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Impact of Technologies on Oilseeds Production in North Eastern Region

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Impact of Technologies on Oilseeds Production in North Eastern Region

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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. The total vegetable oils demand is likely to touch 20.4 million tonnes in India by 2017 to meet up the demand of the projected population of 1276 million. It is therefore, 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 in last three years. During 2016-17, ICAR-ATARI, Umiam through its 32 KVKs across Northeast India conducted 3634 nos. of demonstrations covering an area of 1500 ha in five different oilseed crops, viz. Rapeseed & mustard, linseed, sesame, groundnut and soybean. The average increase in yield was in the range of 22.97% (Soybean)-81.39% (linseed) compared to farmers' practice.

This publication focuses on major technologies popularised among the farmers through the cluster frontline demonstrations in the commonly grown oilseed crops such as Rapeseed & Mustard, Linseed, Sesame, Soybean and Groundnut in the state of Assam, Manipur, Nagaland and Tripura. We express our sincere thanks and gratitude to DAC, Ministry of Agriculture and Farmers' Welfare, Govt. of India, Dr. A.K. Singh, DDG (Ag. Extension), Dr. V.P. Chahal, 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 RAs/ SRFs/ DEOs for successfully conducting the demonstrations and bringing out this publication.

(Bidyut C. Deka)
Director

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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, Linseed, Sesame, Soybean and Groundnut during the year 2016-17.

Achievements during 2016-17

Under ICAR-ATARI, Umiam, 32 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.

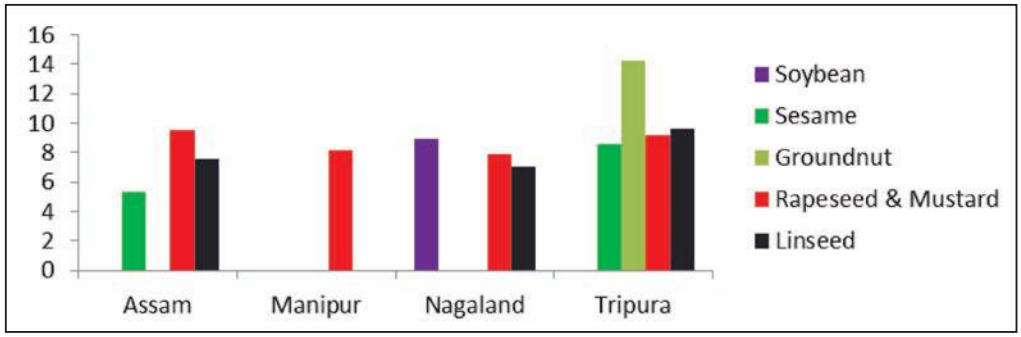
A total of 1500 hectare area was covered for the purpose with 3634 nos. of demonstrations. The cluster demonstration on oilseeds include rapeseed and mustard (var. TS-36, TS-38, TS-46, TS-67, JT- 90-1), linseed (var. T-397, Padmini, NL 165 and Ruchi), Sesamum (var. ST-1683, Bahaubheti, Kaliabor and Nagaontil), Groundnut (var. TG-38) and Soybean (var. JS-335).

The average production rate of rapeseed and mustard during 2016-17 was found to be highest in Assam (9.55 q/ha) followed by Tripura (9.2 q/ha). FLD's on Soybean were conducted by KVK Mon with the variety JS-335. The productivity obtained was 8.94 q/ha with a percent increase of 22.97%. FLD's on Groundnut were conducted by KVKs of Tripura with an average productivity of 10.75 q/ha. The average productivity of Sesamum was highest in Tripura (8.56 q/ha). In Linseed, Tripura obtained the highest productivity of 9.63 q/ha.

Table 1: Summary of CFLD on oilseeds during 2016-17

Sl. No.	Crops	State	Target of FLDs approved		Achievements of FLDs		Average yield (q/ha)		Difference of yield between demo and local (q/ha)	Yield increase (%)
			No. of Demos	Area (ha)	No. of Demos	Area (ha)	Demo	Check		
Kharif season										
1	Sesamum	Assam	600	240	568	240	6.61	4.57	2.04	44.64
		Tripura	75	30	95	30	8.56	4.9	3.66	74.69
2	Groundnut	Tripura	150	60	197	60	14.21	8.67	5.54	63.89
3	Soybean	Nagaland	75	30	61	30	8.94	7.27	1.67	22.97
	Total (Kharif)		900	360	921	360	7.20	5.21	1.99	38.20
Rabi season										
1	Rapeseed & Mustard	Assam	1525	610	1466	610	9.55	6.91	2.64	38.21
		Manipur	150	60	114	60	8.18	7.05	1.13	16.03
		Nagaland	150	60	122	60	7.94	6.03	1.91	31.67
		Tripura	200	80	193	80	9.2	5.45	3.75	68.81
2	Linseed	Assam	450	180	386	165	7.57	5.07	2.50	49.31
		Nagaland	175	70	164	70	7.08	5.07	2.01	39.64
		Tripura	75	30	104	30	9.63	3.23	6.40	198.14
3	Sesamum	Assam	25	10	25	10	4.5	4	0.50	12.50
	Total (Rabi)		2750	1100	2574	1085	7.96	5.35	2.61	48.68
Summer Season										
1	Sesamum	Assam	200	80	139	55	5	3.36	1.64	48.81
	Total (Summer)		200	80	139	55	5	3.36	1.64	48.81
Total (Kharif+Rabi+Summer)			3850	1540	3634	1500				

Fig 1:State-wise productivity in quintals per hectare of Oilseed crops under NMOOP 2016-17



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.

