Unlocking Potential of Groundnut Cultivation in the North-Eastern Region: Strategies, DGR Initiatives and Impact

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Preface

This bulletin presents an in-depth analysis of groundnut cultivation within the North Eastern Hill (NEH) region, highlighting the significant developments and ongoing efforts to advance agricultural practices. It provides a comprehensive overview of the trends in groundnut area and production, showcasing the challenges and opportunities within this diverse region. Key initiatives by ICAR-DGR Junagadh from 2019-20 to 2022-23 under the ICAR NEH Component are examined, illustrating the strategic efforts aimed at enhancing groundnut farming through research and innovation. Additionally, the bulletin details the activities conducted by ICAR-DGR in the fiscal year 2023-24 across various AICRPG centers and Krishi Vigyan Kendras (KVKs), which are instrumental in supporting and improving groundnut cultivation practices. The document further explores cutting-edge groundnut technologies adapted for the unique agro-climatic conditions of the NEH region and highlights success stories that exemplify effective practices and outcomes. Addressing the critical challenges faced in groundnut farming, the bulletin proposes targeted strategies to boost productivity and sustainability. Finally, it outlines extension approaches designed to bridge gaps between research and practice, ensuring that innovative solutions reach and benefit the farming community. This bulletin aims to be a pivotal resource for policymakers, researchers, extension workers, and farmers, providing essential insights and recommendations to drive progress and foster a resilient groundnut sector in the NEH region.

Authors

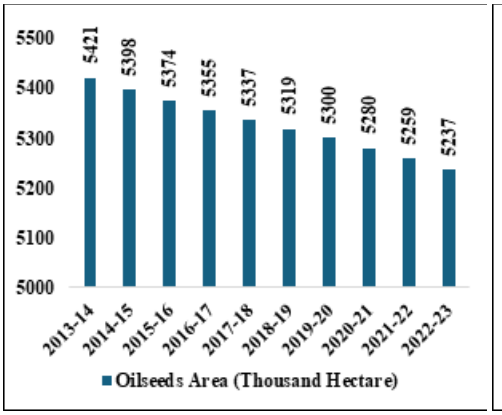
Contents

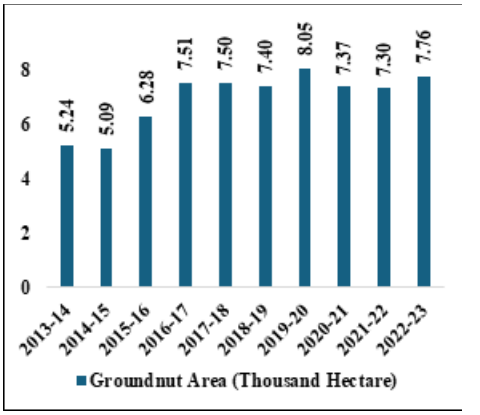
1. Overview of Groundnut Area and Production in NEH Region

Over the past decade, the North Eastern Hill (NEH) region has experienced significant changes in the cultivation of groundnut and other oilseeds. From 2013-14 to 2022-23, the area under groundnut cultivation has increased by an impressive 48%, reflecting a growing preference for the crop in the region. In contrast, the total area under oilseeds has declined slightly by 3.4%, decreasing from 5,421.48 thousand hectares in 2013-14 to 5,236.95 thousand hectares in 2022-23, possibly due to shifts in land use or a transition to other crops. Total oilseeds production has also risen, though less dramatically, with a 14.2% increase, reaching 393.78 thousand tonnes by 2022-23 compared to 344.76 thousand tonnes in 2013-14. Groundnut production has seen substantial growth, rising by 69.5%, with production reaching 7.99 thousand tonnes in 2022-23, up from 4.72 thousand tonnes a decade earlier. This increase in production, despite some fluctuation in yield, highlights the growing importance of groundnut in the NEH region's agricultural economy. Groundnut yield has also increased by 9.6% over the decade. In 2022-23, groundnut yield stood at 1,084.25 kg/ha, compared to 989.25 kg/ha in 2013-14. Similarly, total oilseeds yield has also seen a modest improvement, increasing by 4.1% over the same period, reaching 947.5 kg/ha in 2022-23, up from 910.12 kg/ha a decade earlier. This improvement suggests that farmers are adopting more efficient varieties and cultivation practices and benefiting from advancements in agricultural technology.

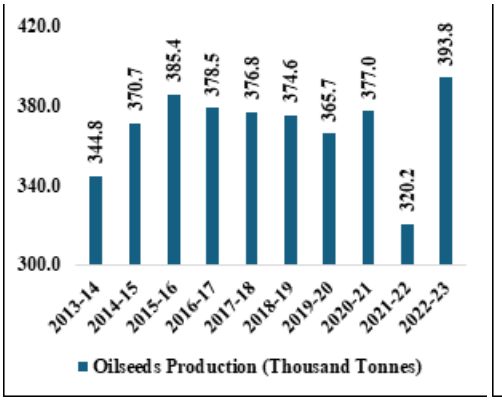
A closer look at the performance of different states within the NEH region in 2022-23 reveals variations in groundnut productivity. Manipur leads in both area and production, with 3.2 thousand hectares dedicated to groundnut and a production of 2.76 thousand tonnes. However, its yield is the lowest at 863 kg/ha, indicating higher potential for yield improvement. Nagaland follows with 1.97 thousand hectares of groundnut and a yield of 1,043 kg/ha. Tripura, despite having a smaller area of 1.37 thousand hectares, records the highest yield at 1,492 kg/ha, indicating the adoption of improved varieties and Good Agricultural Practices (GAP).

