

# **Oilseed Productivity Enhancement through Identified Agro-Technologies in Eastern Region**



**ICAR-ATARI, Kolkata  
Bhumi Vihar Complex, Block- GB, Sector- III,  
Salt Lake, Kolkata, West Bengal 700097**



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## PREFACE

With the launching of Technology Mission in 1986 to provide policy impetus to oilseeds in India, the productivity of oilseeds jumped from 670 kg per hectare in the eighties to 835 kg per hectare in the nineties. However, the pace of growth could not be sustained in the long run and in spite of increased output and productivity. There is a demand-supply gap in the oilseeds in India, particularly in edible oils. Presently, India is world's largest importer of edible oil and 60-65 % of its requirement come from other countries. Between October 2013 and November 2014, India imported around 11.8 million tones of edible oil to meet up the domestic demand. Import dependency becomes worse during the unfavourable monsoon years. Today, the major problem in oilseed production is low productivity. India is way behind the developed countries in productivity of oilseeds per hectare. As increase in production could not keep pace with increased demand, India became more and more dependent on edible oil imports.

The regenerated efforts of DAC&FW, Ministry of Agriculture, Govt. of India through National Mission on Oilseeds and Oil palm (NMOOP) have provided much needed opportunities to enhance the productivity of oilseed in a scientific as well as systematic manner in the form of Clustered Frontline Demonstration programme. The achievements of the performance of demonstration carried out by KVks of Bihar, Jharkhand and West Bengal in 2016-17 have been compiled in a meaningful way to understand the advantage of improved cultivation practices including varietal replacement, line sowing, weed management, IPM, bio-fertilizer application, seed treatment and others. It has been observed that in most of the cases, applied technologies performed much better compared to traditional cultivation practices. However, certain issues like bringing additional oilseed areas under irrigation, strengthening the oilseed crop seed chain, particularly higher yield and implementation of market reforms and implementation of policies like contract farming, public-private partnership in production and processing, crop increase and ensured availability of key physical, financial and technical inputs need to address on priority to sustain the present growth of oilseed production and productivity experienced in the Eastern zone of this country.

(S.S. Singh)  
Director



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## 1. Introduction

Oilseeds are important commodity crops for human diet after cereal and sugar crops in the country and these are the source of vegetable oil which provides 2.5 times more energy than protein and carbohydrates. Oilseeds have some essential fatty acids and vitamins D and E needed for human health. Vegetable oil is considered better for health than ghee from animal source having zero cholesterol and higher percentage of mono & poly unsaturated fats. Oilseeds do not contain an appreciable amount of carbohydrate, but, contain high level of B vitamins. Groundnuts are particularly rich in thiamine and nicotinic acid. Oilseeds add important nutritional value to the diet due to high quality protein and/or vegetable oil, together with oil soluble vitamins like vitamin A.

In India Oilseeds constitute the principal commercial crops. Oils and fats, apart from forming an essential part of human diet, serve as important raw material for the manufacture of soaps, paints and varnishes,

hair oils, lubricants, textiles, auxiliaries, pharmaceuticals, etc. Oilcakes and meals are used in animal feeds and as manures. The bulk of vegetable oil production in India is derived from nine oilseeds; namely, Groundnut, Rapeseed-Mustard, Sesame, Safflower, Niger, Soybean, Sunflower, forming the edible group and Linseed and Castor, forming the non-edible group. Thus, as much as 23 million hectares area under cultivation of nine annual oilseeds is from India alone. Development of oilseeds and vegetable oils holds an important place in Indian economy. There has been some gap between supply and demand of vegetable oils which has been met through imports annually. The oilseeds scenario in the country had undergone a sea change in the last fifteen years while India changed from net importer in the 1980s to a net exporter status during the early 1990s. Again, it has come back to net importer status importing more than 40 percent of its annual edible oil needs. Oilseeds are generally grown on marginal lands with scanty irrigation facilities or in dry land areas.

### India's production and import of Oilseeds in recent past

Particulars	Edible Oil demand/supply dynamics			(in mn tonnes)		
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Oilseed production	32.9	35.7	36.3	36.8	37.7	35.8
Oilseed crushed	25.1	29.1	28.9	29.2	29.4	29.8
Edible production	7.8	8.5	8.1	7.5	7.6	7.7
Imports	9.2	8.7	10.1	10.7	11.8	12.4
<b>Total supplies</b>	<b>17</b>	<b>17.2</b>	<b>18.2</b>	<b>18.1</b>	<b>19.4</b>	<b>22.0</b>

Source: USDA and India Ratings

The scientists have identified non conventional areas and seasons for promoting oilseed cultivation, with the availability of new technologies, it is anticipated that in the near future there would be diversions of area from some of the traditional crops for cultivation of oilseeds.

The experimental evidence available from the research in crop and cropping system in recent years suggest that through introduction of restructured varieties of annual oilseed crops in the place of the traditional cropping systems, a wide range of niches and restructured cropping patterns not available so far could be set up.



India has a strong research program through ICAR, State Agricultural Universities and a number of public and private institutions which are constantly producing new varieties/hybrids and technologies. They have a wide network of research stations spread all over the country. Large number of varieties and hybrids has been produced. India is also fortunate to have the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) which has done tremendous work on several crops including groundnut. There are also a number of technical research laboratories. There are opportunities to exploit the available technologies through different development programs such as National Oilseeds Development Project (NODP), in which appropriate oilseed crops are identified where the critical inputs are given. On the items like breeder seed production, 100% central assistance is given. Similarly, Government of India has also started Oilseed Production Thrust Project (OPTP) on 4 major oilseed crops namely Groundnut, Rapeseed-Mustard, Soybean and Sunflower. Under this project 100% Central assistance is given to provide plant protection, produce and supply more seeds to farmers and transfer of technology etc. Care was taken to classify the selected oilseed producing districts on the basis of high yield and low risk, high yield and high risk, low yield and high risk. Critical inputs needed to boost up production in each of these situations are identified. The scientists were given the targets of increasing the yield potential, increasing oil content, reducing crop duration, breeding pest and disease resistant varieties, large scale production of nucleus and breeders' seeds, import and evaluation of promising exotic varieties and hybrids, developing suitable implements for oilseed cultivation, developing technologies for

storage of oilseeds and oils, inter and sequential cropping systems, integrated weed control, reducing aflatoxin in groundnut and studying the effect of different inputs on quality and quality of oil.

## 2. National Mission on Oilseeds and Oil Palm

National Mission on Oilseeds and Oil Palm (NMOOP) launched during 2014-15 envisages increasing production and productivity of oilseeds crops and oil palm through bringing in fallow areas under oilseed crops and diversification of area from low yielding cereals. It aims to achieve the required target by addressing major constraints to crop productivity through promotion of relevant technological interventions.

Implementation of the Mission has helped in enhancing the cropping intensity of the area ensuring overall improvement of soil health, ensure effective management of insects & pest and increase irrigation coverage of the crop. Recommended varieties and proven technologies would be demonstrated in a cluster approach through Frontline/Cluster demonstration in cultivation of oilseeds. The proposed cluster approach would ensure participation of all categories of farmers, irrespective of the size of their holdings, social status and would demonstrate visible impact of the technologies in enhancing productivity and production.

### Strategy

The strategy to implement the proposed Mission will include

1. Varietal Replacement
2. Increasing irrigation coverage under Oilseeds
3. Diversification of area from low yielding cereals crops to oilseeds crops



4. Use of fallow land after paddy/potato cultivation
5. Enhancing procurement of Oilseeds

### **3. Oilseed production scenario in Bihar, Jharkhand and West Bengal**

In Bihar, Jharkhand and West Bengal Oilseeds cultivation covers three seasons (Kharif, Rabi & Summer). Sesame is the major oilseed crop grown during Kharif season in Bihar. Sesame was cultivated over 2754 ha area in Bihar under Kharif season and the average productivity of Sesame is 868 kg/ha. Groundnut, Sesame and Niger are the major Oilseed crops grown in Jharkhand covering a total 32000ha area with productivity 1021 kg/ha, 476 kg/ha and 600kg/ha, respectively. In Jharkhand during CFLD in kharif season Groundnut covered 1027 ha followed by Niger 600 ha and sesame 476 ha. In West Bengal 2968 ha area is under kharif Oilseeds. The average productivity of Groundnut and Sesame are 917kg/ha & 730 kg/ha, respectively.

