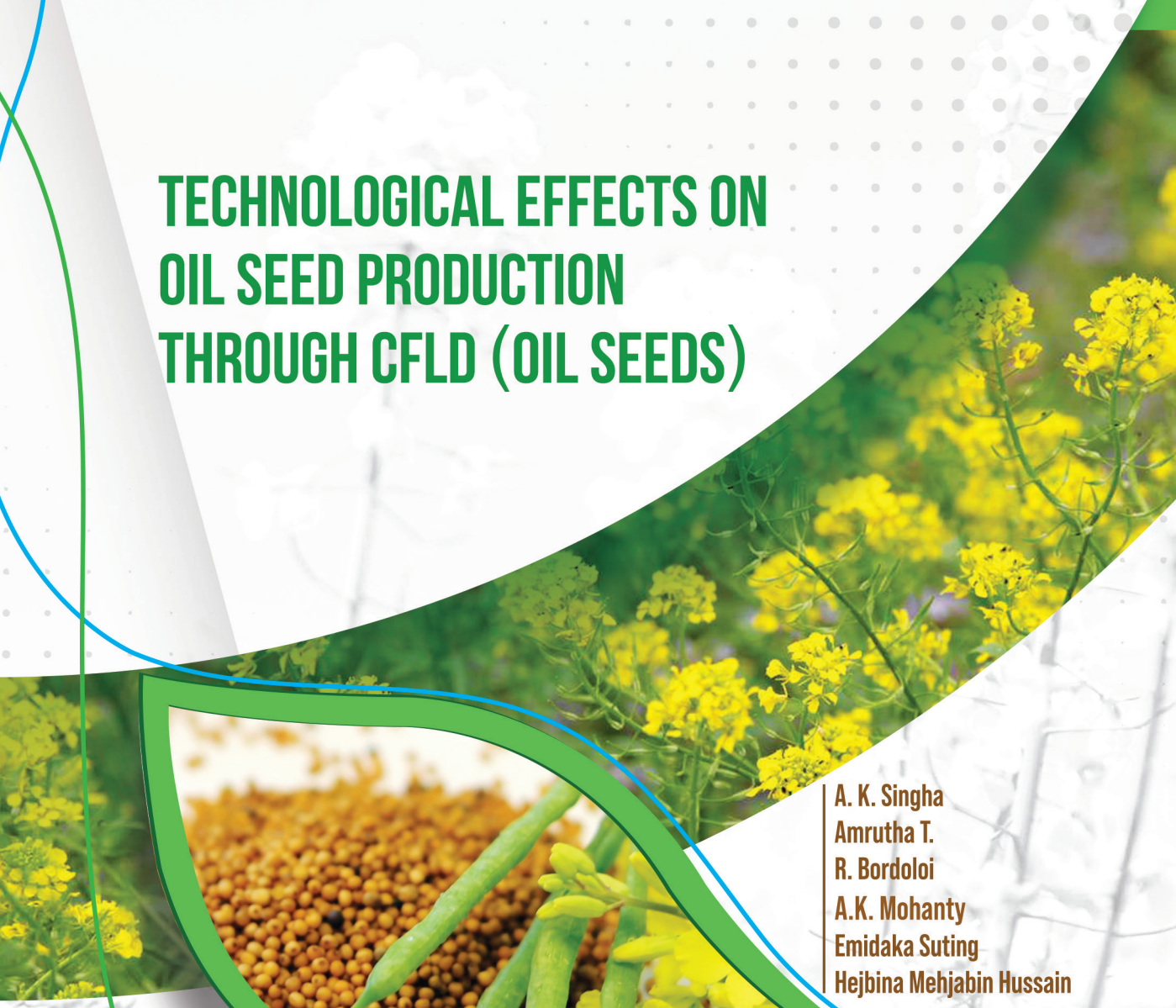
TECHNOLOGICAL EFFECTS ON OIL SEED PRODUCTION THROUGH CFLD (OIL SEEDS)



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KVK- Lawngtlai, Serchhip.
KVK- Dimapur, Kohima, Mon, Wokha, Tuensang, Zunheboto
KVK- West Tripura, North Tripura, South Tripura, Khowai, Sepahijala.

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PREFACE

Oilseed crops play an important role in Indian agricultural economy next to food grains in terms of area and production. Indian vegetable oil economy is fourth largest in the world next to USA, China and Brazil. It is necessary to exploit the domestic resources to maximize the production and productivity to ensure edible oil security of the country. Looking into the present scenario, the Ministry of Agriculture and Farmers' Welfare, Govt. of India had initiated a nationwide cluster frontline demonstration programme on oilseeds under National Mission on Oilseeds and Oil palm (NMOOP) during 2015-16. Under this programme, ICAR through its KVKs across the country has been conducting cluster frontline demonstrations in different oilseed crops. During 2022-23, ICAR-ATARI, Umiam through its 23 KVKs of 5 states including Manipur, Meghalaya, Mizoram, Nagaland and Tripura conducted 674 nos. of demonstrations covering an area of 295 ha in five different oilseed crops, viz. Rapeseed &mustard, sesame, groundnut, sunflower and soybean. This publication focuses on major technologies popularized among the farmers through the cluster frontline demonstrations in the commonly grown oilseed crops such as Rapeseed & Mustard, Sesame, Soybean, Sunflower and Groundnut in the state of Manipur, Meghalaya, Mizoram Nagaland and Tripura. We express our sincere thanks and gratitude to DAC, Ministry of Agriculture and Farmers' Welfare, Govt. of India, Dr. U.S Gautam, DDG (Ag. Extension), Dr. R.R. Burman, ADG (Ag. Extension), Dr. R.K. Singh, ADG (Ag. Extension) and all the colleagues of Agricultural Extension Division in Council HQ for financial support and their constant encouragement, guidance and support in executing the programme. We sincerely acknowledge the services rendered by the Scientists of the KVKs and ICAR-ATARI, Umiam including the SRF for successfully conducting the demonstrations and bringing out this publication.