Frontline demonstrations (FLDs) of groundnut were conducted during Kharif season in two KVKs *i.e* Dhalai and North Tripura. A total number of 197 demonstrations were conducted covering an area of 60 ha.

Technology Demonstration

To improve the productivity of groundnut various technologies like HYV, skipped row method of sowing, seed treatment and INM were demonstrated in farmers fields.

Variety TG 38: The yield potential of this variety is 2768 kg/ha with 48 % oil content. It is recommended for the states of Orissa, West Bengal and North-Eastern states. It is tolerant to stem rot.

Seed Treatment with *Trichoderma viride* @ 4 g/kg of seed and *Pseudomonas flouresence* (10 g/kg seed) for controlling soil born disease and alleviate in nitrogen fixation of crop.

Application of micronutrients to correct nutritional disorders: Borax 10 kg + Gypsum 400 kg/ ha was applied at 45th day after sowing

Calcium Sulphate (Gypsum) @ 400 kg/ha was applied by the side of the plants on 40th to 70th day depending upon soil moisture

Table 2: Performance of Groundnut (TG 38) during Kharif (2016-17)

S.No	KVK	Area (ha)	Number of farmers	Avg. Yield		Yield gap (%)	Gross returns (Rs/ha)	
				Check	Demo		Check	Demo
1	Dhalai	30	133	8.61	14.75	42	55000	75000
2	North Tripura	30	64	9	11	18	36900	45100
Total		**60**	**197**					

Performance of groundnut:

In Groundnut, the variety taken up is TG-38. Highest Yield was obtained with the demonstrations conducted by KVK Dhalai (14.75 q/ha) as compared to check (local) (8.61 q/ha). Also the net return of the demonstration variety was higher in Dhalai (Rs. 51334/-) as compared to North Tripura (Rs. 17425/-).

Vegetative Stage of Kharif Groundnut, KVK North Tripura

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*) and taramira (*Erucasativa*). Some exotic species of Brassicas like gobhi sarson (*B. napus*), Ethiopian mustard or karanrai (*B. carinata*) and white mustard (*Sinapis alba*) 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 area under 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.

Frontline demonstrations (FLDs) were conducted during Kharif season in 31 KVKs across Assam, Manipur, Nagaland and Tripura. A total number of 1894 demonstrations were conducted covering an area of 810 ha.

Technology demonstration:

Use of Improved varieties: The varieties like TS-36, TS-67, TS-38, TS-46, B-9, YSH-401, NRCHB - 101 and TRC T-1-1-5-1 were demonstrated.

Seed treatment: Seed treatment with Azotobacter and PSB @ 40g each/kg of seed.

Nutrient management: Nutrient management with 40 kg N, 35 Kg P_2O_5 and 15 Kg K_2O.

Zero Tillage practice for moisture conservation

Apiculture: 5-6 honey bee colonies were installed for enhanced pollination to increase the production and productivity of Toria/Mustard.

Cropping system: Paddy-Mustard based cropping system

Integrated Pest Management of Mustard Aphid (*Lipaphis erysimi*) 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 a 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.
TS-46	Duration of the variety is 90 days. The oil content is 44 %. The potential yield of the variety is 10-12 q/ha.
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.
YSH-401	It is a bold seeded, high yielding variety, semi dwarf in nature with a duration of 113 days after sowing. It is suitable in rice-cropping system. It has an oil content of 44 % with a potential yield of 12-16 q/h.
M-27	It is a short duration crop of 90-95 duration and suitable under rainfed condition for Orissa, Assam and NEH region. The oil content is 44.6 % with an average yield of 10- 12 q/ha.
TRC Toria 1-1-5-1	TRC Toria 1-1-5-1 selected the cross (YSP-842 x YST-8501) x SS-I. Seeds are bold and black in colour. The potential yield is 13 q/ha. The oil content is 42.6 %.
Pitambari	It is released for cultivation in the states of Uttar Pradesh, West Bengal, Haryana, Bihar, Gujarat, Uttrakhand and Manipur. The height of the plant is 135-145 cm. The crop duration is 110-115 day with an average yield of 15.36 q/ha.
B-9	The duration of the crop is 90-95 days. It is recommended for West Bengal and North Eastern Region. Oil content is 46 %. It is drought resistant with compact branching. The average yield is 10 q/ha.

Performance of Rapeseed and Mustard during Rabi season (2016 17)

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 Assam, Manipur, Nagaland and Tripura. However, highest yield was obtained in the state of Assam (9.5 q/ha) followed by Tripura (9.2 q/ha) where the varieties like YSH-401 and TS-36, TS-38, TS-67 were demonstrated in Tripura and Assam, respectively.

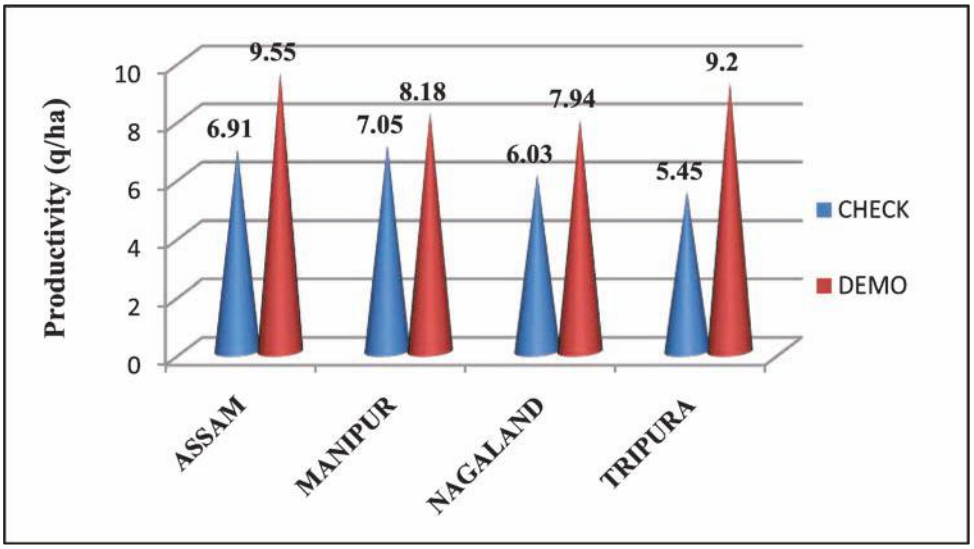


Fig. 2: Yield performance of Rapeseed and Mustard during Rabi season (2016-17)