#### **(I) Kharif Oilseeds**

##### **Bihar**

Crops	Area (ha)	Production (MT)	Productivity (kg/ha)
Sesame	2754	2390	868

##### **Jharkhand**

Crops	Area (ha)	Production (MT)	Productivity (kg/ha)
Groundnut	23000	34000	1021
Sesame	8000	4000	476
Niger	1000	1000	600

##### **West Bengal**

Crops	Area (ha)	Production (MT)	Productivity (kg/ha)
Groundnut	1903	1746	917
Sesame	1065	777	730

Area in hectare, production in metric tonnes, productivity in kg per ha source: Fertilizer and Agriculture Statistics Eastern Region, Edition-39, 2014-15

#### **a) Sesame**

Sesame is commonly known as "Till". Its botanical name is *Sesamum indicum L.* It is one of the earliest domesticated plants. It is a short duration crop grown throughout the year. The seeds of the plant yield edible oil. Due to the presence of potent antioxidant, sesame seeds are known as "the seed of immortality". Two distinct types of seed are recognized, the white and the black. There are also intermediate coloured varieties varying from red to rose or from brown to grey. The sesame seed is a rich source of edible oil. Its oil content generally varies from 46 to 52%. Sesame is grown in India in Kharif and summer season in some states, as in case of kharif in Eastern part of India mainly in Bihar, Jharkhand and West Bengal the crop is grown. Sesame crop is tropical plant and highly drought resistant during the vegetative stage due to its extensive roots. It is grown in all types of soils but well suited for well drained fertile soils. The plant is susceptible to salt and water logging. Sesame seed requires around 20°C for germination and more than 23° C favours good growth and high yields. Crop duration is around 90-120 days depending on season and varieties.

In Bihar, the average yield of Sesame is 868kg/ha (2015-16).In Bihar, Sesame is mainly grown in Supaul (873 ha) and Samastipur (613 ha) district. Major varieties of sesame cultivated in Bihar are Krishna, Tilottama and G.Til-3.

In Jharkhand the average yield of Sesame is 476 kg/ha. The productivity of Sesame in Jharkhand mainly comes from Saraikela (519 ha) and Godda (442 ha). The major varieties of Sesame cultivated in Jharkhand are Gujrat Til-2, RT-346, RT-351, Tilottama etc.



The average yield of sesame is 927 kg/ha in West Bengal. In West Bengal Sesame mainly grows in West Midnapore (73555 ha), Hooghly (32467 ha) and Nadia (29184 ha) district. SWB- 32-10-1, Savitri, HT-1 are the major varieties of Sesame cultivated in West Bengal.

### b) Groundnut

In India, groundnut is one of the most important oilseed crops and occupies an area of 5.86 m ha with production and productivity of 8.26 m tons and 1411 kg/ha, respectively (2010-11). Botanical name of groundnut is *Arachis hypogaea* which is derived from Greek word *Arachis* means legume and *hypogaea* mean below ground, referring to the formation of pods in the soil. It plays an important role in the dietary requirement of resource-poor women and children. It consists of 7.3% N, 1.5% P<sub>2</sub>O<sub>5</sub> and 1.3% K<sub>2</sub>O. The peanut haulms contain crude protein 8– 5%, lipids 1–3% and minerals 9–10%. Well-drained, sandy loam soils are ideally suited to rainfed rabi groundnut. The optimum soil pH for groundnut is 6.0 to 6.5, but a range of 5.5 to 7.0 is acceptable. The oil content of the seed varies from 44 to 50 per cent, depending on the varieties and agronomic conditions. Groundnut oil is edible oil. It finds extensive use as a cooking medium both as refined oil and Vanaspati Ghee. Groundnut is raised mostly as a rainfed kharif crop, being sown from May to June, depending on the monsoon rains. In some areas or where the monsoon is delayed, it is sown as late as August or early September. As an irrigated crop it is grown to limited period, between January to March and between May to July. The crop does best on sandy loam and loamy soils and in the black soils with good drainage. Heavy and stiff clays are unsuitable for groundnut cultivation as the pod

development is hampered in these soils. National average yield of Groundnut is 1418kg/ha (2015-16). In eastern part of India Groundnut is mainly produced in Jharkhand and West Bengal during Kharif & summer season.

In Jharkhand the average yield of Groundnut is 1021kg/ha. Major varieties under cultivation are K-6, TG-37-A, TPG-41. Groundnut is mainly grown in Simdega (4266 ha) and Gumla (4251ha) districts of Jharkhand.

In West Bengal, Groundnut is grown in 68903 ha and total production is 151613 MT. Groundnut production is maximum in Hooghly district covering 13780ha area followed by West Midnapore (13513 ha) and Nadia (7499 ha) districts.

### c) Niger

Niger (*Guizotia abyssinica* (L. f.) Cass. Compositae) is an oilseed crop cultivated in India under rainfed conditions. Niger seed yields about 30–35% of its weight in oil which is clear, slow-drying, and edible. India is the most important country accounting for more than 50% of world niger area and production. In India, Niger is grown on an area of 0.52 million ha mainly during kharif. However, in Orissa it is a rabi crop. Niger can grow on a wide range of soil types, but thrives best on clayey loams or sandy clays. The crop prefers well drained soils in the pH range of 5.2 to 7.3. Niger tolerates waterlogged soils, since it grows equally well on both drained soils or waterlogged clays. Niger is a salt tolerant but its flowering is delayed with increasing salinity.

In Jharkhand Niger is grown in 1000 ha and production is 777 MT with average productivity of 600kg/ha. The major varieties of Niger cultivated are JNC-6, Birsia Niger-1 & Birsia Niger-3.



## (II) Rabi Oilseeds

In Bihar, Jharkhand and West Bengal Rapeseed & Mustard and Linseed are the major oilseed crops during Rabi season. Rapeseed & mustard covers the maximum area (3,33,440 ha) with average productivity 947.7 kg/ha as oilseed crop in Bihar, Jharkhand and west Bengal whereas Linseed covers total 1,10,033 ha area with average productivity 582 kg/ha.

### Bihar

Crops	Area (ha)	Production (MT)	Productivity (q/ha)
Rapeseed & Mustard	89657	94392	10.53
Linseed	15033	12911	8.59

### Jharkhand

Crops	Area (ha)	Production (MT)	Productivity (q/ha)
Rapeseed & Mustard	198000	139000	0.7
Linseed	25000	14000	0.57

### West Bengal

Crops	Area (ha)	Production (MT)	Productivity (q/ha)
Rapeseed & Mustard	457.83	499	10.90
Linseed	700	143	4.89

#### a) Rapeseed & 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*). In India, rapeseed-mustard is grown in diverse agro-climatic conditions ranging from north-eastern/north-western hills to down south under irrigated/rainfed, timely/late sown and mixed cropping. Brassicas grow well under low temperature and average (day and night) temperature of 25°C is required at the time

of sowing for optimum germination. The crop takes 135-150 days to mature. Some early varieties maturing in 110 days are also available. Rai and Mustard can be grown in sandy to heavy clay soils. Oil content in Rapeseed & Mustard seeds varies from 35-46%.

In Bihar, Rapeseed & Mustard mainly comes from Begusarai (9522 ha), Samastipur (8091ha) & West Champaran (6660 ha). The major productivity comes from Nalanda (1835 kg/ha). Major varieties which are under cultivation in Bihar are RGN-48, Rajendra suflam, Pusa Mustard-28 and Uttra.

In Jharkhand, Rapeseed and Mustard is grown during rabi season in 31770 ha area and production is 27227 MT with average productivity 1134 kg/ha. The leading districts in Rapeseed and Mustard production in Jharkhand are Godda (8870 ha), Palamu (13116 ha) and Sahebganj (2113 ha).

In West Bengal rapeseed & mustard is grown in 448591 ha area and total production is 478084 MT. Murshidabad is the leading district in Rapeseed & Mustard production with 87179 ha acreage which is followed by Nadia (77153 ha) and North Dinajpur (49787 ha). The productivity of North 24 Pargana district (1432kg/ha) is highest in Rapeseed & Mustard.

#### b) Linseed

Among the oilseed crops raised during rabi, linseed is next in importance to rapeseed-mustard in area as well as in production. The temperature during the vegetative development of the crop should be moderate or cool. In technical oil production, it ranks first in the country. Seed contains 33 to 47% of oil. Its cultivation is mostly confined to Madhya Pradesh, Maharashtra, Chattisgarh, Uttar Pradesh and Bihar. It is often grown



on marginal and sub-marginal rainfed soils as pure crop, mixed crop, intercrop and *paira* or *utera* crop. Linseed can be raised in almost all types of soils, where sufficient moisture is available, but it also does better on heavier soils having greater water-retention capacity.