(A. K. Mohanty)
Director

CONTENTS

TABLES

INTRODUCTION

India holds a significant share in world oil seed production. There was an increase in production of Oilseeds from 10.83 to 24.75 million tonnes during the year 1985-86 and 1998-99 leading to 'yellow revolution' in the country. But till date, there is no self-sufficiency in domestic oil requirement for the growing population. The deficit is met by imports every year from other countries such as Argentina, Brazil, Malaysia and Indonesia. The production is much lesser in North Eastern India. Though India used to be self-sufficient in edible oil until 1990s, all the states of North East are deficit since 1960s till date. Hence, to increase the oilseed production in North east region, a programme entitled "Cluster Frontline Demonstration under National Mission on Oilseed and Oilpalm (NMOOP)" was launched through KVKs under ATARI. The oilseed crops allotted for the North East region are Rapeseed & Mustard, Sesame, Soybean, Sunflower and Groundnut during the year 2022-23.

Achievements during 2022-23

Under ICAR-ATARI, Umiam, 23 Numbers of KVKs were included for Cluster Demonstrations on Oilseeds. KVKs conducted the Cluster frontline demonstration (FLDs) to demonstrate the production potential of newly released technologies in farmer's fields at different locations in a given farming system for dissemination of various technologies. A total of 295 hectares area was covered for the purpose with 674 nos. of demonstrations. The cluster demonstration on oilseeds include rapeseed and mustard (var. TS-36, TS-38, TS-67, NRCHB 101), Sesame (var. Tripura Siphing), Groundnut (var. ICGS-76) and Soybean (var. JS-335, VL 77, JS -95 60).The average production rate of rapeseed and mustard during 2022-23 was found to be highest in Manipur (8.11 q/ha) followed by, Meghalaya(9.59q/ha), Nagaland(8.52 q/ha), Tripura (6.28 q/ha) and Mizoram (3.65 q/ha). CFLD's on Soybean were conducted by the KVKs of Manipur, Mizoram and Nagaland with the production of 12.42 q/ha, 14.6 q/ha, 16.48 q/ha respectively. CFLD's on Groundnut were conducted by KVKs of Manipur, Mizoram and Tripura with an average productivity of 12.07 q/ha, 15.5 q/ha, 20 q/ha respectively. The average productivity of Sesame was highest in Mizoram (7.9 q/ha). The average productivity of Sunflower was 11.5 q/ha with 20% yield increase.

Table 1: Summary of CFLD on oilseeds during 2022-23

Sl.No	Crops	State	Target of FLDs approved		Achievements of FLDs		Average yield (q/ha)		Yield increase (%)	Yield Gap
			No. of Demos	Area (ha)	No. of Demos	Area (ha)	Demo	Local		
Kharif season										
1	Soybean	Manipur	200	80	182	76	49.68	37.85	94.35	11.83
2		Mizoram	125	50	100	40	29.2	20.1	54	9.1
3		Nagaland	150	60	162	60	49.45	38.3	93.56	11.15
4	Groundnut	Manipur	100	40	90	40	24.14	17.72	74.63	6.42
5		Mizoram	50	20	50	20	15.5	9.65	48	5.85
6		Tripura	50	20	50	20	20	18	11.1	2
7	Sesame	Mizoram	50	20	50	20	7.9	6.5	17	1.4
8		Tripura	50	20	50	20	8.5	5	41.18	3.5
Total (kharif)			**725**	**290**	**684**	**276**	**184.37**	**135.12**	**422.72**	**49.25**
Rabi season										
1	Rapeseed and Mustard	Manipur	350	140	305	140	56.83	42.02	200.49	14.81
2		Meghalaya	150	60	150	60	28.78	21.96	106.57	6.82
3		Mizoram	50	20	50	20	7.3	5.5	24	1.8
4		Nagaland	100	40	160	70	17.04	12.12	45.1	4.92
5		Tripura	150	60	118	55	31.4	20.1	169.25	11.3
Total (Rabi)			**800**	**320**	**783**	**345**	**141.35**	**101.7**	**545.41**	**39.65**
Summer Season										
1	Sesame	Tripura	50	20	76	20	6.2	4.43	40.9	1.77
2	Sunflower	Mizoram	50	20	50	20	11.5	8.5	26	3
Total (Summer)			**100**	**40**	**126**	**40**	**17.7**	**12.93**	**66.9**	**4.77**