Table 4: Yield gaps recorded under FLDs of Rapeseed and Mustard during Rabi (2016-17)

Sl. No	State	Check	Demo	Yield gap (%)	No. of KVKs
1	Assam	6.91	9.55	27.64	23
2	Manipur	7.05	8.18	13.81	2
3	Nagaland	6.03	7.94	24.06	2
4	Tripura	5.45	9.2	40.76	4

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.

FLD's on Toria

Flowering stage of Rabi Toria, KVK Chirang

Participation of women in CFLD on Rabi Rapeseed, KVK Barpeta

CFLD on Rabi Toria, KVK Imphal East

Pod formation stage of Rabi Toria, KVK Khowai

Linseed

Linseed (*Linum usitassimum* L.) belongs to the family Linaceae is cultivated for seeds and fibre. Linseed occupies a greater importance among oilseeds owing to its various uses and special qualities. It is grown mainly for extracting oil in rainfed conditions. The oil content of the seed varies from 33-47 %. Linseed oil is excellent dyeing oil and is used in manufacturing paints and varnishes, oilcloth, waterproof fabrics and linoleum and as edible oil in some areas. Linseed cake is a very good manure and animal feed. Linseed straw produces good quality fibre. Linseed is also used in making paper and plastics. Therefore, it is also known as plastic crop.

Frontline demonstrations (FLDs) were conducted during Kharif season in 12 KVKs across Assam, Nagaland and Tripura. A total number of 654 farmers were benefitted with the demonstrations covering an area of 265 ha.

Technology demonstration:

Use of Improved varieties: The varieties like T-397, Ruchi, Sharda, Parvati and Sekhar were demonstrated. Details on some recent releases suitable for different regions are given in the table 5.

Cropping system: Paddy-linseed based cropping system

Table 5: Characteristics of varieties of Linseed used in demonstration

Variety	Characteristics
T-397	It is a high yielding variety developed through pedigree breeding of T 491 and 1193-2. It has a duration of 130 days. The seed is small in size. The oil content is 44 %. It has high percentage of linolenic acid. The potential yield is 8-10 q/ha.
Shekhar	It is high yielding variety suitable for late sowing and highly adapted under rainfed condition. It is developed through pedigree breeding of Laxmi 27 and EC 1387 with a potential yield of 12-13 q/ha. It is resistant to Powdery mildew and bud fly. It is tolerant to alternaria blight and wilt.
Ruchi	Recommended for Uttar Pradesh, Bihar, Jharkand, West Bengal, Assam & NEH Region. It is highly suitable under rainfed condition. Oil content is 39.84 %. It has a potential yield of 11 q/ha.
Parvati	It is suitable for U.P, Bihar, West Bengal, Assam and Kota, commands areas of Rajasthan under irrigated conditions. It has a test weight of 7.5-7.8 g. The yield of the variety is 16.00 q/ha. The oil content is 42 % and is resistant to rust and powdery mildew.
Sharda	It is dwarf, early duration variety and recommended for rice fallow cropping system. The oil content is 41.32 % with a potential yield of 11 q/ha.

Yield performance of linseed during Rabi (2016-17)

The yield performance of linseed during rabi (2016-17) was highest (9.63 q/ha) in the state of Tripura followed by Assam (7.57 q/ha). The varieties like Sekhar and T-397 outperformed over the local check in the states of Tripura and Assam respectively.

CFLD on Rabi Linseed, KVK Morigaon

CFLD on Rabi Linseed, KVK Wokha

Table 6: Yield gaps recorded under FLDs of Linseed during Rabi (2016-17)

Sl. No	State	Check	Demo	Yield gap (%)	No. of KVKs
1	Assam	5.4	7.57	28.67	8
2	Nagaland	5.07	7.08	28.38	3
3	Tripura	3.23	9.63	66.49	1

It was observed from the results of FLD's data with improved production technologies that there exists a wide yield gap in Linseed under demonstration across the 3 state of North Eastern region *i.e* Assam, Nagaland and Tripura. From the table 6 it evident that the yield gap was ranging from 28.38 % in Nagaland to 66.49 % in Tripura.

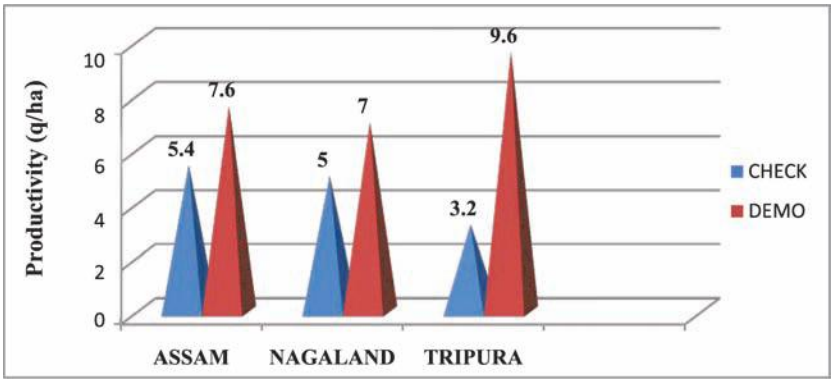


Fig. 3: State-wise yield of Linseed during Rabi season (2016-17)

Sesamum

Sesame is commonly known as 'Til' in India, it is largely produced for its oil and is also used as 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 the plains of Assam and Tripura up to an elevation of 1200 m. It is well grown 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.