Linseed is grown in 15033 ha in rabi season in Bihar and production is 12911 MT with average productivity of 859 kg/ha. The leading districts in Linseed production in Bihar are Aurangabad (3389 ha), Kishanganj (1793 ha) and West Champaran (1448 ha). The varieties of Linseed cultivated in Bihar are Azad Alsi-1, Shekhar, Garima etc.

Linseed is grown in about 25000 ha area in Jharkhand with production of 14000MT and average productivity of 570 kg/ha. Major varieties under cultivation are Azad Alsi-1, Shekhar, Sharda, T-397 etc.

In West Bengal, the total area of Linseed is 700 ha with highest productivity of 353kg/ha in North Dinajpur district. The best yielding varieties are Azad Alsi-1, Parvati and Deepika.

### **(III) Summer Oilseeds**

Summer oilseed crops are grown in certain regions of India during the months of March to June. Major Summer Oilseed crops grown in Bihar, Jharkhand and West Bengal are Groundnut, Sesame and Sunflower.

#### **a) Sunflower**

Sunflower (*Helianthus annuus L.*, Family: Compositae) is one of the four most important annual crops in the world grown for oil along with soybean, rapeseed and groundnut. It is an important addition to the list of edible oilseed crops in India in the last four decades. Sunflowers are usually tall annuals, that grow to a height of 50–390 cm. Sunflower is a drought tolerant crop due to its deep tap root, which makes it the best

substitute to all rain fed commercial crops. Sunflower seed has an oil recovery of 35%. The protein content is around 25% and Sunflower meal is used as a protein source in preparing animal feed. Sunflower oil contains more Vitamin E than any other vegetable oil and hence it is very much used in food products. Sunflower is also a crop of choice for farmers due to its wider adaptability, high yield potential, shorter duration and profitability.

In Bihar Sunflower is grown in 14030 ha area during summer season with production of 19789 MT and the average productivity of sunflower is 1410kg/ha. Major varieties which are under cultivation of Bihar are KBSH-44, KBSH-41 & Sunbreed 275 PR (Arena).

#### **Bihar**

Crops	Area (ha)	Production (MT)	Productivity (q/ha)
Sunflower	11404	16203	14.21

#### **West Bengal**

Crops	Area (ha)	Production (MT)	Productivity (q/ha)
Sunflower	211131	196192	9.29
Groundnut	55031	128321	23.32

### **4.0 Cluster Frontline demonstration on Oilseeds**

Cluster Front-Line Demonstration is the new concept of field demonstration evolved by the Indian Council of Agricultural Research on Oilseed and Pulse crops. The main objective of Cluster Front-Line Demonstrations is to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under different agro-climatic regions and farming situations. While demonstrating the technologies in the farmers' field, the scientist to study the factors



contributing higher crop production, field constraints of production and thereby generate production data and feedback information. The field demonstrations conducted under the close supervision of scientists of the KVKS because the technologies are demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Department of Agriculture.

The special features of Front-Line Demonstrations are:

- Cluster Frontline Demonstrations are conducted under the close supervision of the scientists of the KVKS of ICAR Institute and State Agricultural Universities.
- Only newly released technologies or those likely to be released in near future are selected for the Cluster Front-Line Demonstrations.
- Only critical inputs are provided from the scheme budget, remaining inputs are supplied by the farmers themselves.
- Cluster Front-Line Demonstrations are used as a source of generating data on factors contributing higher crop yields and constraints of production under various farming situations.

The KVKS of Bihar, Jharkhand & West Bengal have conducted Cluster Frontline Demonstration during kharif, rabi and rabi summer seasons of 2016-17 under the supervision of ICAR-ATARI, Kolkata. Various improved technologies are implemented by KVKS during the demonstration programme which includes use of high yielding varieties, INM, IPM, Seed treatment and organic farming etc. The main target was to minimise the gap between existing and potentiality in production of Oilseeds by the application of improved technologies and proper planning under the supervision of KVKS at critical stages of ongoing CFLD programme.

#### **4.1 Performance of CFLD on Oilseeds during 2016-17**

During, 2015-16 a new initiative Cluster Frontline Demonstration on Oilseeds was taken up by KVKS under National Mission on Oilseeds and Oil palm (NMOOP). In 2016-17, Cluster frontline demonstrations were conducted in 77 KVKS i.e 36 KVKS of Bihar, 23 KVKS of Jharkhand and 18 KVKS of West Bengal during 2016-17. The target number of demonstration was 12975 of which 10811 numbers of demonstrations was conducted covering a total area of 5049.3 ha in Bihar, Jharkhand and West Bengal. Details of the number of demonstrations and area under CFLD are indicated in table

**Table: 4.1 (a) Total area covered under CFLD Oilseeds (Kharif) 2016**

Sl. No.	Crops	State	No. of Demonstration	Target Area (in ha)	No. of Demonstration	Achievement Area(in ha)
<b>Kharif Season</b>						
1.	Groundnut	Jharkhand	825	330	794	290
		West Bengal	675	270	472	120
2.	Sesame	Bihar	550	220	273	111.8
		Jharkhand	600	240	633	285
		West Bengal	550	220	119	40
3.	Niger	Bihar	75	30	67	30
		Jharkhand	525	210	550	220
4.	Soybean	Bihar	50	20	50	20
<b>Total Kharif Season</b>			<b>3850</b>	<b>1540</b>	<b>2958</b>	<b>1116.8</b>



**Table: 4.1 (b) Total area covered under CFLD Oilseeds (Rabi) 2016-17**

Sl. No.	Crops	State	No. of Demonstration	Target Area (in ha)	No. of Demonstration	Achievement Area(in ha)
<b>Rabi Season</b>						
1.	Rapeseed & Mustard	Bihar	2550	1020	2416	1025
		Jharkhand	1650	660	1706	700
		West Bengal	1275	510	1874	550
2.	Linseed	Bihar	1075	430	674	247.5
		Jharkhand	425	170	353	150
		West Bengal	525	210	463	140
<b>Total rabi Season</b>			<b>7500</b>	<b>3000</b>	<b>7486</b>	<b>2812.5</b>

**Table: 4.1 (c) Total area covered under CFLD Oilseeds (Summer) 2017**

Sl. No.	Crops	State	No. of Demonstration	Target Area (in ha)	No. of Demonstration	Achievement Area(in ha)
<b>Summer Season</b>						
1.	Sesame	Bihar	325	130	395	160
		Jharkhand	100	40	82	40
		West Bengal	550	220	1097	410
2.	Sunflower	Bihar	650	260	764	330
3.	Groundnut	West Bengal	0	0	452	180
<b>Total Summer Season</b>			<b>1625</b>	<b>650</b>	<b>2790</b>	<b>1120</b>
<b>Grand Total (Kharif + Rabi + Summer)</b>			<b>12975</b>	<b>5190</b>	<b>13234</b>	<b>5049.3</b>

#### 4.2 Technologies demonstrated

Scientists of 77 KVKS under ICAR-ATARI Kolkata applied different advanced technologies during CFLD on Oilseeds in farmer field of Bihar, Jharkhand and West Bengal. Those demonstrated technologies are depicted cropwise in table, Kharif Oilseeds (Groundnut, Sesame, Niger, Soybean) in Table 4.2(a), 4.2(b), 4.2(c), & 4.2(d), rabi crops (Rapeseed & Mustard and Linseed) in table 4.1(e) & 4.2(f) and summer crop in table 4.2(g) & 4.2(h). The demonstrations were on INM, IPM, new released hybrid varieties etc.