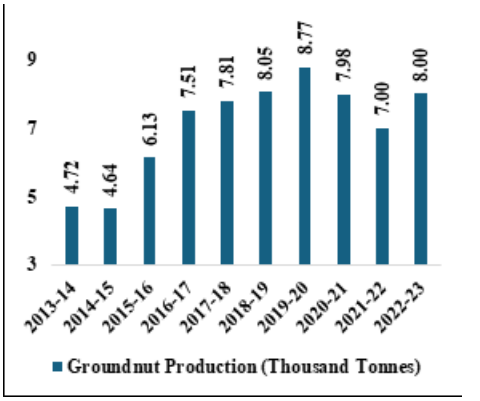
Overall, the trends in the NEH region indicate that groundnut has become increasingly important, with its expansion in area and production underscoring its potential for further growth. The slight decline in total oilseed area is counterbalanced by improvements in production and yield. The region's agricultural future can be further strengthened by focusing on yield improvements, particularly in states like Manipur and Arunachal Pradesh, which show room for growth compared to high-yielding states like Tripura and Nagaland. By addressing these challenges and focusing on the adoption of improved agricultural technologies, the NEH region can optimize production on its groundnut and oilseeds sectors, contributing to the overall development of its agricultural economy.



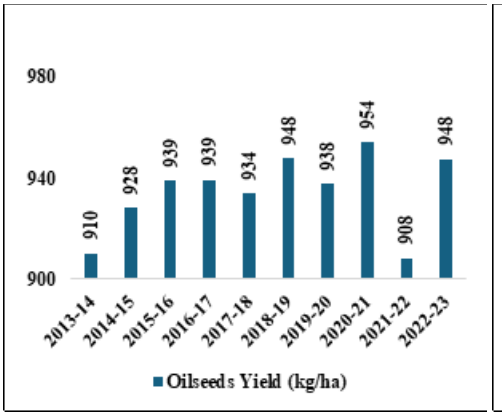


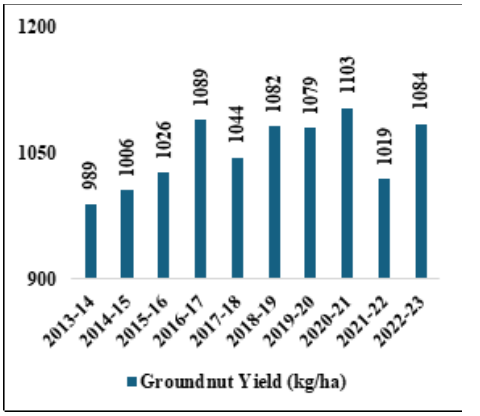
Change in Area in last 10 Years: Total Oilseeds – 3.4% Decline; Groundnut – 48% Increase





Change in Production in last 10 Years: Total Oilseeds – 14.2% Increase; Groundnut – 69.5% Increase





Change in Yield in last 10 Years: Total Oilseeds – 4.1% Increase; Groundnut – 9.6% Increase

Decadal Trend (2013-14 to 2022-23) of Area, Production and Yield of Total Oilseeds and Groundnut in NEH Region

2. Initiatives of ICAR-DGR, Junagadh in NEH Region during 2019-20 to 2022-23 under ICAR NEH Component

A. ICAR-DGR, Junagadh

S. No	Activities	Targets	Achievements	Districts/ States
1.	Trainings (capacity building/ skill develop-ment etc.)	8 nos.	13 nos. (capacity building programme / field day / exposure visit programme)	West Tripura, South Tripura districts
		100 farmers	>200 beneficiaries, trainings on farm machineries for groundnut cultivation and other crop cultivation package of practices, food products development etc.	Jorhat, Assam
2.	Front Line Demonstratio ns (FLDs)	5 no.	5 nos. (adoption and cultivation of TAG-24 variety), 2 nos. (KDG-128 & KDG-123 varieties were cultivated and demonstrated). 6 nos. (20 varieties viz. GJG-22, GJG-HPS-1, KDG-123, GJG-HPS-2, JL-776, Rajmungfuli-2, GJG-32, Girmar-3, HNG-123, DH-256, KDG-182, HNG- 69, TAG-24, JL-1085, TCGS-1157, Mallika, GJG-19, GPBD-5, Rajmungfuli-3, and JL-501 were cultivated and demonstrated.)	West Tripura, North Tripura
3.	Awareness/ vaccination camps, exposure visits, kisan mela, kisan diwas, exhibition etc.	6 no.	6 nos. (3 no. kisan mela, 3no. exhibition.) 2 nos. (1 no. exposure visit & 1 no. of kisan diwas)	West Tripura, South Tripura, Gomati, Khowai, North Tripura & Sepahijala districts of Tripura

S. No	Activities	Targets	Achievements	Districts/ States
4.	Input distribution			
i	Seed	685 farmers	280 kg groundnut seeds, 36 kg yard long bean, 90 kg cowpea, 300 nos. mushroom spawn, 1200 g cucumber seeds, 16 kg okra seeds etc. 600 g cucumber seeds, 12 kg okra seeds, 20 kg coriander etc. 12 kg ridge gourd, 2 kg bitter gourd, 800 nos. chicks, 60 nos. mushroom spawn, 40 kg poultry feed, 4000 nos. fish fingerlings etc.	West Tripura, South Tripura, Gomati, Khowai & sepahijala districts of Tripura
ii	Planting materials	256 farmers benefited	Seedlings (467 nos. mango, 256 nos. litchi, 127nos. lemon, 2220 nos. areca nut, 60 nos coconut . etc.)	Gomati, Khowai districts of Tripura
iii	Fertilizers	134 farmers benefited	50 kg lime & 200 kg vermicompost, 220 kg urea, 112 kg MOP, 280 kg. SSP, 500 kg manure, 100 litres Nano urea , 20 kg VAM	South Tripura, Gomati, Khowai districts of Tripura
iv	Plant protection chemicals	25 farmers benefited	Emamectin benzoate (40 g), Imida chlorpid (100 g), Ridomil (20 kg)	West Tripura, Gomati, Khowai districts of Tripura
5.	Infrastructure development	200 farmers benefited	FLD and farm machineries demonstration and trainings to >200 beneficiaries at KVK Jorhat and AAU, Jorhat	Jorhat, Assam
6.	Any other aspect	3 no.	3 HP solar pump/irrigation facility creation for cultivation demonstration of crop and farm machinery trainings	Jorhat, Assam