Frontline demonstrations (FLDs) were conducted during Kharif, Rabi and Summer season in 14 KVKs across Assam and Tripura. A total number of 827 demonstrations were conducted covering an area of 335 ha.

Technology demonstration

Use of Improved varieties: The varieties which were used for demonstration are ST-1683, Kaliabor, NagaonTil, Bahuabheti and Tilottama.

Seed treatment: Seed treatment with Carbendazim @ 2 g/ kg of seed, Phosphate Solubilizing bacteria @ 150 g/ 3 kg of seed and Azobacter @ 40 g/ kg to solubilize phosphorous in the soil

Nutrient management: Applications of vermicompost @ 220 kg/ha. Integrated nutrient management with 30 kg N, 20 Kg P_2O_5 and 20 Kg K_2O.

Weed management: Some of the common weeds are Amaranthus sps., Celosia sps., Paspalum sps., Corchorus sps., Cyperus sps *etc* which are controlled by hand weeding at 15, 30, 45, 55 DAS.

Table7: Characteristic of Some varieties of Sesamum used in demonstration

Variety	Characteristics
ST-1683	It is a high yielding variety having the duration of 95-100 days. The average number of branches is 5 and average number of capsules is 32. The seed is brown in colour and has a potential yield of 7-9 q/ha.
Kaliabor Til	It is a high yielding variety suitable for both kharif & summer seasons. The seed is small and black in colour highly suitable for Assam. It has a duration of 90-95 days with potential yield of 9 q/ha.
Bahaubheti	The duration of the crop is 110 days with 6 average number of branches and 32 average number of capsules. The potential yield is 7 q/ha.
Tilottama	It is a short stature variety, blackish brown seeded. The crop duration is 75-80 days with a potential yield of 15 q/ha. The oil content content is 40 %. It is resistant to Macrophomina stem/root rot, Phyllody and Bihar hairy caterpillar

Performance of Sesamum

In Tripura, FLD's on sesamum were conducted by KVK Dhalai with an average productivity of 8.56 q/ha and 74.69 % increase over local variety. In Assam, the average productivity was highest in Bongaigaon (8.15 q/ha) followed by Chirang (8.05 q/ha). During Rabi Season, FLDs were conducted by KVK Golaghat with the variety Bahuabheti. The productivity obtained was 4.5 q/ha with a percent increase of 12.50 %. In Summer, highest average productivity was obtained in Karbi Anglong (6 q/ha) with 20 % increase over local (check).

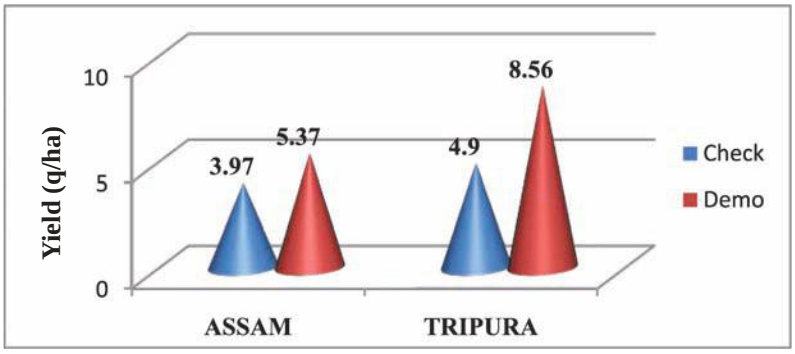


Fig. 4: State-wise yield of Sesamum during Kharif season (2016-17)

Table 8: Yield gaps recorded under FLDs of Sesamum (2016-17)

Sl. No	State	Check	Demo	Yield gap (%)	No. of KVKs
1	Assam	3.97	5.37	26.07	12
2	Tripura	4.9	8.56	42.76	1

There is a wide yield gap between demonstration fields with improved technology and the farmer field (check). Under cluster frontline demonstration, the yield gaps are 26.07 % and 42.76 % for Assam and Tripura respectively. The yield gap is maximum in Tripura (42.76 %) which calls for an effective mechanism of improved sesamum production technology to the farmers so that yield could be tackled.

Flowering stage of Summer Sesamum, KVK Nagaon

Pod formation stage Summer Sesamum, KVK Morigaon

CFLD on Kharif Sesamum, KVK Kamrup

CFLD on Kharif Sesamum, KVK Sonitpur

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 KVK Mon of Nagaland covering an area of 30 ha with 61 total number of demonstration during the year 2016-17.

Technology demonstration

Seed treatment with rhizobium culture @ 10 kg/ha for enhancing nitrogen fixation in plant through improved root nodulation.

Weed Management Manual weeding at 35 days intervals was followed to remove unwanted plant.

Diseases management Spraying of Dithane M-45 @ 0.2 % at 15 days intervals to control seedling rot which usually occur after germination.