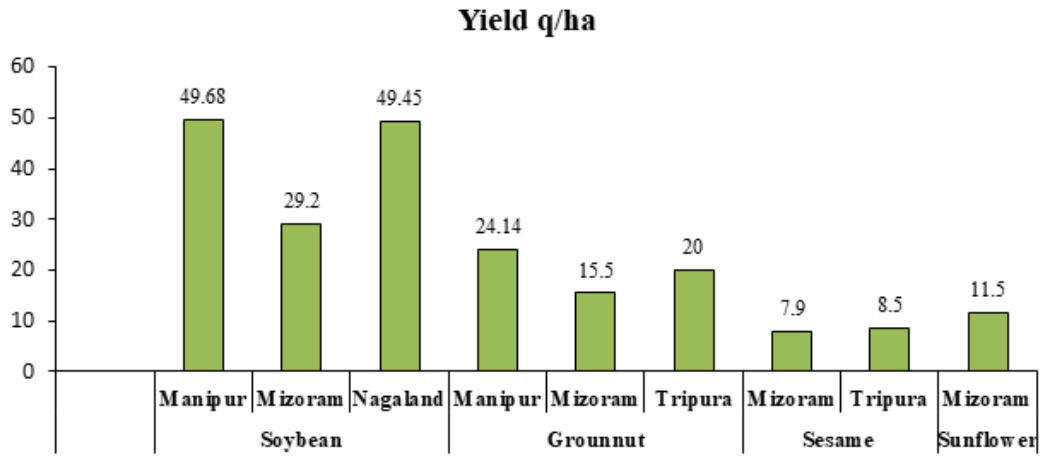

Fig 1: State-wise productivity in quintals per hectare of Oilseed crops under NMOOP 2022-23

Groundnut

Groundnut is cultivated in North east region during Kharif season (May-June) under rainfed conditions with low input use depending on the monsoon rains. In some areas where the monsoon is delayed, it is sown as late as August or early September utilizing residual moisture in the soil. Under following situations groundnut is mainly grown in NE states.

Season and Situations

Kharif (Rainy)	Rainfed upland
Rabi (Winter)	Rainfed on residual moisture/minimal irrigation situations
Zaid (Summer):	Irrigation medium land (Rice plains) River bank and river bed fallow on residual moisture

Interestingly, due to cooler climatic conditions and short day nature of growing season, the production system does not support aflatoxin development in groundnut beyond permissible limit and that could be the boon to the farmers. Therefore, there is a huge scope for large scale cultivation of groundnut in NE states for export to ASEAN countries. Cluster Frontline demonstrations (CFLDs) of groundnut were conducted during Kharif season in three states *i.e* Manipur, Mizoram and Tripura. A total number of 190 demonstrations were conducted covering an area of 80 ha.

Technology Demonstration

To improve the productivity of groundnut various technologies like HYV, seed treatment and Integrated Nutrient Management were demonstrated in farmer's fields.

Variety ICGS-76: The yield potential of this variety is 8.5/ha with 43% oil and 20% protein. It is tolerant of mid-season drought and bud necrosis.

Seed Treatment with Rhizobium @ 20 g/kg of seed+RDF

Application of micronutrients to correct nutritional disorders: Application of 10%LR+Application of FYM 5ton/ha+ NPKS@20:40:20:15 kg/ha

Line spacing 45X15 cm.

Table 2: Performance of Groundnut (ICGS-76) during Kharif (2022-23)

Sl. No.	Crops	State	Average yield (q/ha)		Yield increase (%)
			Demo	Local	
1	Groundnut	Manipur	24.14	17.72	74.63
2		Mizoram	15.5	9.65	48
3		Tripura	20	18	11.11

Performance of groundnut

In Groundnut, the variety taken up is **ICGS-76**. The demonstrations by KVK of Manipur yielded the highest yield (24.14 q/ha) when compared to the check (local) (17.72 q/ha), with a yield increase of 74.63%. KVK of Tripura (20 q/ha) yielded the second-highest yield when compared to the check (local) (18 q/ha), with a yield increase of 11.11%. With a yield increase of 48%, KVK of Mizoram produces 15.5 q/ha in the demonstration plot, which is more than the check (9.65 q/ha).

Tillering Stage of Kharif Groundnut KVK North Tripura

Rapeseed and Mustard

Rapeseed/mustard is a group of crops comprising rapeseed (toria, brown sarson and yellow sarson), cultivar of *Brassica campestris*; Indian Mustard (*Brassica juncea*); black mustard (*Brassica nigra*). Some exotic species of Brassicas like gobhisarson (*B. napus*), Ethiopian mustard or karanrai (*B. carinata*) and white mustard (*Sinapisalba*) have been brought into cultivation in India. The crops of rapeseed group are largely cross pollinated whereas Indian mustard is largely self-pollinated. Out of these cultivars Indian mustard fits well in cropping system of rainfed areas and accounts for >75% of the total areaunder rapeseed-mustard cultivation in India. Other cultivars like brown sarson and yellow sarson are under cultivation over a limited area in the Eastern part of the country including North-Eastern States. Cluster Frontline demonstrations (CFLDs) were conducted during Kharif season in 23 KVKs across Manipur, Mizoram, Meghalaya, Nagaland and Tripura. A total number of 783 demonstrations were conducted covering an area of 345 ha.