B. AICRP on Groundnut center, Manipur

S. No	Activities	Targets	Achievements	Districts / States
1.	Trainings (capacity building/skill development etc.)	6	6	Chandel, Ukhrul, Churachandrapur, Imphal East, Kangpokpi, Kakching, Thoubal and Bishnupur of Manipur state
2.	Front Line Demonstrations (FLDs)	120 farmers	120 (48 ha)	Chandel, Ukhrul, Churachandrapur, Imphal East, Kangpokpi, Kakching, Thoubal and Bishnupur of Manipur state
3.	Input distribution			
i	Seed	62 Q	62 Q Groundnut seed distributed	Chandel, Ukhrul, Churachandrapur, Imphal East, Kangpokpi, Kakching, Thoubal and Bishnupur of Manipur state
iii	Fertilizers	124 Q lime, 120 Q SSP, 8Q MOP, 6.48 Q Urea	124 Q lime, 120 Q SSP, 8Q MOP, 6.48 Q Urea	Chandel, Ukhrul, Churachandrapur, Imphal East, Kangpokpi, Kakching, Thoubal and Bishnupur of Manipur state
7	Sprayers	120	120 farmers given sprayers	Chandel, Ukhrul, Churachandrapur, Imphal East, Kangpokpi, Kakching, Thoubal and Bishnupur of Manipur state
8	Groundnut decorticator	40	40	

3. Activities Undertaken by ICAR-DGR in NEH Region at various AICRPG center and KVKs in FY 2023-24

Centre	Activities/Inputs	Expenditure (lakhs)
CAU, Imphal	CAU-GS-1 (5 Q); inputs like fertilizers, pesticides etc., for 60 farmers; sprayers (60 no.); farmer training (2 no.); seed bin/tarpaulin (60 no.); spade (60 no.)	9.40
CAU, Pasighat	Groundnut variety (50 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/ tarpaulin (60 no.)	9.84
KVK, Serchhip	Groundnut variety (20 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/ tarpaulin (60 no.); seed drills (7 no.); sprayers (22 no.); decorticator (1 no.)	6.74
	Small implements (10-30 no.)	1.17
KVK, Thoubal	Groundnut variety (20 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/tarpaulin (60 no.); seed drills (7 no.); sprayers (22 no.); decorticator (1 no.)	7.84
	Small implements (10-30 no.)	1.17
KVK, Dhalai	Groundnut variety (20 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/tarpaulin (60 no.)	7.84
KVK, North Tripura	Groundnut variety (20 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/tarpaulin (60 no.)	6.14
	small implements (10-30 no.)	1.38
KVK, Zunheboto	Groundnut variety (10 Q); farmer training (2 no.); transport and other inputs; sprayers/seed bin/tarpaulin (70 no.)	6.74
KVK East Garo	Groundnut variety (1 Q); farmer training (1 no.); transport and other inputs	0.30
KVK Ribhoi	Groundnut variety (1 Q); farmer training (1 no.); transport and other inputs	0.30
	Total	**58.86**

Training program conducted at KVK, East Garo Hills

Training program conducted at CAU, Imphal

Distribution of seeds/inputs for Cluster Demonstration on Groundnut at KVK, Serchhip

Groundnut crop in the farmers field sponsored by KVK, Dhalai

Groundnut crop in the faremrs field with good pod bearing sponsored by KVK, North Tripura

Training program conducted at KVK, Thoubal

Performance of Vishista variety at North Tripura during *Kharif* 2023

4. Groundnut varieties recommended over last 10 years for NEH Region

VARIETY 1

1.	Name of the Variety	:	**GJG 18 (JSP 49)**
2.	Source of Technology	:	JAU, Junagadh
3.	Year of Release	:	2015
4.	Agro-climatic Zone	:	Odisha, WB, Jharkhand and Manipur
5.	Description of Technology	:	• Suitability : *Kharif* • Days to maturity : 121 • Oil content (%) : 48 • Pod yield : 1450 • Kernal Yield : 1001 • Shelling : 69% • Testa colour : Rose • 100- kernel mass (g) : 50 • Quality traits : Pod and kernel • Disease resistance : Moderately resistant to PBND and PSND 
6.	Critical inputs recommended	:	GJG 18 (JSP 49)
7.	Observations recorded	:	Moderately resistant to PBND and PSND
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs 103/kg pod (certified seed)

VARIETY 2

1.	Name of the Variety	:	**RG 578 (Raj Mungfali 2)**
2.	Source of Technology	:	SKRAU, Durgapura
3.	Year of Release	:	2015
4.	Agro-climatic Zone	:	Odisha, WB and Manipur
5.	Description of Technology	:	• Suitability : *Kharif* • Average yield (kg/ha) : 1587 • Days to maturity : 120 • Oil content (%) : 46 • Pod yield : 1480 • Kernal Yield : 1066 • Shelling : 72% • Testa colour : Tan • 100- kernel mass (g) : 53 • Quality traits : Pod and kernel • Disease resistance: Resistant to LLS, dry root rot, ELS and rust • Insect tolerance: Tolerant to *S. litura*, thrips, jassids and leaf miner 
6.	Critical inputs recommended	:	RG 578 (Raj Mungfali 2)
7.	Observations recorded	:	Resistant to LLS, dry root rot, ELS and rust and tolerant to *Spodoptera litura*, thrips, jassids and leaf miner