**Table 4.2(a) Technology demonstration on Groundnut during Kharif 2016**

Crop	Varieties	Seed treatment	Weed management	Fertilizer management/ Micronutrients	Insect pest and disease
Groundnut	Kadiri-6, TG 51, TG-37-A, TPG-41, TAG 24, TG-38	<ul style="list-style-type: none"> <li>● Trichoderma viridi, and Cyperchloro 2ml/lit,</li> <li>● Bavistin 1gm/lit and Propinophex 2ml/lit, with carboxin + thiram @ 2-3 g/kg of seed</li> <li>● Rhizobium culture @200gm/kg</li> <li>● <i>Trichoderma harzianum</i> and <i>Pseudomonas fluorescens</i> @ 10g/kg seed;</li> </ul>	<ul style="list-style-type: none"> <li>● Fluchloralin at 0.9 to 1.2 kg/ha,</li> <li>● pendimethalin as Pre-emergence (PE) 1.5 kg/ha</li> </ul>	<ul style="list-style-type: none"> <li>● Sulphur, Gypsum application @75kg/ha,</li> <li>● Micro nutrient 2ml/lit Application of <math>ZnSO_4</math> 25 kg @ &amp; Boron as Borax @ 10 kg /ha</li> <li>● N: <math>P_2O_5</math> : <math>K_2O</math> :: 15:30:45 Kg/ha</li> </ul>	IPM, Bio-pesticide



**Table 4.2(b) Technology demonstration on Sesamne during Kharif 2016**

Crop	Varieties	Seed treatment	Weed management Micronutrients	Fertilizer management/	Insect pest and disease
Sesame	GT-2, Krishna, Sekhar, SWB- 32-10-1, RT-351, N-28, Shekhar-2, Tilotamma, G. Til-3	● seed treatment Bavistin 2g/kg,	pre-emergence application of alachlor 50 EC @ 0.75 kg a.i.ha	(N <sub>40</sub> P <sub>40</sub> K <sub>20</sub> ), Phosphogypsum, INM, Biofertilizer	Pesticide, biopesticide, Herbicides, Micronutrient spray

**Table 4.2(c) Technology demonstration on Niger during Kharif 2016**

Crop	Varieties	Seed treatment	Weed management Micronutrients	Fertilizer management/	Insect pest and disease
Niger	JNC-6, Birsa Niger-3, JNC-5, Birsa Niger-1	● Bavistin 2g/kg seed, Tri-choderma viridi		Micro-nutrients, (N <sub>40</sub> P <sub>40</sub> K <sub>20</sub> )	

**Table 4.2(d) Technology demonstration on Soybean during Kharif 2016**

Crop	Varieties	Seed treatment	Weed management Micronutrients	Fertilizer management/	Insect pest and disease
Soybean	PS-1042		Carbendazim, Imizathiaper		Profenophos + cypermethrin

**Table 4.2(e) Technology demonstration on Rapeseed & Mustard during Rabi 2016-17**

Crop	Varieties	Seed treatment	Weed management	Fertilizer management/ Micronutrients	Insect pest and disease
Rapeseed & Mustard	Pusa Mahek, YSBNC-1, NC-1, Mustard B-9, B-54, Pusa Vijay, PAN-70, RGN-48	● Trichoderma Viride @100gm/ha ● Pseudomonas @100g/ha	Application of pre emergence Herbicide Oxyfluorfen @ 2.5 ml// lt of water, Spraying pendimethalin @ 6 ml/ lt alongwith 1 hand weeding at 25 DAS	Fertilizer-60kg N, 30 kg P <sub>2</sub> O <sub>5</sub> & 30 Kg K <sub>2</sub> O/ha Seed Rate: 5 Kg/ha Bio-Fertilizer: PSB @ 2 Kg/ha & PMB @ 4kg/ha Micronutrient: Zn @ 8 Kg/ha & Mn @ 8 kg/ha, Sulphur @ 40kg/ha	Imidachlorprid was applied @ 3ml/10l water, Thiomethoxam (for Aphid)



**Table 4.2(f) Technology demonstration on Linseed during Rabi 2016-17**

Crop	Varieties	Seed treatment	Weed management	Fertilizer management/ Micronutrients	Insect pest and disease
Linseed	Deepika, Sekhar, Azad Alsi 1, Parvati	<ul style="list-style-type: none"> <li>● Trichoderma Viride @200gm/ha</li> <li>● Pseudomonas @ 300g/ha,</li> <li>● Bavistin 2g/kg seed,</li> </ul>		Fertilizer-40kg N, 20 kg P2O5 & 20 Kg K2O/ha Seed Rate: 35 Kg/ha Bio-Fertilizer: PSB @ 2 Kg/ha & PMB @ 4kg/ha Micronutrient: Zn @ 8 Kg/ha & Mn @ 8 kg/ha, sulphur @10kg/ha	@ 2.5 kg/ha Spray of neem oil at the time of flowering @ 5ml/liter water

**Table 4.2(g) Technology demonstration on Sesame during Rabi 2017**

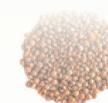
Crop	Varieties	Seed treatment	Weed management	Fertilizer management/ Micronutrients	Insect pest and disease
Sesame	Tilottama, SWB- 32-10-1, RT 346, HT-1, Rama	Seed treatment with Mencozeb, 2. Application of Insecticide at flowering and pod development stage, Inoculation of seed with PSB @ 1.75 lit/ha, 6.0 kg/ha, Azotobactor, PSB, Trichoderma viride, & Pseudomonas fluorescens- 1.5 kg/ha		Micronutrient mixture @1gm/lit,	Solomon @ 0.4 ml/lt, Tafgor @ 1.5 ml/lt and Asataf @ 0.75 ml/lt, Foliar application of sulphur (@ 1% at 30 and 60 DAS

**Table 4.2(h) Technology demonstration on Sunflower during Summer 2017**

Crop	Varieties	Seed treatment	Weed management	Fertilizer management/ Micronutrients	Insect pest and disease
Sunflower	KBSH-44, NSFH-145, KBSH 41, KBSH 1	inoculation of seed with Carbendazim 50% Wp, PSB Pendimethalin 30% EC		Sulphur 20 kg/ha, 1 kg/ha Micronutrient (B + Mo)	

## 5. Performance of clustered Oilseed demonstration in Kharif 2016

A total of 3850 number of demonstration was allotted to ATARI-ICAR, against which 2958 number of demonstrations to an area of 1116.8 ha was covered throughout Bihar, Jharkhand and West Bengal. The details of state-wise and crop wise breakup of demonstrations are provided in Table 4(a)



**Table 5 (a) : State-wise demonstration conducted in Kharif 2016**

Crop/State	Area(ha)	No of Demonstration
<b>Groundnut</b>		
Jharkhand	290	794
West Bengal	120	472
<b>Total</b>	<b>410</b>	<b>1266</b>
<b>Sesame</b>		
Bihar	111.8	273
Jharkhand	285	633
West Bengal	40	119
<b>Total</b>	<b>436.8</b>	<b>1025</b>
<b>Niger</b>		
Bihar	30	67
Jharkhand	220	550
<b>Total</b>	<b>250</b>	<b>617</b>
<b>Soybean</b>		
Bihar	20	50
<b>Total</b>	<b>20</b>	<b>50</b>
<b>Total</b>	<b>1116.8</b>	<b>2958</b>

CFLD on Groundnut encompasses 290 ha in Jharkhand and 120 ha in West Bengal. The area covered by Sesame in Bihar 111.8 ha involving 273 no of demonstrations whereas in Jharkhand and West Bengal Sesame covered 285 ha and 40 ha, respectively. The acreage of CFLD on Niger in Bihar 30 ha and in Jharkhand was 220 ha. CFLD on Soybean was demonstrated in 20 ha through 50 demonstrations in Bihar during kharif, 2016. The average state wise and crop wise yield performance of kharif Oilseeds in farmers existing plot and demonstrations plot is shown in Table 4(b)

ICAR



**Table 5 (b): Performance of Oilseed demonstration in Kharif 2016**

Sl. No.	Crop	State	No. of Farmers	Area (he)	Yield (q/ha)		Increase (%)	Farmers Existing Plot			Demonstrated Plot				
					Demo	Check		Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return		
1.	Groundnut	Jharkhand	794	290	11.85	8.23	40.48	203950	945742	208204	1.83	238824	601138	363114	2.38
		West Bengal	472	120	7.6	6.08	14.50	157750	321850	163500	1.97	177660	398320	221160	2.19
		<b>Total</b>	<b>1266</b>	<b>410</b>											
2.	Sesame	Bihar	273	111.8	4.675	3.40	35.73	73352	153630	105368	1.77	83985	214090	157005	2.68
		Jharkhand	633	285	4.43	3.10	42.17	141310	236915	93205	1.65	167311	395698	228387	2.35
		West Bengal	119	40	9.36	7.13	31.33	16750	38887	22137	2.4	19050	52432	33382	2.9
		<b>Total</b>	<b>1025</b>	<b>436.8</b>											
3.	Niger	Bihar	67	30	3.17	2.25	40.89	6150	9450	3300	1.53	7200	13314	6114	1.84
		Jharkhand	550	220	5.15	3.80	36.43	81205	146848	62763	2.59	98573	191579	93056	3.07
		<b>Total</b>	<b>617</b>	<b>250</b>											
4.	Soybean	Bihar	50	20	21.7	18.6	16.67	29700	55800	26100	1.87	29700	65100	35400	2.19



## **Groundnut**

In Jharkhand it has been observed from the above table there is an average increase of 40.48% in yield of demonstration plots over the local check and the BC ratio is 2.38. In West Bengal, the percentage in yield increase in demonstration plot was 14.5. BC ratio in West Bengal was 2.19.