Technology demonstration

Use of Improved varieties: The varieties like TS-36, TS-67, TS-38 and NRCHB

- 101 were demonstrated.

Seed treatment: Seed treatment with Rhizobium 4gm/kg.

Nutrient management: Nutrient management with 80 kg N, 60 Kg P2O5 and 40 Kg K2O.

Zero Tillage: practice for moisture conservation.

Cropping system: Paddy-Mustard based cropping system

Integrated Pest Management of Mustard Aphid (*Lipaphiserysimi*) during Vegetative/ flowering and pod formation stage by spray of systemic insecticides *viz.*Monocrotophos, Oxydemeton Methyl *etc*.

Table 3: Characteristics of Some varieties of Rapeseed & Mustard used in demonstration

Variety	Characteristics
TS-36	TS 36 is suitable under late sown condition having a duration of 90-95 days. Sowing time is mid October to mid November. So, this variety can be grown after mid duration rice varieties in Rice based cropping system. The seed is medium in size. The potential yield is 12 q/ha. It is tolerant to water stress.

TS-38	It is a high yielding variety with a duration of 90-95 days and is suitable for timely and late sowing (up to 1st week, Dec) in rice fallows. The average number of pods per plant is 80 and average number of seeds/ pod is 72. The oil content is 44-46 %. The variety has a potential yield of 10-12 q/ ha. It is tolerant to White Rust and Alternaria blight.
TS-67	The variety is suitable in paddy-toria cropping sequence under late sown condition (up to 1st week of December). Plant type is Semi erect and medium in height with duration of 90-95 days.Oil content is 40.7-42.3 %. The yield is 10-12 q/ha in timely sown crop and 7.01 q/ha for late sown upto December.
NRCHB - 101	It is a long duration (130-150 days) variety. The plant height may range from 1 1.5 m depending upon the soil type and fertility status. Pod (siliqua) is medium appressed type with 150-200 pods/plant and 15-25 seeds per pod. It is a bold seeded type with a potential yield of 16-17 q/ha.

Performance of Rapeseed and Mustard during Rabi season (2022-23)

From the figure it is evident that the yield performance of improved varieties was highest than the local (check) varieties across all the states of Manipur, Meghalaya, Mizoram Nagaland and Tripura. However, highest average yield was obtained in the state of Meghalaya (9.59q/ha), followed by Manipur (8.11 q/ha), Nagaland (8.52q/ ha), Tripura (6.28 q/ha) and Mizoram yielded the least with average yield (3.6 q/ha).

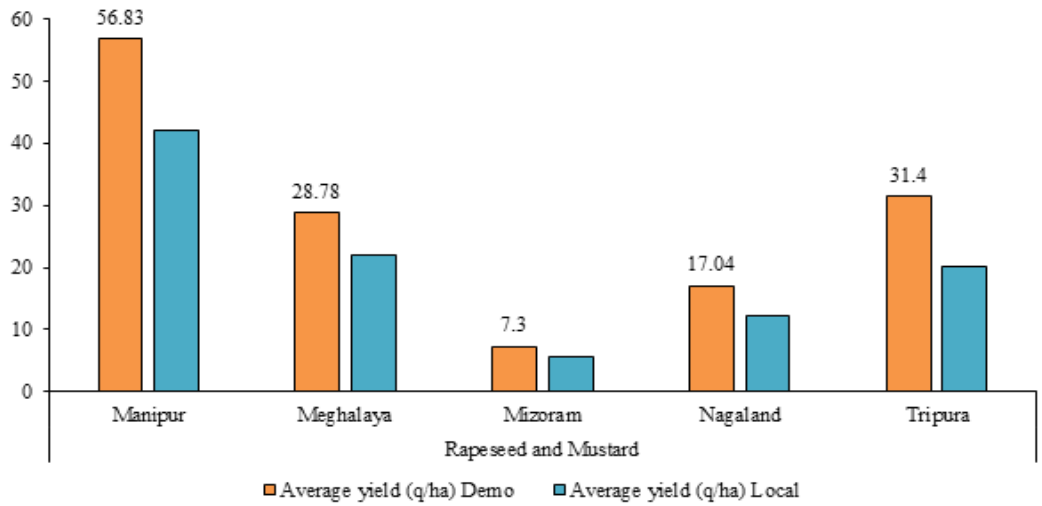

Fig: 2 State-wise yield of Rapeseed and Mustard during Rabi season (2022-23)

Rapeseed-mustard is the major source of income, especially for the marginal and small farmers in the rain-fed areas. Because of its low water requirement, rapeseed-mustard crops fit well in the rainfed cropping system. Current data of front line demonstrations revealed that the yield gap ranged from 13.81 % (Manipur) to 40.76 % (Tripura) among oilseeds growing states in the North Eastern region. This situation assures an urgent need to effectively disseminate the improved rapeseed mustard technologies among the oilseed growers, so that these gaps could be narrowed down.