VARIETY 3

1.	Name of the Technology	:	**GJG 19 (JSP 51)**
2.	Source of Technology	:	JAU, Junagadh
3.	Year of Release	:	2016
4.	Agro-climatic Zone	:	Odisha, West Bengal, Jharkhand and Manipur
5.	Description of Technology	:	• Suitability : *Kharif* • Days to maturity : 122 • Oil content (%) : 47 • Pod yield : 1876 • Kernal Yield : 1294 • Shelling : 69% • Testa colour : Monochrome rose • 100- kernel mass (g) : 50 • Quality traits : Pod and kernel • Disease resistance : Tolerant to stem rot, dry root rot and rust  
6.	Critical inputs recommended	:	GJG 19 (JSP 51)
7.	Observations recorded	:	Tolerant to stem rot, dry root rot and rust
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs 103/kg pod (certified seed)

VARIETY 4

1.	Name of the Variety	:	**Phule Morna (KDG 123)**
2.	Source of Technology	:	MPKV, Digraj
3.	Year of Release	:	2016
4.	Agro-climatic Zone	:	Gujarat, Rajasthan, Tamil Nadu, AP, Karnataka, and Southern Maharashtra
5.	Description of Technology	:	• Suitability : *Kharif* • Average yield (kg/ha) : 2212 • Days to maturity : 113 • Oil content (%) : 50.9 • Pod yield : 2425 • Kernal Yield : 1576 • Shelling : 65 % • Testa colour : Red • 100- kernel mass (g) : 41 • Quality traits : Pod and kernel • Disease resistance : Moderately resistant to rust and leaf spot  
6.	Critical inputs recommended	:	Phule Morna (KDG 123)
7.	Observations recorded	:	Moderately resistant to rust and leaf spot
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	RS 130/kg pod (certified seed)

VARIETY 5

1.	Name of the Variety	:	**Kalinga Groundnut 101**
2.	Source of Technology	:	OUAT, Bhubaneshwar
3.	Year of Release	:	2021
4.	Agro-climatic Zone	:	Odisha
5.	Description of Technology	:	• Suitability : *rabi*-summer Oil content (%): 50 • Pod yield : 3179 (*rabi*-summer) • Kernal Yield : 1576 • Shelling : 72 % • Quality traits : Pod and kernel • Disease resistance : Tolerant to late leaf spot and rust  
6.	Critical inputs recommended	:	Kalinga Groundnut 101
7.	Observations recorded	:	Tolerant to late leaf spot and rust
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs 107/kg pod (certified seed)

VARIETY 6

1.	Name of the Technology	:	**Visishta (TCGS 1694)**
2.	Source of Technology	:	ANGRAU, Tirupati
3.	Year of Release	:	2021
4.	Agro-climatic Zone	:	Andhra Pradesh
5.	Description of Technology	:	• Suitability : *Kharif and Rabi* • Oil content (%): 50 • Pod yield : 2489 kg/ha (*kharif*); 2495 kg/ha (*rabi*) • Kernal Yield : 1576 • Shelling : 66-70 % • Quality traits : High water use efficiency • Disease resistance : Tolerant to foliar diseases viz., early leaf spot, late leaf spot and rust diseases   
6.	Critical inputs recommended	:	Visishta (TCGS 1694)
7.	Observations recorded	:	Tolerant to foliar diseases viz., early leaf spot, late leaf spot and rust diseases
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs 107/kg pod (certified seed)

5. Crop Production and Protection Technologies recommended over last 10 years for NEH Region

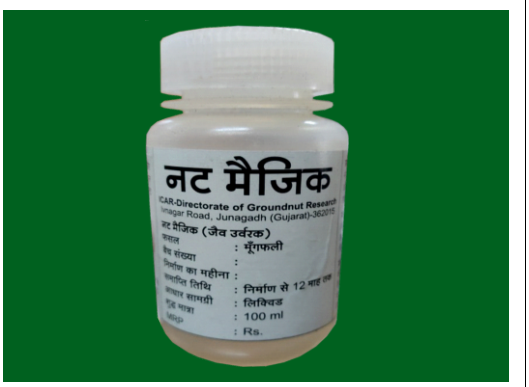
TECHNOLOGY 1

1.	Name of the Technology	:	**Nut Boost: A Wonder Formulation of PGPR for Groundnut**
2.	Source of Technology	:	ICAR-DGR
3.	Year of Release	:	2018-2023
4.	Agro-climatic Zone	:	Rajasthan, Gujarat, Maharashtra, TN, Karnataka, Telangana, AP, Odisha, West Bengal
5.	Description of Technology	:	The consortium produces enzyme ACC deaminase and transforms organic form of nitrogen into inorganic forms. It can easily be applied through irrigation water or through FYM or through drip beside seed treatment. Yield advantage upto 18% is observed through usage of this consortia. It also improves in soil health, nutrient mobilization and uptake like N, P, K, Fe, Zn, etc. (P, Zn, and K solubilizers) by 5-7%. It also minimizes incidence of soil-borne fungal pathogens (*Sclerotium rolfsii* and *Aspergillus niger*). It is compatible with seed treating chemicals like Bavistin (Carbendazim)/ Thiram. It is very fast growing and ease in large-scale multiplication. It is useful for both irrigated and rainfed conditions. 
6.	Critical inputs recommended	:	200 g bio fertilizer per acre of seed to be applied
7.	Observations recorded	:	Increase in pod and haulm yield over control, Economics
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs. 50 per 200 g per acre / Rs. 75 per 100 ml per acre