## **Sesame**

Yield increase percentage of demonstrated plot of kharif Sesame in Bihar was 35.73 while in Jharkhand and West Bengal, the yield increase percentage was 42.17 and 31.33 respectively. The BC ratio of kharif Sesame of Bihar, Jharkhand and west Bengal were 2.68, 2.35 and 2.9, respectively.



## **Niger**

Yield performance of Niger during Kharif under CFLD in Bihar and Jharkhand shows an increase of 40.89% and 36.43%, respectively. In Jharkhand, the net return in demonstration plot was about Rs.191579/- against Rs.98573/-in existing plot.



## Soybean

In Bihar, the yield increase in demonstrated plot was observed 16.67% against existing plot and the BC ratio of demonstrated plot was 2.19. The net return in demonstration plot was Rs. 35400/- against Rs. 26100/- in existing plot.

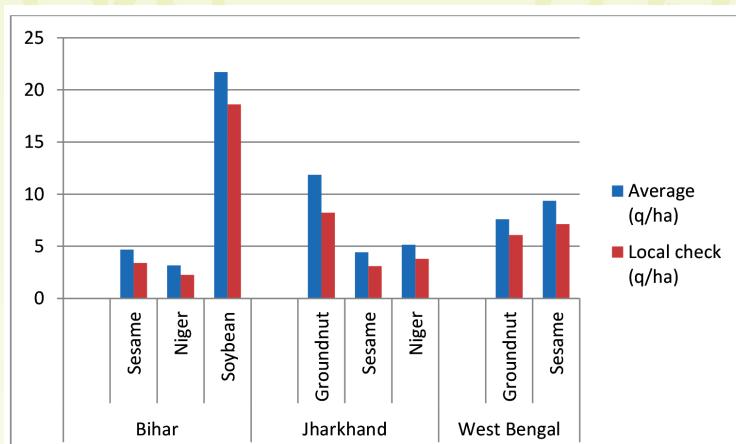


Fig-1: Performance of Kharif Oilseeds in comparison with average yield (demonstrated variety) and farmers practices (local check)

### 5.1 Varietal performance of Groundnut under CFLD

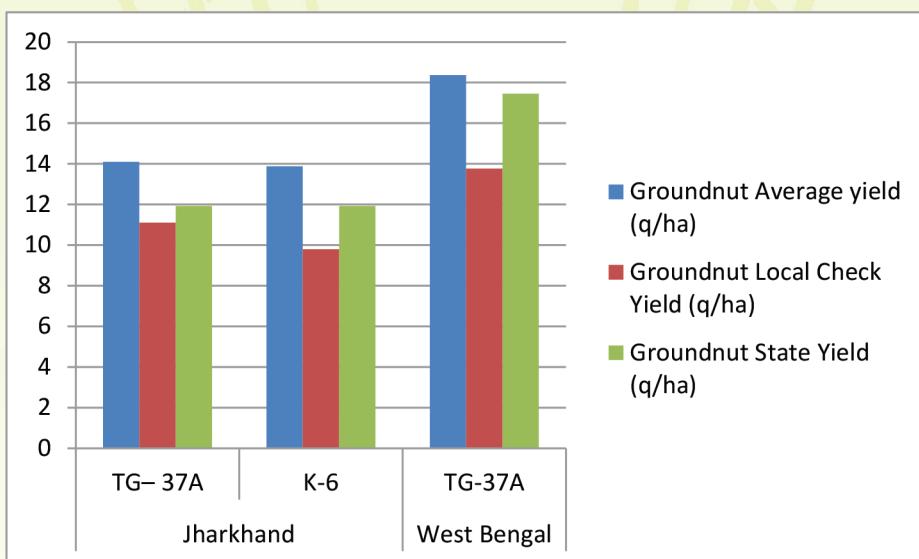
In Jharkhand the varieties of Groundnut namely K-6, TG-37A, TG-38, TPG-41 & M-13 are demonstrated whereas in West Bengal TG-37 and TAG-24 are demonstrated under CFLD during kharif 2016-17. K-6 is widely adopted variety of Jharkhand under CFLD on Groundnut covering 150 ha area. The variety is recommended for kharif season and tolerant to leaf spot. The average demonstrated yield is 13.88 q/ha. The percentage of yield increase over existing yield is 41.77. TG-37A is a widely adopted variety of West Bengal under CFLD on

Groundnut programme, 120.1 ha area was brought under demonstrated through this variety. The average yield of demonstrated variety TG-37 A is 15.37 q/ha. The percentage of yield increase over the existing yield is 30.58. This variety is suitable for both kharif and summer seasons and tolerant to collar rot, rust and late leaf spot. Variety M-13 gave highest average yield of 18.3 q/ha yield in Jharkhand during Kharif season. The percentage of yield increase over the existing variety is 55.17. In West Bengal the maximum average yield is observed in case of variety TAG-24 i.e 21 q/ha. This variety also shows the minimum yield gap (%) i.e 10.71.



**Table : 5.1 (a) Performance of major varieties of Groundnut (Kharif)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Jharkhand</b>						
K-6	150	412	13.88	9.79	41.77	29.46
TG- 37A	30	93	14.1	11.1	27.03	21.30
TG-38	30	64	14.2	9.5	49.5	33.09
TPG-41	30	75	6.25	4.6	35.86	26.40
M-13	30	75	18.3	11.16	55.17	39.01
<b>West Bengal</b>						
TG-37A	120.1	427	18.37	13.77	34	25
TAG- 24	30	138	21	18.75	12	10.71



## 5.2 Varietal performance of Kharif Sesame under CFLD

Sesame varieties namely Krishna, Tilottama and Gujart Til-3 were demonstrated in Bihar under CFLD during kharif season 2016-17. The variety Krishna covered maximum area (51.8 ha) in Bihar under CFLD. Gujart Til-3 is a short duration variety. The percentage of yield increase over the existing yield in case of variety Krishna is 38.93. In Jharkhand the varieties of Sesame demonstrated in Kharif season are GT-2, RT-351, RT-346 and Shekhar-2. Variety GT-2 covered maximum

area (200 ha) in Jharkhand. The highest percentage of yield increase is observed in case of variety RT-351 and this variety is resistant to leaf curl. RT-346 is resistant to leaf curl and moderately resistant to Macrophomina, Alternaria, Cercospora etc. Variety SWB-32-10 and Tilottama were demonstrated in West Bengal during kharif, 2016-17. The minimum yield gap (%) in kharif Sesame is observed 20.04. Variety SWB-32-10 is a short duration variety and tolerant to Macrophomina.



**Table : 5.1 (b) Performance of major varieties of Sesame (Kharif)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
Krishna	51.8	99	4.96	3.57	38.93	28.02
G.Til-3	20	50	3.43	2.5	37.2	27.11
<b>Jharkhand</b>						
GT-2	80	200	4.89	3.91	25.06	20.04
RT-351	50	75	5.65	3.85	46.75	31.85
RT-346	40	96	3.32	2.37	40.00	28.6
Shekhar 2	40	61	5.94	4.13	43.82	30.47
<b>West Bengal</b>						
SWB- 32-10-1	20	65	9.7	8.11	20	17

### 5.3 Varietal performance of Niger under CFLD :

JNC-6 & BN 1 are the varieties of Niger demonstrated in Bihar & Jharkhand during kharif season under CFLD, 2016-17. In Bihar the maximum percentage of yield is observed is 40.89 and the yield gap(%) is 26.78. Both the varieties are short duration varieties.