Table 9: Characteristics of Soybean (JS 335) variety used in demonstration

Variety	Characteristics
JS-335	JS-335 is developed by pedigree breeding method of JS78-77 (Kohar x P.S. 73-22). It is an early maturity crop with a duration of 99 days. The oil and protein content is 18.12 % and 40- 41 % respectively. The potential yield is 25-30 q/ha. It is resistant to bacterial pustules, bacterial blight, green mosaic virus and Alternaria leaf spot, tolerant to bud blight. It is tolerant to stem fly suitable for early sowing under rainfed and irrigated conditions, suitable for double cropping suitable for shallow light to moderately & heavy deep black soil.

Table 10: Performance data of Soybean during Kharif (2016-17)

S.No	KVK	Area (ha)	Number of farmers	Avg. Yield		Gross returns (Rs/ha)	
				Check	Demo	Check	Demo
1	Mon	30	61	7.27	8.94	6810	11820

The productivity of the demonstration field obtained was 8.94 q/ha with a percent increase of 22.97 % over local variety (check) (7.27 q/ha). Frontline Demonstrations of Soybean were conducted during kharif 2016 indicates a yield gap of 19 % over average yield of local check (Table 10).

FLDs on Soybean

Fruiting Stage of Kharif Soybean, KVK Mon

Pod formation of Kharif Soybean, KVK Mon

Scenario of Oilseed crops in North Eastern Region

Table 11: Scenario of CFLD Oilseeds in North Eastern Region during 2016-17

Sl. No.	Crop	No. of Farmers/ Demo.	Area (ha)	Average yield (q/ha)		Avg. % Increase	Avg. cost of cultivation (Rs./ ha)		Avg. Benefit Cost ratio
				Demo.	Check		Demo.	Check	
1	Linseed	654	265	8.09	4.46	81.39	16988	15076	2.2
2	Rapeseed & Mustard	1895	810	8.72	6.36	37.11	18240	16230	2.24
3	Sesamum	827	335	6.96	4.43	57.11	19508	16398	2.41
4	Groundnut	197	60	14.21	8.67	63.89	43838	37338	1.4
5	Soybean	61	30	8.94	7.27	22.97	15000	15000	1.78
	Total	**3634**	**1500**						

Table 12: State-wise oilseeds crop with highest yield

State	KVK	Crop	Demo	Area	Highest (q/ha)	Reasons
Tripura	Dhalai	Groundnut	133	30	18.33	Newly introduced variety (TG-38)
Assam	Nagaon	Linseed	51	20	9.85	Latest improved varieties were used
Nagaland	Dimapur	Linseed	50	20	10.12	Use of improved variety and other scientific practices
Tripura	Dhalai	Linseed	104	30	11.3	Newly introduced variety
Assam	Sonitpur	Mustard	100	40	14.5	HYV and INM/IPM package
Manipur	Thoubal	Mustard	41	30	13.4	Reason for high- Timely sowing, maintainance of plant population, correct nutrient management, seed treatment, proper pest management.
Nagaland	Mon	Mustard	47	30	9.24	HYV
Tripura	Dhalai	Mustard	58	20	13.5	Newly introduced variety
Assam	Chirang	Sesame	35	30	8.5	Adoption of high yielding variety accompanied by integrated crop management technique
Tripura	Dhalai	Sesame	95	30	9.86	Package & practices is well adopted by the farmer. New improved variety (Tillotama)
Nagaland	Mon	Soybean	61	30	9.7	Due to biofertilizer (rhizobium- as seed treatment).

Table 13: State-wise oilseeds crop with lowest yield

State	KVK	Crop	Demo	Area	Lowest (q/ha)	Reasons
Tripura	North Tripura	Groundnut	64	30	9	Not sown in time. No proper spacing.
Assam	Goalpara	Linseed	20	10	4.5	Due to late sowing
Nagaland	Mon	Linseed	37	20	4.3	Due to moisture stress
Tripura	Dhalai	Linseed	104	30	7.9	Not timely sown. No proper spacing
Assam	Darrang	Mustard	67	20	5.8	Lack of irrigation facility
Manipur	Imphal East	Mustard	73	30	5.18	Non availability of inputs in time for timely planting
Nagaland	Dimapur	Mustard	75	30	6.58	Rainfed and no irrigation
Tripura	North Tripura	Mustard	40	20	5.5	Irrigation facility was not available at critical stage
Assam	Baksa	Sesame	50	20	3.7	Lower yield due to incesent rainfall during sowing time
Tripura	Dhalai	Sesame	95	30	7.26	No micronutrient is applied. Not timely sown.
Nagaland	Mon	Soybean	61	30	8.17	Seed rot, heavy rainfall and variety was not suitable to the district

Table 14: Yield comparison of oilseed crop

KVK	Crop	Demo (Nos)	Area (ha)	Highest Yield (q/ha)	Lowest Yield (q/ha)	Average Yield (q/ha)	Dist. Yield (q/ ha)	State Yield (q/ ha)	% yield increase w.r.t	
									Dist Yield	State Yield
Baksa	Mustard	75	30	10.9	9.5	10.2	5.8	6.67	75.86	52.92
Barpeta	Mustard	75	30	12.9	7.5	10.3	6.6	5.28	56.06	95.08
Bongaigaon	Mustard	79	30	10.5	9.3	9.76	5.01	6.67	94.81	46.33
Chirang	Mustard	64	30	14	9.3	11	4	6.66	175.00	65.17
Darrang	Mustard	67	20	9.75	5.8	7.75	6.1	6.3	27.05	23.02
Dhemaji	Mustard	75	30	13.5	8.5	11	5.6	6.05	96.43	81.82
Dhubri	Mustard	68	20	10.5	7.5	9	8	6.67	12.50	34.93
Dibrugarh	Mustard	28	20	12	10.5	11.25	6.13	4.86	83.52	131.48
Goalpara	Mustard	39	30	9.25	6.5	8.5	7.15	6.67	18.88	27.44
Golaghat	Mustard	70	30	12	10.5	11.2	10	7	12.00	60.00
Jorhat	Mustard	57	20	9.45	8.77	9.1	6.09	6.98	49.43	30.37