TECHNOLOGY 2

1.	Name of the Technology	:	**'Nut Grow': Insurance Against Soil-borne Diseases of Groundnut**
2.	Source of Technology	:	ICAR-DGR
3.	Year of Release	:	2018-2023
4.	Agro-climatic Zone	:	Rajasthan, Gujarat, Maharashtra, TN, Karnataka, Telangana, AP, Odisha, West Bengal
5.	Description of Technology	:	It produces enzyme ACC deaminase which improves seedling vigour and thus better plant stand. It improves soil health by suppressing plant pathogens and nematodes and make availability of macro- and micro-nutrients (P, K, Mn, Zn, etc.). It improves yield by 20% and reduces incidence of collar and stem rot by 40-60% and nematodes by 30-40%. Dependence on external inputs of P, K, Mn, Zn, and Fe can be reduced by 30%. It helps by improving solubilisation, mobilization and uptake of nutrients (P. K, Fe, Mn, and Zn) from soil and improving soil health by suppressing soil-borne fungal pathogens and nematodes. It also suppresses major soil-borne fungal pathogens of groundnut like *S. rolfsii* & *A. niger.* 
6.	Critical inputs recommended	:	200 g bio fertilizer per acre of seed to be applied
7.	Observations recorded	:	Increase in pod and haulm yield over control, Economics
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs. 50 per 200 g per acre / Rs. 75 per 100 ml per acre

TECHNOLOGY 3

1.	Name of the Technology	:	**"Nut Magic": A Bacterial Formulation for Augmenting Groundnut Yield**
2.	Source of Technology	:	ICAR-DGR
3.	Year of Release	:	2018-2023
4.	Agro-climatic Zone	:	Rajasthan, Gujarat, Maharashtra, TN, Karnataka, Telangana, AP, Odisha, West Bengal
5.	Description of Technology	:	It produces ACC deaminase, solubilizes fixed forms of phosphates, Zn, Mn, and K, mobilizes Fe, produces antifungal metabolites, plant hormones like IAA, Gibberellins, etc. and transforms organic form of nitrogen into inorganic forms. Rhizobia can fix atmospheric nitrogen biologically up to 200 kg/ha/yr. It can easily be applied through irrigation water or through FYM or through drip beside seed treatment. Yield advantage up to 20% is observed through usage of this consortia. It enhances biological nitrogen fixation and is compatible with seed treating chemicals like Bavistin (Carbendazim)/ Thiram. Through its usage dependence on nitrogenous, potassic and phosphatic fertilizer can be reduced by 25-30%. 
6.	Critical inputs recommended	:	200 g bio fertilizer per acre of seed to be applied
7.	Observations recorded	:	Increase in pod and haulm yield over control, Economics
	Suitability for the programme OFT/FLD	:	OFT/FLD
8.	Cost of the technology (Rs.)	:	Rs. 50 per 200 g per acre / Rs. 75 per 100 ml per acre

TECHNOLOGY 4

1.	Name of the Technology	:	**Integrated management of Groundnut diseases by seed treatment with a mixture of *Trichoderma* sp. and *Pseudomonas fluorescens***
2.	Source of Technology	:	AICRP Groundnut
3.	Year of Release	:	2015
4.	Agro-climatic Zone	:	Bhubaneshwar, Jhargram, Imphal, Berhampore
5.	Description of Technology	:	• Seed treatment with a mixture of *Trichoderma* sp. and *Pseudomonas fluorescens* @ 10 g each / kg of seed • Combined furrow application of both *Trichoderma* sp. and *P. fluorescens* @ 2 kg each enriched with FYM @ 250 kg/ha along with foliar application of mixture of both @ 5 g each / lit (2.5 kg/ha each) at 30 and 45 DAS • Reduce the soil -borne diseases up to 75%, and foliar diseases up to 33% over control • Enhance the pod yield from 269 to 463 kg/ha and haulm yield from 163 to 1043 kg/ha over the control • ICBR (Incremental Cost Benefit Ratio) up to 1:7.6.
6.	Critical inputs recommended	:	FYM, *Trichoderma* sp. and *Pseudomonas fluorescens*
7.	Observations recorded for validation.	:	Reduction in soil borne diseases over control, pod yield
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	*Pseudomonas fluorescens* – Rs (250-500)/kg, *Trichoderma* sp. – Rs (150-300)/kg

TECHNOLOGY 5

1.	Name of the Technology	:	**DAPG-producing fluorescent pseudomon ades for enhancing nutrient use efficiency, bio-control of soil-borne diseases, and yield of groundnut**
2.	Source of Technology	:	AICRP Groundnut
3.	Year of Release	:	2016
4.	Agro-climatic Zone	:	Bhubaneshwar, Jhargram, Imphal, Berhampore
5.	Description of Technology	:	• Seed inoculation using DAPG -producing fluorescent pseudomonades like FP 86, FP 98, and DAPG 4 produced a higher yield and better NUE in *kharif* groundnut. • About **18 - 28% more yield** and **less collar rot and dry root rot incidence** over non-application at Bhubaneswar. • **Maximum dry pod yield (2410.4 kg/ha) with DAPG 1 with maximum net return (Rs. 81437.8) and B: C ratio (2.7)** at Raigarh.
6.	Critical inputs recommended	:	Fluorescent pseudomonads like FP 86, FP 98, and DAPG 4
7.	Observations recorded for validation.	:	Pod yield, nutrient use efficiency and disease incidence
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Rs. 50 per 200 g per acre / Rs. 75 per 100 ml per acre

TECHNOLOGY 6

1.	Name of the Technology	:	**Intercropping of Groundnut and millets**
2.	Source of Technology	:	AICRP Groundnut
3.	Year of Release	:	2020
4.	Agro-climatic Zone	:	Bhubaneshwar, Jhargram, Imphal, Berhampore
5.	Description of Technology	:	Intercropping of Groundnut + millet s (Foxtail millet, little millet and Finger millet) in 2: 1 row ratios. Paired row (20/30 x 20 cm) method of sowing with land preparation by any tillage practice.
6.	Critical inputs recommended	:	Millet seeds
7.	Observations recorded for validation.	:	Pod yield, System yield and intercropping efficiency indices
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Cost of cultivation – Rs 45000/ha approx.