Fig: Flowering stage of Rapeseed and Mustard

Sesamum

Sesame is commonly known as 'Til' in India, it is largely produced for its oil and is also usedas a flavoring agent. The seeds come in several colors like red, white, black, yellow, depending upon the variety of the seeds. Sesame seeds have high nutritive value and are used in numerous cuisines in North Eastern region. The seeds have high oil content around 55 %. Sesame oil is used in cooking and in preparation of salads and also finds its use in the production of margarine, soaps, pharmaceuticals, paints and lubricants. The residue left after the extraction of oil is known as the oil seed cake which is used as cattle feed.

Sesame grows well in sandy-loam to heavy black soils. It can be grown during all seasons in North Eastern Region. However, farmers are reluctant to cultivate summer sesame. Cluster Frontline demonstrations (CFLDs) were conducted during summer seasonin North Tripura. A total number of 50 demonstrations were conducted covering an area of 20 ha. In the demonstrated plot, the average production is 6.2 q/ha, which is greater than the local average of 4.43 q/ha with a yield increase of 40.9%.

Technology demonstration

Use of Improved varieties: The varieties which were used for demonstration are Tripura Siphing.

Seed treatment: Seed treatment with PSB@ 20 g/kg of seed.

Nutrient management: Application of Jeevamrita as a Component of Natural Farming, Application of lime@ 10% LR+ Application of FYM 5 t/ha.

Fig 1. Flowering sgate of crop

Fig 2. Healthy pants at vegetative stage

Fig 3. Plants are at pod formation stage

Soybean

Soybean is not only an important oilseed crop and feed for livestock and aquaculture, but also a good source of protein for human diet. Of late, it has also emerged out to be a major biofuel feedstock. It is one of the most important rainfed *Kharif* season crop which can grow properly despite low level of irrigation (<1% area under irrigation). In North east, soybean is cultivated in kharif season only. It is difficult to grow the crop in rabi season due to non-availability of irrigation facilities, poor water retention capacity of the soil, prolonged low temperature, frosting, free grazing of stray cattle, synchronization of harvesting time with pre monsoon. Though productivity of soybean is higher in North Eastern region, total area under cultivation is very low. Despite the limited area, soybean has good prospects for cultivation due to higher productivity and introduction of improved variety in this region. Cluster Frontline demonstrations (FLDs) on Soybean were conducted by KVKs of Manipur, Mizoram and Nagaland covering an area of 176 ha with 444 total number of demonstration during the year 2022-23.

Technology demonstration

Variety: JS 9560, VL 77, DSb-19, JS-335

Seed treatment with Rhizobium spp. @50g+10 g sugar per kg seed.

Nutrient management: NPK 40:60:40 kg/Ha,

Line spacing 45X15 cm

Table 4: Performance data of Soybean during Kharif (2022-23)

Sl. No	Crops	State	Average yield (q/ha)		Yield increase (%)	Yield Gap
			Demo	Local		
1	Soybean	Manipur	49.68	37.85	94.35	11.83
2		Mizoram	29.2	20.1	54	9.1
3		Nagaland	49.45	38.3	93.56	11.15

The highest productivity of the demonstration field obtained was from KVKs of Manipur 49.68 q/ha with a percent increase of 94.35% over local variety (check) (37.85 q/ha), followed by KVKs of Nagaland 49.45 q/ha in demonstrated plot as compared to the local (38.3 q/ha) with yield increase of 93.56 %. The minimum production of soybean was from KVKs of Mizoram in demonstrated plot (29.2 q/ha) as compared to local (20.1 q/ha) with an increase yield of 54 %.

Fig: CFLD on Soybean

Sunflower

Sunflowers are mostly native to North and South America, although certain varieties are grown as ornamentals due to their magnificent size and bloom heads, as well as their edible seeds. It is an annual herb with a rough hairy stem that grows 1-4.5 metres (3-15 feet) tall and broad, coarsely serrated, rough leaves that grow in spirals. The gorgeous flower heads are 7.5-15 cm wide in wild specimens and 30 cm or more in cultivated varieties. The disc blooms are brown, yellow, or purple, while the ray flowers have yellow petals. A single-seeded achene is the fruit. Oilseed types typically have little black achenes, whereas confection kinds, which are developed for direct seed eating, have larger black-and-white achenes that easily detach from the seed within. The common sunflower is valuable both economically and as a decorative plant. The leaves are used as fodder, the flowers provide a yellow colour, and the seeds

contain oil and are eaten. For table use, the delicious yellow oil obtained by pressing the seeds is considered equivalent to olive or almond oil. Sunflower oil cake is fed to livestock and fowl. The oil is also used as a lubricant and in soap and paint. The oil is also used as a lubricant and in soap and paint. The seeds can be consumed dry, roasted, or mashed into nut butter.