Kamrup	Mustard	75	30	8	7.88	7.88	7.04	5.28	11.93	49.24
KarbiAnglong	Mustard	44	20	7.2	6.8	7	7.25	5.3	-3.45	32.08
Karimganj	Mustard	38	20	8.2	7.6	7.9	4.5	6.5	75.56	21.54
Kokrajhar	Mustard	75	30	9	6.9	8.5	10	6.8	-15.00	25.00
Lakhimpur	Mustard	27	20	11.4	7.8	9.4	6.4	6.1	46.88	54.10
Morigaon	Mustard	75	30	12.4	11.6	12	8	6.2	50.00	93.55
Nagaon	Mustard	116	30	13.25	10.65	11.24	7.27	5.85	54.61	92.14
Nalbari	Mustard	89	30	9.5	8.2	9.1	6	6.6	51.67	37.88
Sivasagar	Mustard	53	30	12.12	10.5	11.31	5.63	6.67	100.89	69.57
Sonitpur	Mustard	100	40	14.5	8.6	10.7	6.3	5.43	69.84	97.05
Tinsukia	Mustard	27	20	14.2	11.6	13.5	7.06	6.67	91.22	102.40
Udalguri	Mustard	50	20	8.78	6.37	7.23	4.13	5.7	75.06	26.84
Imphal East	Mustard	73	30	8.2	5.18	6.85	8	8.8	-14.38	-22.16
Thoubal	Mustard	41	30	13.4	7.3	9.5	8.4	7.46	13.10	27.35
Dimapur	Mustard	75	30	8.89	6.58	7.9	10.19	10.1	-22.47	-21.78
Mon	Mustard	47	30	9.24	6.73	7.98	6.89	6.75	15.82	18.22
Dhalai	Mustard	58	20	13.5	7.5	13.5	7.5	8.5	80.00	58.82
North Tripura	Mustard	40	20	9	5.5	9	6.75	7	33.33	28.57
South Tripura	Mustard	62	20	8.5	7.9	8.2	6.4	7	28.13	17.14
Khowai	Mustard	33	20	12	9	10.5	8.4	7.72	25.00	36.01
Barpeta	Linseed	68	30	7.6	6.4	7.4	5.44	5.23	36.03	41.49
Bongaigaon	Linseed	51	20	8.4	7.1	7.93	3.41	7.02	132.55	12.96
Chirang	Linseed	34	20	7.9	6	8.14	4.41	5.14	84.58	58.37
Goalpara	Linseed	20	10	6	4.5	5.5	4.5	5.25	22.22	4.76
Kokrajhar	Linseed	50	20	7.5	6.8	7.3	6	2	21.67	265.00
Morigaon	Linseed	37	15	7.14	5.43	7.14	3.65	4.84	95.62	47.52
Nagaon	Linseed	51	20	9.85	7.05	8.45	4.95	6.58	70.71	28.42
Sonitpur	Linseed	75	30	9.1	6.8	8.2	7.4	5.4	10.81	51.85
Dimapur	Linseed	50	20	10.12	7.36	9.4	8.27	8.02	13.66	17.21
Mon	Linseed	37	20	6.7	4.3	5.5	4.5	5.2	22.22	5.77
Wokha	Linseed	77	30	6.9	5.8		3.26	3.36	-100.00	-100.00
Dhalai	Linseed	104	30	11.3	7.9	10.5	4.5	6.5	133.33	61.54
Baksa	Sesame	50	20	4.6	3.7	4.3	6.25	7.33	-31.20	-41.34
Barpeta	Sesame	50	20	6.75	6.2	6.6	5.75	5.78	14.78	14.19

Bongaigaon	Sesame	78	30	8.3	8	8.15	4.52	7.58	80.31	7.52
Chirang	Sesame	35	30	8.5	7.8	8.09	5.21	7.27	55.28	11.28
Dhemaji	Sesame	50	20	6.32	5.52	5.92	7.76	7.27	-23.71	-18.57
Golaghat	Sesame	25	10	5		4.5	4.5	4.5	0.00	0.00
Kamrup	Sesame	58	20	6.22	5.4	5.25	5.6	5.7	-6.25	-7.89
Karbianglong	Sesame	50	20	7	4.5	6	7.55	7.58	-20.53	-20.84
Morigaon	Sesame	88	35	6.66	5.34	6.45	6.99	7.58	-7.73	-14.91
Nagaon	Sesame	101	40	5.2	4.1	4.3	6.72	7.58	-36.01	-43.27
Nalbari	Sesame	50	20	8.1	6.3	7.3	5.22	7.27	39.85	0.41
Sivasagar	Sesame	47	20	8.2	6.5	7.35	5.55	7.58	32.43	-3.03
Sonitpur	Sesame	50	20	7.9	6	7.4	7.45	7.5	-0.67	-1.33
Dhalai	Sesame	95	30	9.86	7.26	8.5	7.5	10.5	13.33	-19.05
Dhalai	Groundnut	133	30	18.33	11.2	14.75	10.5	15	40.48	-1.67
North Tripura	Groundnut	64	30	13	9	11	13	11	-15.38	0.00
Mon	Soybean	61	30	9.7	8.17	8.94	8.48	10.17	5.42	-12.09

Capacity Building

Table 15: Extension activities conducted during 2016-17 under Cluster FLD Oilseeds programme

Season	Extension Activities	No. of Programme	Number of participants	No. of KVKs
Kharif	Trainings	19	491	9
	Field day	13	517	10
	Field Visit	50	482	10
	Others	11	175	6
Rabi	Trainings	52	1637	25
	Field day	41	1775	29
	Field Visit	135	2211	21
	Others	35	534	9
Summer	Trainings	6	131	3
	Field day	1	30	1
	Others	8	155	2
Total (Training)		77	2259	
Total (Field day)		55	2322	
Total (Field Visit)		185	2693	

During 2016-17, a total number of 77 training programmes were organized by the KVKs with 19 trainings during Kharif Season, 52 trainings during Rabi and 6 trainings during the Summer season. The training programmes benefited a total number of 2259 participants. A total number of 55 field days and 185 field visits were organised which benefitted 2322 and 2693 participants respectively.