TECHNOLOGY 7

1.	Name of the Technology	:	**Package of practices for organic groundnut production**
2.	Source of Technology	:	AICRP Groundnut
3.	Year of Release	:	2011
4.	Agro-climatic Zone	:	Bhubaneshwar, Jhargram, Imphal, Berhampore
5.	Description of Technology	:	For organic groundnut production, application of beneficial micro-organisms pre-treated FYM @ 7.5 t/ha + seed treatment with bio-fertilizers and bio-pesticides in addition to either foliar spray of *Pseudomonas* @ 1 % or NSKE @ 5 % or panchagavya @ 3 % at 40 to 45 days after sowing is beneficial
6.	Critical inputs recommended	:	micro-organisms pre-treated FYM, *Pseudomonas,* neem seed kernel extract (NSKE), panchagavya
7.	Observations recorded for validation.	:	Pod yield, soil quality
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	*Pseudomonas*-Rs (250-500)/kg, NSKE-Rs (200-400)/l, panchagavya -Rs (150-450)/l

TECHNOLOGY 8

1.	Name of the Technology	:	**Land configuration and mulching for augmenting productivity and resource use efficiency of *kharif* groundnut**
2.	Source of Technology	:	AICRP Groundnut
3.	Year of Release	:	2016
4.	Agro-climatic Zone	:	Bhubaneshwar, Jhargram, Imphal, Berhampore
5.	Description of Technology	:	Use of broad bed and furrow or raised bed and furrow (60 cm width x 30 cm furrow) method of groundnut sowing with mulch is recommended for obtaining **higher yield (25-28%), net returns (₹10653-₹11373), and BCR (2.12-2.13)** from *kharif* groundnut.
-6.	Critical inputs recommended	:	Organic/ biodegradable mulch
7.	Observations recorded for validation.	:	Pod yield and net returns
8.	Suitability for the programme OFT/FLD	:	OFT/FLD
9.	Cost of the technology (Rs.)	:	Cost of cultivation – Rs 36000/ha approx.

6. Success Stories of Groundnut Cultivation in NEH Region

1. Groundnut cultivation in Brajendranagar-an additional income source

Inputs by: Santanu Das, SMS (Agronomy), KVK North Tripura, Panisagar

Name of farmer : Jharu Das
Address : Brajendranagar
Contact No : 7005169301
Education : Class IX pass
Agri. Experience : 17 years
Total Land holding : 1 hectare

I. Background information:

Mr. Jharu Das, a 32-year-old farmer from Brajendranagar in North Tripura district, sustains his family entirely through farming. The predominant cropping system in the village is paddy-vegetable rotation. On his paddy field, Mr. Das achieves an average yield of 4.5 t/ha, primarily growing paddy for his family's consumption, with any surplus sold in the market. After harvesting paddy, he cultivates vegetables like brinjal in summer, and potato, bottle gourd, and pumpkin during winter, mainly for his family's use. With 8 family members to support, he focuses on minimal fertilizer use for vegetable cultivation, as the soil structure and texture in the riverbank area of Brajendranagar are conducive to productive vegetable farming.

II. Introduction of the technology:

Groundnut, a vital oilseed crop, is also known for its unpredictability and its ability to fix atmospheric nitrogen through root nodules. On average, groundnut kernels contain 20% protein and 40% oil. Groundnut oil is widely popular, ranking just after mustard oil. The crop thrives in sandy loam or light-textured soils and has a growth duration of 4-5 months. The AICRP Groundnut Centre at UAS Dharwad has developed Dh 256, a drought and foliar disease-tolerant variety suitable for cultivation in both the *kharif* and rabi/summer seasons. Its pod yield ranges between 3000-3500 kg/ha across both seasons, with a maturity period of 110-115 days, placing it in the medium maturity group.

Fig 1. Pods development in variety Dh 256

III. Intervention of the technology:

The farmer frequently visited the KVKs and engaged with the scientists at KVK North Tripura. He expressed interest in cultivating high-value crops like groundnut for seed production to generate additional income. As a beneficiary of the NFSM Oilseed Project 2022-23, he cultivated 0.16 hectares of land during the rabi season. To improve soil fertility, he was provided with lime and boron and advised to apply N: P: K fertilizers using Urea, SSP, and MOP at rates of 30:60:40 kg/ha. Lime was applied at 500 kg/ha in furrows, and boron was applied at 1 kg/ha (equivalent to 9 kg/ha of borax). The rows were spaced 30 cm apart, with seeds sown 10 cm apart using the ridge and furrow method.

IV. Output & outcome:

At harvest, Mr. Jharu Das achieved a pod yield of 2637.5 kg per hectare, with a total cultivation cost of ₹196,250 per hectare. His total income amounted to ₹263,750 per hectare, resulting in a net income of ₹67,500 and a B: C ratio of 1.34:1. The average selling price of his produce was ₹100 per kg.