Technology demonstration

Variety: DRSH 1

Seed treatment: Fungicide @ 2 g per Kg of Seed

Nutrient management: NPK 40:40:20 Kg/Ha, PSB @ 40 g/ Kg Seed**.** 50 % N, Full P & K at Sowing, 50 % N top dress in two equal split @ 30 DAS & 30 days thereafter.

Table 5: Performance data of Sunflower during summer (2022-23)

Sl. No	Crops	State	Achievements of FLDs		Average yield (q/ha)		Yield increase (%)
			No. of Demos	Area (ha)	Demo	Local	
1	Sunflower	Mizoram	50	20	11.5	8.5	26

Sunflower production from Mizoram during summer 2022-23 was 11.5 q/ha in demonstrated plot as compared to local (8.5 q/ha) covered an area of 20 ha with 50 numbers of demonstration having yield increase of 26%.

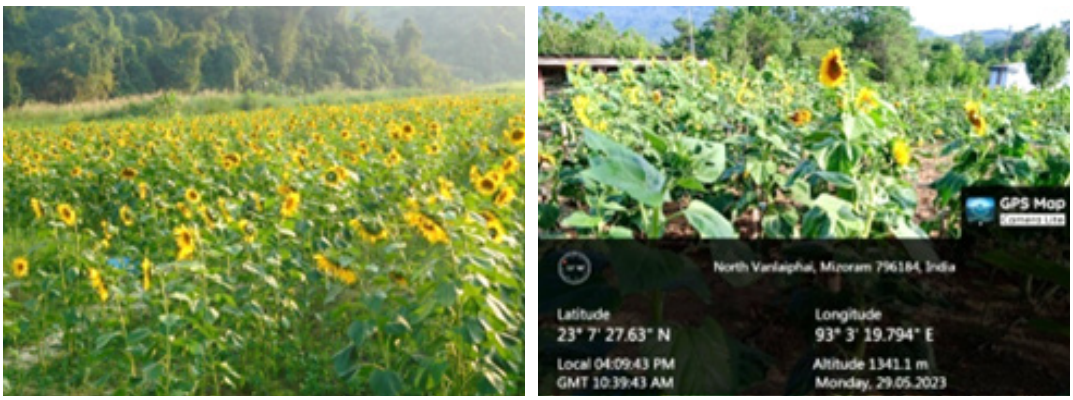

Fig: Sunflower field in Serchhip, Mizoram

Capacity Building

Table 6: Extension activities conducted during 2022-23 under Cluster FLD Oilseeds programme

Season Extension	Activities	No. of Programme	Number of participants	No. of KVKs
Kharif	Farmers training	19	484	10
	Field day	5	134	5
	Group meeting	19	262	9
	Others	14	110	4
Rabi	Farmers training	37	873	17
	Field day	15	431	12
	Group meeting	32	554	16
	Others	56	706	12
Summer	Farmers training	1	21	1
	Field day	2	45	2
	Group meeting	1	20	1
	Others	2	35	1
Total (Training)		57	1378	28
Total (Field day)		22	610	19
Total(Group meeting)		52	836	26
Total Others		72	851	17

In 2022–2023, a total of 57 training sessions totaling 1378 participants were organized by 28 KVKs during the kharif, Rabi, and summer seasons. Additionally, 19 KVKs conducted 22 field days during this same period, involving 610 participants. There were 836 participants in all 52 group meetings, led by 26 KVKs.

Fig: Extension acticities Under CFLD Oilseeds

Success stories

Potential of groundnut cultivation in North Tripura-A Success Story.

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**

Introduction and background of the farmer

Mr. Ashim Chandra Das of age forty four is a marginal farmer in the Brajendranagar area under Kadamtala RD Block of North Tripura district. He simply cultivates paddy and vegetable in one year. In the month of April-May he cultivate paddy and besides he grows vegetables such as, brinjal, ridge gourd, cowpea and okra. During winter he mostly grows pumpkin, potato, Tomato, green chilliknol-khol etc. The farmer has 4 members including him in his family for his children's education and nutrition he expends about Rs. 7000/- per month. The yield of his field is mainly for his own consumption and remaining he sell in the market to get some income.Due to the location of his cultivated land near the river bank of *Juri,* it has a great potential to grow crops rather that paddy with minimum doses of fertilizer. But due to lack of proper guidance and knowledge he was not able to utilize his land for growing some high value crops.

Introduction and background of the technology

Groundnut being an important oilseed crop it is also known as an unpredictable crop that has the capacity to fix nitrogen from the atmosphere with root nodules. In general groundnut contains 20% protein and 40% oil in its kernel. The popularity of groundnut oil is just after the mustard oil. The crop grows well in the sandy loam soil in light textured soils with 4-5 months duration. The groundnut variety *Kadiri Lepakshi (K 1812)*release in the year 2020 contains 51% oil suitable for both kharif and rabi season. In kharif its duration is 112 days with 70% shelling percentage. It is a very high yielding, profuse bearing Spanish variety with high oil and high protein. Multiple resistant for drought, pests and diseases with 15-20 q/ha stable yield.