Glimpses of Extension activities

Success stories

1. Toria var. TS-38 enhances profitability of farmers in the flood prone areas

INTRODUCTION

Essential sustenance for livelihood of more than 85 % of the people residing in Dhemaji district of Assam is agriculture and allied sectors. The farmers of the district are less aware of the modern tools and technology in agriculture and allied sectors in general. Since inception, Krishi Vigyan Kendra, Dhemaji has been giving an untiring effort to upgrade the knowledge and to build up the capacity of the farmers through its mandated activities. The KVK always remain vigilant among the farmers, their shortcomings for adopting agricultural activities. Along with soil type, non availability of quality inputs, non judicious use of valuable resources, lack of knowledge on scientific method of cultivation and market led production system etc. are some considerable reasons for low economic return of farmers.

Toria is the second major crop after Sali paddy in Dhemaji district. Though, traditionally toria is grown by the farmer, the productivity of the crop is very low (6.0 qt/ha) due to non adaption of high yielding variety (HYV). Moreover, traditionally toria is grown in area where other crops like Sali paddy is not grown.

KVK INTERVENTION

During the year 2015-16, KVK Dhemaji conducted a Cluster Frontline demonstration programme on "Integrated Nutrient Management in toria variety TS- 38", in 3 different clusters *viz*., Lakhtakia, Jatiachapori and Bhangidia chapori covering 75 nos. of beneficiaries. The technology demonstrated under the programme was 50 % RD (N:P:K is 40:35:15 kg/ha) of fertilizers along with 50 % Vermicompost (RD of Vermicompost is 1 t/ha) and Borax @ 7.5 kg/ ha. The same demonstration was conducted during 2016-17, where 3 clusters viz., Jyotishpur, Machkhowa and Naruathan were covered with 30 ha of area and 75 nos. of beneficiaries. In this year, Seed coating with Azotobacter and PSB @ 40 g each/kg of seed + 75 % of N & P and full K @ RD 40:35:15 kg N: P_2O_5: K_2O/ ha + Vermicompost @ 1 t/ha was demonstrated in the same variety TS- 38. A training programme and time to time field visits were conducted to motivate the farmers and for proper technological backstopping.

OUTPUT AND OUTCOME

During the year 2015-16, the farmers were able to harvest on an average 13.5 q/ ha which is 28.6 % more over local variety (10.5 q/ha). The gross cost of cultivation was Rs. 16339.00 per ha and they were able to receive gross income of Rs. 40500.00 with Net income of Rs. 24161.00 with B: C ratio of 2.48. During 2016-17, 4.5 q of seeds were distributed to the nearby villagers who got inspired by observing the crop field and the yield of the variety. The variety was cultivated during 2016-17 in 100 ha of area by the farmers in their own cost.

During the year 2016-17, poor weather condition persists during the crop season thereby the yield of the variety was reduced than the potential yield. However, the farmers were able to harvest 11.0 q/ ha with a gross income of Rs. 33000.00 per ha with B: C ratio of 1.87. During this year, the variety spread horizontally to 150 ha of area within the District.

IMPACT

TS 38 variety is suitable in Sali paddy followed by Toria farming system where short duration Sali paddy (120-130 days) is grown. Farmers prefer the variety due to its luxurious growth, branching habit and no. of siliqua/branch. Farmers are satisfied with the performance of the variety and planning to adopt the technology for future cultivation. The farmers of the adjacent villages are also willing to adopt the variety for next year cultivation.

Crop at flowering stage

Field day

2. Integrated Nutrient Management boosts the productivity of Kharif Sesame

INTRODUCTION

In Sonitpur district, farmers generally grow sesame in less fertile upland soils which are not suitable for the transplanted *Sali* paddy. Farmers invest their entire resources and energy for the *Sali* paddy for completing transplanting of the *Sali* paddy within 10th August. Hence, most farmers do not allocate their fertile land for cultivation of *Kharif* sesame to be sown in the month of August. The resource poor farmers cannot afford costly inputs for the sesame crops after utilizing their full resources in the *sali* paddy. Due to poor input management farmers get very low yield of *Kharif* sesame.

KVK INTERVENTION

Demonstration programmes were conducted to motivate the farmers for growing *kharif* sesame under technical supervision of KVK, scientists in 20.0 ha land under NMOOP, 2016-17. The farmers were trained on scientific production technology emphasizing more on INM (Toria Foundation seed Var. TS-38, Application of Vermicompost @ 0.5t/ha, Biofertilizer seed treatment with Rhizobium and PSB @ 150g/3kg of seeds and Borax @ 7.5 kg /ha) practices for improving productivity of soils and crops so that Kharif sesame could be a remunerative crop in the rainfed upland situations. Under the demo programmes, land plots in contiguous blocks were selected. Farmers were motivated to undertake group approach in land preparation and other intercultural operations.