Fig 2. Crop at vegetative stage


Fig 3. Crop at harvest

V. Challenges to the farmer:

While adopting and implementing the project under the NFSM oilseed programme, the farmer encountered several challenges. These included a lack of confidence in growing a new crop due to perceived risks, limited experience with detailed cultivation and management practices, and insufficient water availability for irrigation, as the crop was grown during the *rabi* season in December.

VI. Technological impact:

He supplied approximately 150 kg of groundnut seed to the KVK and is eager to cultivate other varieties for higher yields in the next season, with plans to expand the cultivation area. Having gained valuable experience in groundnut farming, he now encourages other farmers to adopt the crop to improve their income and livelihoods.

2. Potential of Groundnut cultivation in North Tripura-A success story

Inputs by - Santanu Das, SMS (Agronomy), KVK North Tripura, Panisagar

Name of farmer	:	**Ashim Chandra Das**
Address	:	**Brajendranagar**
Contact No	:	**9366442070**
Education	:	**Class V pass**
Agri. Experience	:	**8 years**
Total Land holding	:	**0.8 hectare**

I. Background information:

Mr. Ashim Chandra Das, a 44-year-old marginal farmer from Brajendranagar in the Kadamtala RD Block of North Tripura district, cultivates paddy and vegetables annually. He plants paddy in April-May and also grows vegetables like brinjal, ridge gourd, cowpea, and okra. In winter, he primarily grows pumpkin, potato, tomato, green chilli, and knol-khol. With a family of four, including his children, Mr. Das spends around ₹7,000

per month on their education and nutrition. Most of the yield from his farm is for family consumption, with any surplus sold to generate income. Despite the fertile potential of his land, located near the Juri riverbank, which requires minimal fertilizer for crop production, he has been unable to grow high-value crops due to a lack of proper guidance and knowledge.

II. Introduction of the technology:

Groundnut, an important oilseed crop, is known for its unpredictability and its ability to fix atmospheric nitrogen through root nodules. Typically, groundnut kernels contain 20% protein and 40% oil. Groundnut oil is second in popularity only to mustard oil. The crop thrives in sandy loam and light-textured soils with a growing duration of 4-5 months. The Kadiri Lepakshi (K 1812) variety, released in 2020, contains 51% oil and is suitable for both kharif and rabi seasons. In the kharif season, it matures in 112 days with a 70% shelling percentage. This high-yielding, profusely bearing Spanish variety is rich in both oil and protein, and offers multiple resistances to drought, pests, and diseases, producing a stable yield of 15-20 q/ha.

Fig 1. Pod Development in Variety Kadiri Lepakshi (K 1812)

III. Intervention of the technology:

The farmer made several visits to the KVK and engaged with the scientists at KVK North Tripura. He expressed interest in cultivating high-value crops like groundnut for seed production to generate additional income. As a beneficiary of the NFSM Oilseed Project 2022-23, he cultivated 0.16 hectares of land during the rabi season. To improve soil fertility, he was provided with lime and boron, and was advised to apply N:P fertilizers using Urea, SSP, and MOP at rates of 30:60:40 kg/ha. Lime was applied at 500 kg/ha in the furrows, and boron was applied at 1 kg/ha (using 9 kg/ha of borax). The rows were spaced 30 cm apart, with seeds sown 10 cm apart using the ridge and furrow method.

IV. Output & outcome:

At harvest, Mr. Ashim Chandra Das achieved a pod yield of 2,187.5 kg per hectare, with a total cultivation cost of ₹1,47,125 per hectare. His total income amounted to ₹2,18,750 per hectare, resulting in a net income of ₹71,625 and a B: C ratio of 1.45:1. The average selling price of his produce was ₹100 per kg.

Fig 2. Crop growth at different stages

Fig 3. Field day organized at farmer's field for technology demonstration

Fig 4. Harvesting of the crop

V. Farmer's feedback:

The farmer was pleased to cultivate a new crop for the first time. His successful experience encouraged other villagers to consider growing similar crops in the upcoming season.

VI. Technological Impact:

He supplied approximately 150 kg of seed to the KVK and is enthusiastic about growing other varieties of groundnut to achieve higher yields and expand his cultivation area in the next season. Having gained experience in groundnut farming, he now encourages other farmers to adopt similar crops to improve their income and livelihoods.

7. Challenges associated with Groundnut Cultivation in NEH Region

Groundnut cultivation in the NEH regions faces several challenges, primarily due to limited development efforts focused on this crop. These constraints must be addressed to encourage farmers to adopt new technologies and improve groundnut productivity. The existing land system in the hill states discourages farmers from investing in land development or diversifying their crops. Additionally, the socio-economic conditions, coupled with the predominance of subsistence rainfed farming under shifting cultivation, hinder the adoption of modern agricultural technologies. Since rice dominates the agricultural landscape, groundnut has received less attention in terms of development activities.

1. **Low and Declining Yields -** One of the major challenges in groundnut cultivation in the NEH region is the low and fluctuating yields. According to data from 2022-23, while some states like Tripura achieve high yields (1,492 kg/ha), others such as Manipur struggle with yields as low as 863 kg/ha. Factors contributing to this decline include:
   - **Nutrient related issues:** Soil acidity, Al-toxicity, and Al-induced deficiencies of Ca, P, and Mg, along with micro-nutrient deficiencies, particularly of B and Mo, are key constraints in the cultivation of groundnut.
   - **Pest and disease pressure:** Groundnut crops are vulnerable to diseases like leaf spot and rust, as well as pests such as aphids and white grubs, which reduce yield.
   - **Limited adoption of improved varieties:** The use of traditional, low-yielding groundnut varieties persists in many areas, limiting the potential for higher productivity.
2. **Limited Access to Critical Inputs -** Groundnut farmers in the NEH region often face difficulties in accessing quality seeds, fertilizers, and pesticides due to region's remoteness in areas like Manipur, where yields are lower than the regional average, the lack of access to modern inputs could be a significant contributing factor.
3. **Adverse Climatic Conditions -** The NEH region is characterized by unpredictable and erratic weather condition. Excessive rainfall during the growing season can lead to waterlogging, while periods of drought or dry spells can cause water stress. The high rainfall and heavy down pour during sowing cause problem of land preparation and many a time seed get rotten due to high moisture and poor drainage.