**Table : 5.1 (c) Performance of major varieties of Niger (Kharif)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
JNC-6	30	67	3.17	2.25	40.89	29.02
<b>Jharkhand</b>						
JNC-6	100	240	5.45	3.99	36.59	26.78
BN 1	60	178	5.90	4.25	38.82	27.96

### 5.4 Varietal performance of Soybean under CFLD:

The variety of Soybean PS-1042 is demonstrated only in Bihar during kharif season of 2016-17. The yield increase is observed 16.67% over the existing local variety. The yield gap (%) was 14.28

**Table : 5.1 (d) Performance of major varieties of Soybean (Kharif)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
PS-1042	20	50	21.7	18.6	16.67	14.28

## 6. Performance of clustered Oilseed demonstration in Rabi-Summer 2016-17

Rapeseed & Mustard, Linseed, Sesame, Groundnut & Sunflower are the major rabi and summer Oilseed crops in the states of Bihar, Jharkhand and West Bengal. A total 3932.5 ha area was covered by rabi and summer conducting 10276 number of demonstration on Oilseeds under CFLD during 2017-18. The details of state-wise and crop wise breakup is given in Table



**Table: 5.2 State-wise demonstration conducted in Rabi and Summer 2016-17**

Crop/State	Area(ha)	No of Demonstration
<b>Rapeseed &amp; Mustard</b>		
Bihar	1025	2416
Jharkhand	700	1706
West Bengal	550	1874
<b>Total</b>	<b>2275</b>	<b>5996</b>
<b>Linseed</b>		
Bihar	247.5	674
Jharkhand	150	353
West Bengal	140	463
<b>Total</b>	<b>537.5</b>	<b>1490</b>
<b>Sesame</b>		
Bihar	160	395
Jharkhand	40	82
West Bengal	410	1097
<b>Total</b>	<b>610</b>	<b>1574</b>
<b>Sunflower</b>		
Bihar	330	764
<b>Total</b>	<b>330</b>	<b>764</b>
<b>Groundnut</b>		
West Bengal	180	452
<b>Total</b>	<b>180</b>	<b>452</b>
<b>Grand total</b>	<b>3932.5</b>	<b>10276</b>

Rapeseed & Mustard covered 1025 ha area in Bihar whereas in Jharkhand 700 ha and in West Bengal 550 ha area were brought under CFLD. The acreage of CFLD on Linseed in Bihar, Jharkhand and West Bengal were 247.5ha, 150ha, 140ha, respectively. CFLD on Sesame was demonstrated in 160ha in Bihar whereas in Jharkhand 40 ha and 410

ha in West Bengal were demonstrated under CFLD during Summer 2017. Demonstrations on Sunflower in Bihar were in 330 ha and Groundnut in West Bengal was in 180 ha area during summer 2017. The average state wise and crop wise yield performance of rabi Oilseeds in farmers existing plot and demonstration plots are shown in table



**Table 5 (a) : Frontline Demonstration (CFLD) on Rabi Oilseeds 2016-17**

Sl. No.	Crop	State	No. of Farmers	Area (he)	Yield (q/ha)		Increase (%)	Farmers Existing Plot		Demonstrated Plot		BCR
					Demo	Check		Gross Cost	Gross Return	Net Return	Gross Cost	
1. Rapeseed & Mustard	Bihar	2416	1025	12.86	6.20	39.38	16570	34855.3	18402.7	1.85	19149.3	49583.8
	Jharkhand	1706	700	10.32	6.69	57.17	13445.09	25471.22	11939.17	1.89	15262.52	40672.48
	West Bengal	1874	550	12.29	8.99	37.38	19262.72	35480.05	16217.33	1.84	21460.83	47186.33
	<b>Total</b>	<b>5996</b>	<b>2275</b>									<b>25725.5</b>
2. Linseed	Bihar	674	247.5	7.13	5.15	27.41	19272.7	36468.3	16810.9	1.65	22745.15	51431
	Jharkhand	353	150	6.31	4.52	35.16	10395.5	18287.5	7892	2.47	122167	308740
	West Bengal	463	140	6.25	4.72	28.27	71127	122130	51003	1.72	80297.5	170980
	<b>Total</b>	<b>1490</b>	<b>537.5</b>									



**Table : 5.2 (b) : Frontline Demonstration (CFLD) on Summer Oilseeds 2017**

Sl. No.	Crop	State	No. of Farmers	Area (he)	Yield (q/ha) Demo Check	Increase (%)	Farmers Existing Plot			Demonstrated Plot					
							Gross Cost	Gross Return	Net Return	BCR	Gross Return	Net Return	BCR		
1.	Sesame	Bihar	395	160	6.08	4.17	45.8	10400	22825	12425	1.29	16091.5	49670	33578.5	2.20
		Jharkhand	82	40	2.82	1.95	44.61	8627.5	14256.25	5628.75	1.65	9270	21915	12645	2.36
		West Bengal	1097	410	10.13	8.0	26.6	19714.08	32709.54	12995.46	1.66	21055.62	42432.08	21376.46	2.02
		<b>Total</b>	<b>1574</b>	<b>610</b>											
2.	Sunflower	Bihar	764	330	18.26	13.19	38.44	22659.31	50389.62	27730.23	2.21	24156.31	60448.15	36291.85	3.38
		<b>Total</b>	<b>764</b>	<b>330</b>											
3.	Ground nut	West Bengal	452	180	26.17	21.08	24.10	54368.33	97051.67	42683.33	1.79	58242.33	122462.00	64219.67	2.10
		<b>Total</b>	<b>452</b>	<b>180</b>											



## Rapeseed & Mustard

In Bihar there was an average increase of 39.38% in yield of demonstration plots over the local check and the BC ratio is 2.42. In Jharkhand and West Bengal, the percentages in yield increase in demonstration plots were



57.17 & 37.38, respectively, during rabi season under CFLD. It has been observed that the average net return (Rs. 25455.61) in demonstrated plot is highest in Jharkhand against the average net return (Rs. 15262.52) in existing plot.



## Linseed

In Jharkhand the yield increase percentage of Linseed is maximum i.e. 35.16 followed by 28.27 in West Bengal and 27.41 in

Bihar. In West Bengal the average net return of demonstrated plot is Rs. 90682.5 against average net return Rs. 51003.00 of existing plot.



## Sesame

The BC ratios of summer Sesame of demonstrated plot in Bihar, Jharkhand & West Bengal are 2.2, 2.36 and 2.02, respectively. The average net return of demonstration plot is highest in Bihar against the existing plot. The yield increase percentage in Bihar is 45.8 whereas in Jharkhand and West Bengal the yield increase percentages are 44.61 and 26.6 respectively.



## Sunflower

It has been observed that the BC ratio of Sunflower of demonstrated plot during summer under CFLD is 3.38. The yield increase percentage of demonstrated plot is 38.44. The average net return of demonstrated plot is Rs. 36291.85 whereas the average net return of existing plot is Rs. 27730.00.



## Groundnut

The Summer Groundnut was grown under CFLD during 2017 in West Bengal only. The percentage of yield increase of demonstrated plot is 24.10. The average net return of demonstrated plot is Rs. 64219.67 against the average existing plot is Rs. 42683.33.

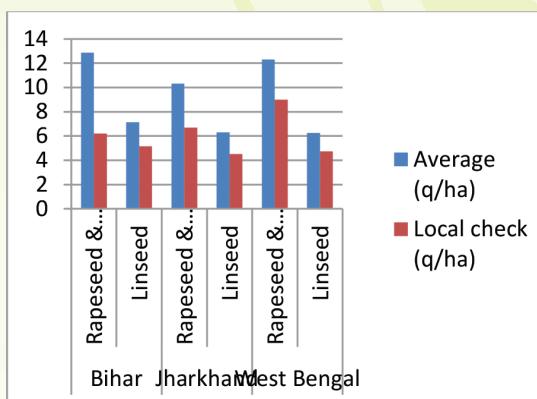


Fig-2: Performance of Rabi Oilseeds in comparison with average yield (demonstrated variety) and farmers practices (local check)

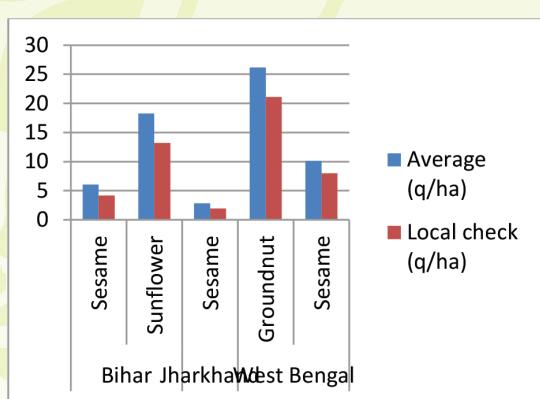


Fig-3: Performance of Summer Oilseeds in comparison with average yield (demonstrated variety) and farmers practices (local check)



## 6.1 Varietal performance of Rapeseed & Mustard under CFLD

RGN-48, Rajendra Suflam, Uttra are the improved varieties of Rapeseed & Mustard, demonstrated in Bihar under CFLD during Rabi season, 2016-17. In Bihar maximum area (460 ha) was covered by Rajendra Suflam. The demonstrated yield was highest with this variety (12.38q/ha), an increase of 48.26 over the existing yield of 8.35q/ha.