OUTPUT & OUTCOME

As a result of Integrated Nutrient Management (INM) in *Kharif* sesame, 76.74 % productivity improvement was recorded in the demo plot giving a boost to the economic indices.

Yield and Economics of Kharif sesame at farmers field at Dhekiajuli in Sonitpur district of Assam during *Kharif*, 2016

Parameters	Demo (INM in Sesame)	Farmers Practice (Local var. with urea @ 25.0 Kg/ha, SSP@ 30.0 Kg/ha, MOP @ 0.0 Kg/ha approx.)
Yield (q/ha)	7.6	4.3
Gross Cost(GC) (Rs/ha)	23000.00	19000.00
Gross Return (GR) (Rs/ha)	53,000.00	30,000.00
Net Return (Rs/ha)	30,000.00	11,000.00
B: Cratio	2.3	1.58

IMPACT

Institutional support for capacity building as well as input support for growing the crops encouraged the farmers to include *Kharif* sesame in their crop calendar. They showed interest to grow the crop in subsequent years.

Crop at Tillering stage

Field visit by KVK Scientists

3. Sesamum variety "ST 1683" brings prosperity to the farmers

INTRODUCTION

Sesamum is the most important kharif oilseed crop grown in Bongaigaon district of Assam. It is cultivated in 572 hectare area in the district with average productivity of 452 kg/ha. The lower productivity of the crop is attributed to cultivation of locally available varieties, poor adoption of improved management practices and poor crop stand due to water stagnation during rainy season. Keeping above reasons for low productivity in mind, KVK Bongaigaon motivated a group of 17 numbers of farmers led by Mr. Dinabandhu Das of Kotashbari village to adopt HYVs of Sesamum with improved management practices. Farmers in that locality generally grow Sesamum with local varieties without following the scientific cultivation practices.

KVK INTERVENTION

KVK Bongaigaon conducted cluster frontline demonstration on "High Yielding Variety of Kharif Sesamum 'ST1683' with scientific management practices" during 2016-17. The crop is sown during 2nd week of August with seed rate @ 4.0 kg/ha. The recommended fertilizer dose of N:P:K is 30:20:20 kg/ha. One hand weeding at 20 days after sowing. KVK provides input distribution, technology demonstration, giving training, field day, monitoring and field visit by scientists *etc*. to farmers.

OUTPUT AND OUTCOME

During the harvest of the crop, the farmers were surprised with the gaining yield which was recorded as 8.3 q per ha of the new variety as compared to 5-5.5 q per ha of their local variety. HYV with adoption of improved production technology resulted 36 per cent increase in yield with net return of Rs. 13, 300.00 per hectare. The participatory farmers were very much happy & interested to adopt the technology.

Economics of cultivation

Particulars	Demonstration	Check
Gross Cost (Rs./ha)	17050	15070
Gross Return (Rs./ha)	58100	43750
Net Return (Rs./ha)	41000	28680
BCR	3.41	2.90

IMPACT

This group cultivated Sesamum in 6.67 ha area. Many farmers are now interested to grow Sesamum in other areas and the area is expected to be 10.0 ha in the village.

Cluster frontline demonstration of kharif sesamum at Kotashbari village during 2016-17

4. Soybean variety JS 95-60 fetches high farm income

INTRODUCTION

Wokha District, the home of the Lothas has a total geographical area of 1628 sq km with a population of 1, 66,343 as per 2011 census. Agriculture constitutes the main occupation of about 80 % of the population of the district. *Jhum* system of cultivation or shifting cultivation is practiced in an area of 13382 ha covering major parts of the district. As most of the farmers of the district are economically very poor and cannot afford to adopt, only negligible farmers practice the terrace system of cultivation. Soybean as a vegetable crop is cultivated in upland area by a sizeable population in the district. However, the yield of soybean is not encouraging as most of the farmers following unscientific practices with local variety. Hence, a promising variety JS 95-60 was introduced under the cluster frontline demonstration programme on oil seeds.

KVK INTERVENTION

Mungya and Tsungiki are the two villages where the CFLD's were conducted. Mungya is a medium sized village with total of 181 families residing and Tsungiki is a large village with total of 556 families residing. A total of 31 demonstrations covering 15 ha area were conducted in both the villages. Before demonstration training on scientific packages of Soybean was imparted to the farmers. Critical inputs like seed were provided to all the farmers. The variety taken for the programme is JS 95-60 having a duration of 90 days. The recommended seed rate is 80 kg/ha and spacing of 45 x 5 cm is maintained. The crop is sown in the month of June-July.

OUTPUT AND OUTCOME

The average yield of JS 95-60 was observed to be 20.8 q per hectare whereas that of local variety was observed to be 16.9 q per hectare. The total cost of cultivation is Rs.29800/ha. The gross return and net return were Rs.77800/- and Rs.48800/- respectively. The cost-benefit ratio worked out to be 2.6:1. The net profit before intervention of the technology is Rs.41,600/- and after the adoption of the technology, the profit is Rs. 48800.

Crop	Technology demonstrated	Demonstration yield	Yield of local check	Yield increase	Cultivation cost	Gross Return	Net return	BC ratio
Soybean	Soybean Variety: JS-95-60	20.8	16.9	20.08	29800	77800	48800	2.6

IMPACT

The farmers showed very keen interest in soybean cultivation owing to its high returns (Rs. 40 to Rs. 80/= per kg). It was observed that the local variety (Lingkyim) takes about six months to maturity and the yield is also poor. Considering these factors, JS 95-60, an improved and extra early variety (88-90 days to maturity) readily accepted by the farmers and it will spread in the neighbouring village in coming days.

Soybean at Tsuniki Village

Field Day at Mungya village

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