4. **Fragmented Land Holdings and Terrain –** In the NEH region, most farmers operate small, fragmented landholdings on slopes (hilly terrain), making it difficult to use machinery for planting, harvesting, and soil preparation. This results in labor-intensive farming practices, which are less efficient and more time-consuming. The limited scope for mechanization also restricts the adoption of modern agricultural techniques that could otherwise improve productivity.
5. **Soil Erosion and Degradation -** The sloping landscape in the NEH region makes the soil prone to erosion, especially during the monsoon season when heavy rains wash away the topsoil. This erosion depletes soil nutrients and reduces the organic matter essential for healthy crop growth. The result is poor soil quality, which impacts groundnut yield.
6. **Poor Infrastructure and Market Access -** The remoteness of the NEH region leads to significant logistical challenges. Farmers often have limited access to markets, resulting in low prices for their produce due to the high cost of transportation. This discourages investments in better farming practices or inputs like fertilizers and pesticides, which are necessary to increase productivity. Additionally, inadequate storage facilities also lead to post-harvest losses.
7. **Pest and Disease Problems -** Leaf spot, rust, and collar rot are common diseases, while pests such as aphids, white grubs, and termites pose significant threats. Without access to proper pest control measures or resistant crop varieties, these challenges often result in yield losses. For instance, the state of Arunachal Pradesh, with a groundnut yield of 939 kg/ha, experiences such pest-related constraints that lower productivity compared to better-performing regions like Tripura.
8. **Other Constraints -** Other than the above, following issues are also encountered in groundnut cultivation –

- Low population of native *Brady rhizobium* in both upland and rice fallow due to changes in soil microclimate from anaerobic to aerobic conditions.
- Excessive stem elongation caused by reduced sunshine duration and fewer sunny days during *kharif*, resulting in crop loading, low yield, and poor harvest index.
- Delayed release of land for rabi groundnut cultivation due to the long duration of rice varieties.
- Poor quality seeds and patchy crop stands, especially during rabi

and summer seasons, due to the quick loss of seed viability from these regions' *rabi* and summer produce.

- Low temperatures during the early growth stages of rabi and summer groundnut.
- Lack of early vigour in groundnut varieties for rabi and summer to withstand low temperatures, particularly after 50 days.
- Inadequate seed storage facilities in the region.
- Predominance of small and marginal farmers with limited investment capacity.

8. Strategies to boost Groundnut Productivity in NEH Regions

1. **Adopt High-Yielding Varieties (HYs) -** Introducing drought-tolerant and high-yielding varieties like can boost productivity. For example, Tripura, which uses improved varieties, like Vishista recorded the highest yield in the region at 1,492 kg/ha in 2022-23.
2. **Drip Irrigation and Rainwater Harvesting -** Using drip irrigation can optimize water usage, preventing both drought stress and waterlogging. This is essential in regions like Manipur, where poor water management results in low yields of 863 kg/ha. Rainwater harvesting can ensure a stable water supply during dry spells.
3. **Soil Nutrient Management -** Applying balanced fertilizers, especially phosphorus (P) and potassium (K), along with organic matter like compost, can improve soil fertility. In Arunachal Pradesh, where yields are at 939 kg/ha, better nutrient management could boost productivity. Promoting soil testing will help farmers apply the right nutrients based on local soil conditions.
4. **Adoption of Conservation Tillage -** Conservation tillage, including minimum tillage practices, can prevent soil erosion and retain soil moisture. This is crucial in the NEH's hilly terrain, where soil erosion is prevalent. Conservation tillage also enhances water infiltration and helps maintain soil fertility.
5. **Integrated Pest Management (IPM) -** Adopting IPM strategies can reduce crop losses from pests like aphids and white grubs, as well as diseases like rust and leaf spot. IPM combines biological, mechanical, and chemical control methods for sustainable pest management.
6. **Use of Biofertilizers and Rhizobium Inoculation -** The application of biofertilizers and Rhizobium inoculants can improve nitrogen fixation in the soil, enhancing groundnut growth. This can be particularly effective in regions like Nagaland, which already produces 2.06 thousand tonnes but has room for further improvement.
7. **Mechanization with Small-Scale Tools -** Promoting mechanization with small-scale tools like mini-tillers and hand seeders in hilly terrains can improve planting and harvesting efficiency in fragmented and sloped fields. In regions like Manipur, where labour-intensive practices limit productivity, adopting such tools could increase yields beyond the current 863 kg/ha.
8. **Improved Crop Rotation and Intercropping -** Introducing crop rotation with legumes and intercropping groundnut with cereals or

pulses can improve soil fertility and yield. Intercropping can reduce pest pressure and increase overall farm productivity. For example, intercropping groundnut with maize in regions like Tripura can enhance soil structure and boost.

9. **Climate-Resilient farming practices** - Promoting climate-resilient farming practices, such as adjusting sowing dates and adopting drought-resistant varieties, can mitigate the adverse effects of erratic weather. Regions like Arunachal Pradesh, where yield fluctuations are significant can benefit from these strategies to stabilize yields.
10. **Government policy support and subsidies** - Expanding government support through subsidies for seeds, fertilizers and machinery along with ensuring minimum support prices (MSP), can incentivize farmers to expand cultivation.

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