In Jharkhand it has been observed that the variety Pusa Bold shows maximum yield increase percentage i.e 43.13 during CFLD demonstration in rabi season. Minimum yield gap (%) is observed in case of variety Pusa 30. During CFLD in West Bengal, Pusa Mahek covered maximum area (230 ha). The percentage yield increase of the variety NC-1 has recorded 39.77 over check yield in West Bengal.

**Table: 5.3 (a) Performance of major varieties of Linseed**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
RGN-48	363.4	849	14.60	10.44	39.84	28.49
Rajendra suflam	460	1114	12.38	8.35	48.26	32.55
Uttra	60	175	11.49	8.41	36.62	26.80
<b>Jharkhand</b>						
Pusa Mahek	410	902	10.38	7.57	37.12	27.07
Pusa 30	80	434	10.00	7.33	36.42	26.7
Pusa Bold	60	361	7.3	5.1	43.13	30.13
Pusa 26	60	151	13.33	9.57	39.29	28.20
<b>West Bengal</b>						
Pusa Mahek	230	1025	11.27	9.31	21.05	17.39
B-9	100	572	11.35	9.36	21.26	17.53
NC-1	90	288	12.65	9.05	39.77	28.45

## 6.2 Varietal performance of Linseed under CFLD

Azad alsi-1 was the most preferred linseed variety under CFLD in Bihar, Jharkhand and West Bengal, during rabi season 2016-17. In Bihar variety Azad alsi-1 was demonstrated in 155 ha through 421

demonstrations whereas in Jharkhand and West Bengal Azad alsi-1 was demonstrated in 70 ha and 30 ha area, respectively. In Jharkhand maximum yield increase percentage is observed by the variety T-397. Minimum yield gap percentage is observed by the variety Parvati in West Bengal.



**Table: 5.3 (b) Performance of major varieties of Linseed**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
Azad alsi-1	155	421	12.03	8.70	38.27	27.69
Shekhar	80	220	11.7	8.8	32.95	24.78
Subhra	22.5	55	9.27	7.43	24.76	19.85
<b>Jharkhand</b>						
Azad alsi-1	70	193	6.96	5.79	20.21	16.81
T-397	50	157	6.77	5.45	24.22	19.49
<b>West Bengal</b>						
Shekhar	80	257	6.45	4.86	32.71	24.65
Azad Alsi 1	30	75	6.76	5.25	28.76	22.33
Parvati	30	131	9	7.5	20.00	16.67

### 6.3 Varietal performance of Sesame under CFLD

Sesame variety Savitri was demonstrated in 210 ha through 794 demonstrations during

summer season in West Bengal. The yield performance of RT 346, variety of Sesame has shown higher yield increase over check. Variety RT351 & HT-1 performed well in Bihar during CFLD demonstration.

**Table: 5.3 (c) Performance of major varieties of Sesame (Summer)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
RT 351	70	143	6.4	4.9	30.61	23.43
HT-1	10	25	5.25	4.5	16.67	14.28
<b>Jharkhand</b>						
RT 346	20	32	2.25	1.5	50.0	33.33
<b>West Bengal</b>						
Savitri	210	794	11.08	9.03	22.70	18.50
Tilottama	60	170	8.53	5.8	47.06	32.00

### 6.4 Varietal performance of Sunflower under CFLD

Sunflower is demonstrated under CFLD only in Bihar during summer. Variety KBSH-44

covered 180 ha area through 436 demonstrations.

Maximum yield increase percentage is observed in case of KBSH-41.

**Table: 5.3 (d) Performance of major varieties of Sunflower**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>Bihar</b>						
KBSH- 44	180	436	16.16	13.56	19.17	16.09
KBSH-41	60	206	18.24	13.27	37.45	27.24



## 6.5 Varietal performance of Groundnut under CFLD

During summer Groundnut was demonstrated in West Bengal only. The variety TG-37A has recorded 27.72% of yield

increase whereas TAG-51 has shown 20.91% over check yield in West Bengal. The minimum yield gap percentage is observed during demonstration of variety TAG-51 under CFLD.

**Table: 5.3 (e) Performance of major varieties of Groundnut (Summer)**

Variety	Area in (ha)	No. of demos	Demonstrated yield (q/ha)	Existing yield (q/ha)	% of yield increase	Yield gap (%)
<b>West Bengal</b>						
TAG-51	90	337	25.03	20.7	20.91	17.29
TG-37A	60	137	28.1	22.0	27.72	21.71

## 7. Successful technologies identified through clustered frontline demonstrations

### 7.1 Kharif Oilseeds

#### West Bengal

#### Birbhum KVK

Farmers of Birbhum KVK usually do not use micronutrients and herbicides for sesame

cultivation. But during CFLD demonstration KVK Rathindra introduced some improved technologies viz. use of improved variety of Sesame Sabitri (SWB-32-10-1), application of micronutrients, Zn EDTA @ 1 gm. / lit. of water at 25 and 45 DAS and application of herbicides, Pendimethalin @ 3 lit. / ha at 1 – 3 DAS etc. As a result yield increase is observed 48.4% over local check.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
B – 67(Tilottama)	7.95	2.75	SWB-32-10-1 (Sabitri)	11.8	3.83	48.4 (+)



## Burdwan KVK

Application of vermicompost along with FYM and use of improved variety (TAG-24/ AK-12-24) for groundnut cultivation leads to

12.3% increase in yield during CFLD in kharif season in Burdwan KVK. The farmers were also advised to spray micronutrients mixture (Agromin) for making up of deficient micronutrients in soil, especially Zn & B.



Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
TAG-24	19.9	1.57	TAG-37-A	22.3	1.83	12

## Bihar

### KVK Khagaria

In Khagaria KVK, Soybean variety PS1042 was demonstrated during kharif 2016. Seed treatment was done with application of

Bavistin 2.5 g/kg seed. The farmers also applied herbicide, Imizathiaper @ 40 gm ai/ha at 25-35 DAS and insecticide Profenofos (40%) along with Cypermethrin (4%) @ 1-1.5 lt/ha. The resultant increase in yield is 16.7%.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
JS- 335	18.6	1.87	PS1042	21.7	2.19	16.7





## Jharkhand

### KVK Chatra

Niger being a drought tolerant Oilseed crop is preferred by the farmer of Jharkhand during Kharif season. Chatra KVK demonstrated the

variety of Niger JNC-6. Application of Bavistin @ 2g/kg seed as seed treatment with two foliar spray of 40:40:20::NPK. Line sowing of Niger with spacing 30x15 cm also helps to increase demonstrated yield i.e 34.18%.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
Local	2.75	1.75	JNC-6	3.69	2.46	34.18

## 7.2 Rabi Oilseeds

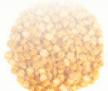
### Bihar

### KVK Aurangabad

The performance of variety Rajendra suflam

of Rapeseed and Mustard is observed exceptionally good with the application of sulphur @ 40kg/ha and imidacloprid @ 100ml/ha. Introduction of improved variety and seed treatment with Carbendazim 2.5g/kg seed also helped the yield increase.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
Varuna	8.5	2.07	Rajendra suflam	13.35	2.52	36.32



## Jharkhand KVK Ramgarh

Line sowing method with spacing  $30 \times 10$  cm was adopted with improved variety of Linseed

(Sekhar) in this KV. Foliar spray of NPK in 19:19:19 enhances the growth of the crop. The demonstrated yield is observed 4.3q/ha in comparison to existing yield i.e. 3.4q/ha.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
Local	3.4	2.47	Shekhar	4.3	2.89	26.47



## KVK Buxar

Sunflower is widely grown in Bihar during summer season. In Buxar district sunflower was demonstrated during summer 2016-17.

Sunflower is one of the most drought tolerant Oilseed crop. Application of Sulphur and micronutrient 20 kg/ha and 1kg/ha results yield enhancement up to 18.6%.

