm × 30 cm
Seed treatment	Carbendazim (0.01%) + thiram (0.4%) or <i>Trichoderma viridi</i> (0.4%)
Manures and fertilizers	10–20 t/ha FYM at ploughing. Sesame requires 20–50 kg N/ha applied at two equal splits at sowing and flower initial stage. Apply 20–40 kg P ₂ O ₅ /ha at sowing and 10–30 kg K ₂ O/ha in K-deficient soils. Apply 25 kg ZnSO ₄ /ha once in 3 years in Zn-deficient soils.
Weed management	Two hand weedings at 15 and 35 DAS.
Cropping system	Intercropping with maize (1:2), pigeon pea (1:2), cowpea (1:3), and soybean (1:3).
Harvesting and threshing	Harvest crop when the leaves and capsules turn yellow and defoliation starts. Delayed harvesting may result in capsule shattering. After harvest, bundles are staked erect on threshing floor for several days for drying and then threshed.
Yield	8–9.5 q/ha
Crop duration	120 days

A key aspect of the intervention was the introduction of oil extraction facility, which allowed farmers to process their sesame seeds into oil. The farmers were able to produce 320 L of sesame oil, generating ₹320,000 from oil sales. Additionally, they earned ₹23,750 from selling oil cake, a byproduct of the extraction process. With these extra earnings, the total revenue after oil extraction surged to ₹343,750. As a result, the cost-benefit ratio increased dramatically to 4.83, reflecting a substantial improvement in profitability. This intervention not only enhanced the productivity of sesame cultivation but also enabled farmers to maximise the value of their harvests, leading to higher incomes.

Nagaland currently faces a significant deficit in oil production, indicating a major opportunity to scale sesame cultivation and local value addition. To bridge this gap, the State Government of Nagaland can facilitate the establishment of oil extraction units and promote Farmer Producer Organisations (FPOs) to integrated oil production and processing.

The ICAR Nagaland Centre has successfully revitalised the region's oilseed sector by introducing improved sesame varieties, Amrit and Prachi. These varieties were specifically selected for their high yields, disease resistance and adaptability to the local agro-climate. By integrating participatory seed production programmes

their sesame seeds into oil, and has enabled them to secure a better income, with sesame oil fetching a price of ₹1,000/L in the local market. By addressing both cultivation practices and value addition through oil extraction, the centre is helping local farmers improve both their productivity and profitability.

The economics of sesame cultivation in the farmers' field in a one-hectare area has significantly improved after the intervention of ICAR Nagaland Centre. Prior to

the intervention, the average cost of production was ₹52,420, resulting in an average yield of 6 quintals. With a modest cost-benefit ratio of 1.37, the profit margins for farmers were relatively low. However, after the introduction of better sesame varieties and farming practices suited for the region, the cost of production increased slightly to ₹60,420, but the yield also increased to 8 quintals. This improved the cost-benefit ratio to 1.59, reflecting better returns on investment.



Participatory seed production of sesame at Beisumpuikam, Peren, Nagaland during March, 2023



Field day-cum-farmers'-scientist interaction on Amrit variety of sesame, 6 June, 2023 at ICAR Research Farm



Field day on sesame varieties, Amrit and Prachi, at Hakhizhe village, Niuland, Dimapur, 2024



Oil expeller at ICAR Research Complex, Nagaland Centre

with modern agronomic training, the initiative has bridged the gap between scientific research and field application. This collaboration has ensured that farmers are no longer just cultivators but active participants in a streamlined production chain that prioritizes agricultural sustainability and crop resilience.

SUMMARY

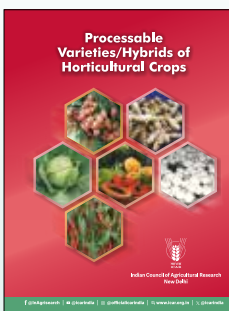
The shift toward high-quality seeds and value-added processing has transformed sesame from a subsistence crop into a resilient economic driver. The establishment of an oil extraction facility has been a pivotal development, enabling farmers to process raw seeds into higher-value oil and oil cakes, which has significantly increased household incomes. Moving forward, the long-term growth of Nagaland's oilseed sector will depend on continued collaboration between agricultural institutions and local communities. By overcoming traditional cultivation challenges, these efforts have not only strengthened the local economy but also positioned Nagaland's sesame for broader scope for domestic and international market reach.

*Corresponding author email: harendraicar@gmail.com

Table 3. Economics of sesame cultivation in farmer's field per hectare based on the results of three farmers

Particulars	Before ICAR intervention (₹)	After ICAR intervention (₹)
Land preparation	13,320	13,320
Seed cost (5 kg @ ₹120/kg)	600	600
FYM application	-	5,000
Weeding (40 man-days @ ₹500/day)	18,500	18,500
Fungicide application	-	1,000
Pesticide application	-	2,000
Harvesting and threshing	20,000	20,000
Total cost of cultivation	52,420	60,420
Yield (kg)	600	800
Gross return (₹120/kg)	72,000	96,000
Cost-benefit ratio	1.37	1.59
Oil extraction and transportation	-	6,000
Packaging (320 bottles @ ₹15/bottle)	-	4,800
Sesame oil (320 L @ ₹1,000/L)	-	3,20,000
Oil cake (475 kg @ ₹50/kg)	-	23,750
Total cost (including processing)	-	71,220
Total return after oil extraction	-	3,43,750
Cost-benefit ratio after value addition	-	4.83

Processable Varieties/Hybrids of Horticultural Crops



This book will be useful for the processing industry as it provides information on the recent varieties /hybrids of horticultural crops and their availability. The information provided in this document will help the Indian farmers and Food Processing Industry in identifying suitable crops and varieties/hybrids based on their processing qualities for strengthening entrepreneurship.

TECHNICAL ASPECTS

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