Fig 1. Pod formation at different stages of crop growth stage

Intervention Process and intervention of technology in farmers' field

The farmer has visited several times in KVK and had an interaction with the Scientists of KVK north Tripura, he was interested to grow some high value crop such as groundnut as seed production purpose to generate some extra income. He was select as beneficiary under NFSM oilseed project 2022-23 and cultivated 0.16 hectares of land and sown seeds in rabi season. He was provided Lime and boron to enhance fertility of his field and advised him to apply N: P: K from Urea, SSP and MOP @ 30:60:40 kg/ha. Lime was applied @ 500 kg/ha in furrow and B applied @ 1 kg/ha (borax @ 9 kg/ha). Rows were made at 30 cm apart and seed were sown at 10 cm apart distance in ridge and furrow method.

Output & outcome

At harvest Mr. Ashim Chandra Das has harvest 2,187.5 kg of pod per hectare with total cost of cultivation Rs. 1,47,125/- per hectare. His total income was Rs. 2,18,750/- per hectare with Rs. 71,625/- net income and B:C ratio of 1.45:1. He average selling price was Rs. 100/- per kg

Fig 2. Crop growth stage at different stages


Fig 3. Field day programme on farmers field

Farmers' feedback

Farmer was happy to cultivate a new crop in first time under minimal management practice, where the other villagers were also encouraged to grow such crops in next season.

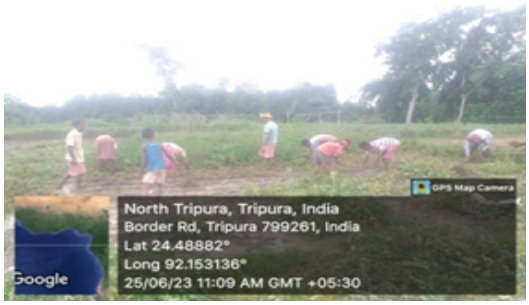

Fig. Farmer at harvest of crop

Hurdles for the farmer

During adopting and implementing the project under NFSM oilseed programme farmer faced the following problems such as:

1. Low confidence to take up a new crop with risk
2. Less experience about the detailed cultivation and management practices.
3. Less availability of water for irrigation as the crop was grown in rabi season in the month of December.

Impact of the technology

He supplied around 150 kgs of seed to KVK and eagerly wants to grow other varieties of groundnut for more yields in next season with horizontal expansion of area. He has gain experience in groundnut cultivation and encourages more famer to adopt such crops to enhance income and livelihood.

Success story on Tripura Siping- a promising sesame variety for Doubling Farmers' Income (DFI)

KVK North Tripura, Panisagar

Name of farmer	:	Abdul Rob
Address	:	Palgaon, West Tilthoi
Contact No	:	8732052958
Education	:	Class V Pass
Agri. Experience	:	30 years (from 1993)
Total Land holding	:	2 hectare

Introduction and background

Mr. Abdul Rob is known as innovative and progressive farmer of west Tilthoi, Palgaon area under Jubarajnagar block. Many farmers of his village visit his farm and take his advice about new technologies and interact with him regarding different practices under rainfed cultivation. He cultivate paddy in both Aus & Aman season starting from March-April and continues up to November-December. Besides the paddy cultivation he also engaged with cultivation of summer vegetables such as Brinjal, chilli (12 month duration), colocasia, Tomato etc., whereas, in rabi season he cultivates different cole crops such as, cabbage, cauliflower, knolkhol, radish etc. He sells his vegetables in nearby Panisagar market biweekly. Still he noticed that all his land are not completely utilized and suitable for vegetable cultivation that remains fallow for a long period of time, from where he can actually earn some income with a short duration cops such s Mustard or Sesame. This situation compelled him to turn towards diversified agriculture.

Need of the technology

The farmer is well recognized for his successful and diversified farming. He cultivates Paddy (0.8 ha), Brinjal (0.4 ha), Chilli (0.25 ha), Pea (0.25 ha), potato (0.4 ha). He usually cultivated black Til in his 0.16 hectares land from where he usually got only 40 kg due to its less production of pods/plant, however he also mentioned that he was not aware the proper package and practices of sesame cultivation. The unavailability of good quality of seed is also another reason for delay in sowing which ultimately graves an unsatisfactory yield.

Intervention made by KVK

Although the farmer was successful as a rice-vegetable farmer but he was eager to grow good variety of sesame as it can add a good amount of return to his profit.

In the year 2022-23 he got 2 kgs of sesame seed var. *TRIPURA SIPING*(released from ICAR RC NEH Region, Tripura center)from KVK North Tripura under CFLD scheme of NFSM project of oilseed. The variety if brownish white in color which became very famous among the farmers later on, however the number of pods per plant is reported as on an average 80 per plant which is also much higher that their earlier variety with very rare pest and disease infestation reports. The scientist from KVK also visited his farm and advised him to grow the crops during the month of March before onset of pre-monsoon rainfall with line sowing method. As per the advice of the KVK scientist he also applied boron (source: borax powder @ 9 kg/ha) @ 1kg/ha as micronutrient along with FYM, prior to sowing and cultivated sesame in 30 cm row distance. Thus with sound guidance and support of KVK scientists, regular study of technologies and their application in agriculture he has developed his confidence in oilseed farming.

Fig 1. Flowering sgate of crop

Fig 2. Healthy pants at vegetative stage

Fig 3. Plants are at pod formation stage

Output and Outcome

After the final harvest of the crop he received 95 kg sesame from 0.16 hectare (1 kani) of land. However he kept around 5 kgs for his family consumption and 90 kg he sold in market @ 150/- per kg.

Table-1: comparison of yield and economics of the sesame variety under CFLD

Sl. No	Name of the variety	Yield (kg/ha)	Yield increase over local variety (%)	Gross cost (Rs.)	Gross return (Rs.)	Net Return (Rs.)	B:C Ratio
1	Local (black Til)	562.50	63.6	34375.0	84375.0	50000.0	2.5
2	Tripura Siping (brown Til)	343.75		29375.0	34375.0	5000.0	1.2

Hurdles during adoption of the technology

The farmer has also faced some bellow mentioned problem during the adoption of the technologies such as:

1. Long dry spell due to irregularity of rainfall which gave less germination percentage
2. Less irrigation facility to irrigate the crops during pre-flowering stage
3. Less availability of farm labours
4. Moderate to heavy rainfall on prior to harvesting

Impact of the technology

1. Changes in crop diversification, selection of crop types, improved variety and production technology in cropping system, helped him to generate remarkable farm income *i.e.* around Rs.8000/- per kani.
2. Feedback collected from the farmers experience explained that, application of borax @ 1.45 kg/kani improved the structure of pods and number of seeds per pod.
3. The technology has given more emphasis on oilseed crop cultivation among other farmers around the locality.
4. Due to successful experiments in diversified agriculture his socio-economic status has increased to recognizable level.

Success Story on"NRCHB-101"- A promising mustard variety under rainfed situation of North Tripura

Name of farmer	:	Abdul Rob
Address	:	Palgaon, West Tilthoi
Contact No	:	8732052958
Education	:	Class V Pass
Agri. Experience	:	30 years (from 1993)
Total Land holding	:	2 hectare

Introduction and Background of the farmer

Mr. Abdul Rob a well-known and established farmer of Palgaon area of Paschim Tilthoil village under North Tripura district. Paschim Tilthai village is located in Panisagar subdivision of North Tripura district in Tripura, India. It is situated 8km away from sub-district headquarter Panisagar (tehsildar office) and 25 km away from Dharmanagar (district headquarter). The total geographical area of village is 1365 hectares. Paschim Tilthai has a total population of 1,313 peoples, where maximum of the peoples are dependent on agriculture for their livelihood. Rice-vegetable cropping system is the dominant cropping system in the village under complete rainfed situation only. However scientific and technical knowledge about the cultivation or farming is the major problem of low income standard of living of the farming community of the village. The farmer has 8 family members and agriculture is his only profession of earning income.

Adoption of the technology

The farmers has experienced in cultivating the mustard crops but due to lack of proper knowledge in cultivating process, lack of suitable variety, improper nutrient management practices he was not able to achieve a good yield of mustard. The aim of mustard cultivation is to extraction of oil which required for his family consumption, however remaining seeds he sold out in market @ 60 kg. His traditional variety provide on average 60 kg mustard from one kani of land. In the year 2022-23 he visited KVK north Tripura and discussed his problem regarding mustard cultivation, the scientist of KVK suggested him to cultivate NRCHB 101variety with scientific method of cultivation. He was encouraged to apply lime @ 500 kg/ha (80 kg/kani) at least 20 days prior to sowing along with line sowing method. He also adopted the technology on integrated nutrient management i.e. application of FYM @ 3 t/ha + N:P:K @ 30: 40: 40 + Boron (borax) @ 1.0 kg/kani.

Fig1.: Field preparion and making rows for sowing mustard

Output and Outcome

The farmer has adopted the technology as per given suggestion of KVK scientist and achieved 180 kg mustard from 0.24 hectare land with 750 kg production per hectare.

Fig 2.: Performamce of the crop at flowering stage

Table 1: comparison of yield and economics of the sesame variety under CFLD

Sl. No	Name of the variety	Yield (kg/ha)	Yield increase over local variety (%)	Gross cost (Rs.)	Gross return (Rs.)	Net Return (Rs.)	B:C Ratio
1	Local	530	41.5	12575	31800	19225	2.5
2	NRCHB-101	750		17968	67500	49532	3.8

Due to adoption of scientific cultivation practice under guidance of KVK scientist the farmer earned a good harvest of the crop which gives 41.5% more yield over local check.

Hurdles during adoption of the technology

The farmer has also faced some bellow mentioned problem during the adoption of the technologies such as:

1. Reduction of expected yield due to less availability of supplemental irrigation at pre flowering and pod formation stage
2. Less interest to grow as sole crop due to unavailability of oil extraction mill.

Impact of the technology

1. After the seeing the performance of CFLD on NRCHB-101of Mr. Abdul Rob, neighbouring farmers are very enthusiastic and agree to grow thus variety as a sole crop instead of their practice of mixed cropping with potato & Rajhma.
2. Farmers preferred short duration late sown variety, so that they can grow mustard in rice fallow area with limited irrigation facility.