Local Check			Demonstration			
Variety	Yield (q/ha)	BCR	Variety	Yield (q/ha)	BCR	Change in Yield (%)
NSFH-145	14	1.6	NSFH-145	16.6	1.78	18.6



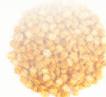
## 8. Performance of major Oilseed crops under CFLD in Bihar, Jharkhand & West Bengal during 2016-17

### 8.1 Performance of CFLDs on Sesame in West Bengal during Kharif 2016

RT-346, Savitri, HT-1, Tilottama and SWB-32-10-1 are the varieties of Sesame demonstrated in West Bengal under CFLD programme during summer 2017 with other improved technologies in different agro-climatic Zones of West Bengal.

**Table: 8.1.1 Performance of CFLD on Sesame in West Bengal during Kharif 2016**

Agro Climatic Zone/Climate	KVks	Variety demonstrated	Area (in ha)	No. Of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)		BCR
					Check	Demo		Demo	Check	
Coastal Saline Zone	South 24 PGS (Nimpith)	Savitri	10	70	9.46	8.39	13	12110	15418	1.56
Burdwan	RT-346	50	278	8.2	8.96	9.26	10898	17972	1.61	1.69
Hooghly	Savitri	40	205	11.5	15.4	33.7	8104	19729	1.35	1.82
Howrah	Sabitri	40	111	9.7	13.1	35.05	15820	22830	1.82	2.08
Murshidabad	Savitri	40	134	10.1	13.9	36.92	33233.5	13471	1.11	1.44
Nadia	Savitri	30	112	11.3	12.9	14.38	18200	22500	1.7	1.8
North 24 Pgs	Savitri	20	88	8.55	9.34	9.24	9700	16000	1.39	1.64
Terai-Teesta	Jalpaiguri HT-1	10	25	4.5	5.25	16.67	31500	36500	2.37	3.28
alluvial Zone	Uttar Dinajpur Tilottama	40	105	5.2	8.8	69.23	5060	19390	1.28	1.96
Bankura	Tilottama	20	65	6	8.25	37.5	21500	33500	2.04	2.38
Birbhum	SWB- 32-10-1	20	65	9	11.9	31.94	25200	38400	2.64	3.33
Purulia										
West Medinipur	SWB- 32-10-1	20	50	6.8	10.3	52	15200	20900	1.93	2.08



## 8.2 Performance of CFLDs on Sesame in Jharkhand during Kharif 2016

RT-351, GT-2, RT 346, Sekhar, N-28 and Tilotamma are the varieties of Sesame demonstrated in Jharkhand under CFLD programme during Kharif 2016 with other improved technologies in different agro-climatic Zones of Jharkhand.

**Table: 8.2.1 Performance of CFLD on Sesame in Jharkhand during Kharif 2016**

Agro Climatic Zone/Climate	KVs	Variety demonstrated	Area (in ha)	No. Of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)		BCR
					Check	Demo		Check	Demo	
Bokaro	RT-351	20	44	2.7	4.3	60	7300	25600	2.4	3.9
Chatra	G T-2	20	40	2.25	3.39	51	5000	14340	2.56	2.85
Gumla	G T-2	20	60	3.4	4.9	45	6330	16675	1.41	1.89
Central Western Plateau Zone	RT-351	30	31	4.2	7	67	9400	15690	1.88	2.33
Lohardaga	G T-2	20	59	3.8	5	32	6900	12300	1.68	2.21
Palamu	G T-2	20	50	3.7	5.4	46	6000	3000	1.5	1.32
Ranchi	Sekhar	20	50	4.25	5.65	32.94	6175	16322	1.34	1.79
Simdega	G T-2	20	50	3.1	4.88	57.4	2300	8200	1.17	1.51
Dhanbad	RT 346	20	32	2.5	3.25	30	19250	28125	1.6	2.25
Central & North Dumka	N-28 Shekhar-2	20	11	4	6.23	55.75	11700	37495	1.81	3.34
Eastern Plateau Zone	Giridih	20	50	4.3	6.5	51.16	7000	22000	1.63	2.29
Sahibganj	RT 346	20	64	2.25	3.39	50.7	2850	3933	1.23	1.32



### 8.3 Performance of CFLDs on Rapeseed & Mustard in West Bengal during Rabi 2016-17

Pusa mahak, B-9, Pusa vijay, JD-6, NC-1, PAN-70, YSBNC-1 and B-54 are the varieties of Rapeseed and Mustard demonstrated in West Bengal under CFLD programme during Rabi 2016-17 with other improved technologies in different agro-climatic Zones of West Bengal.

**Table: 8.3.1 (a) Performance of CFLD on Rapeseed & Mustard in West Bengal during Rabi 2016-17**

Agro Climatic Zone/Climate	KVs	Variety demonstrated	Area (in ha)	No. Of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)		BCR
					Check	Demo		Check	Demo	
Gangetic Alluvial Zone	South 24 PGS (Nimpith)	Pusa Mahak	20.0	127	6.87	8.45	23	8580	13435	1.34
	Burdwan	Pusa Mustard 2	50.0	175	11.6	15	30	20607	29516	1.91
	Hooghly	B-9	30.0	176	10.8	12	12	22,050	27,575	2.4
	Howrah	Pusa Mahek	30.0	141	9.9	11.2	14	25310	34460	2.38
	Murshidabad	Pusa Vijay	20.0	50	10.13	16	50	22650	36450	1.97
	Nadia	Pusa Mahek (JD-6)	30.0	87	10.9	12	10	11900	17150	1.4
	North 24 Pgs	JD-6	30.0	135	10.5	11.03	5	13500	14870	1.47
	Northern Hill Zone	Darjeeling	29, Garima	30.0	120	8.32	9.9	19	9241	11970
	Terai-Teesta alluvial Zone	Coochbehar	YSBNC-1	30.0	70	7.8	12.4	59.23	8080	19750
	Jalpaiguri	B-9	30.0	87	8.2	10.5	28.04	11600	17450	1.77
Undulating Red & Latarite zone	Uttar Dinajpur	NC-1 (Jhumka)	60.0	196	9.9	12.8	28.78	20130	30990	2.03
	Bankura	Pusa Mahek	30.0	101	5.6	8.37	49.55	33500	52250	2.48
	Birbhum	Pusa Mahek	30.0	70	9.05	11.2	23.2	27083	41100	2.49
	Purulia	PAN-70								3.16
	West Medinipur	Binoy	30.0	62	8.75	14.4	65	19500	32900	1.87
Vindhyan Alluvial Zone	Dakshin Dinajpur	NC-1	30.0	92	8.2	13.3	63	5490	20890	1.35
	Malda	B-54	30.0	75	10.9	12	10	5900	10620	1.28
										1.47



#### 8.4 Performance of CFLDs on Rapeseed & Mustard in Bihar during Rabi 2016-17

Uttara and RGN-48 are the varieties of Rapeseed and Mustard demonstrated in Bihar under CFLD programme during rabi 2016-17 with other improved technologies in different agro-climatic Zones of Bihar.

**Table: 8.4.1 Performance of CFLD on Rapeseed & Mustard in Bihar during Rabi 2016-17**

Agro Climatic Zone/Climate	KVs	Variety demonstrated	Area (in ha)	No. Of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)		BCR
					Check	Demo		Check	Demo	
North East Alluvial Zone	Araria	Ultra	30	100	11	15.25	39	10310	19910	1.41
	Katihar	Ultra	30	75	5.81	7.74	34	9335	14890	1.84
	Kishanganj	Rajendra Suflam	30	75	5.4	9.1	69	6000	19600	
	Madhepura	Rajendra Suflam	30	94	8.35	11.6	39	21000	45580	2.95
	Purnea	RGN-48	30	75	10.36	8.75	19	19625	24160	2.78
	Saharsa	Rajendra Suflam	30	75	10.5	12.15	16	26598	34780	2.08
	Supaul	Rajendra Suflam	30	72	6.47	9.45	46	14487	29300	2.5
	Begusarai	Rajendra Suflam	40.0	72	15.1	20.16	33.5	28580	41310	2.17
	Darbhanga	Rajendra Suflam	30.0	75	13.51	19.25	42.5	27790	55785	2.7
	Gopalganj	Rajendra Suflam	30.0	75	10.5	14.75	40.47	12900	31300	1.9
North West Alluvial Plain Zone	Madhubani	Rajendra Suflam	10.0	49	7.75	10.5	35.48	12450	21942	1.76
	Samastipur	Rajendra Suflam	30.0	75	7.8	12.4	58.97	4840	11820	1.23
	Saran	Rajendra Suflam	40.0	144	12	17.2	43.33	31257	56787	1.89
	Sitamarhi	Rajendra Suflam	30.0	95	8	10	25	25700	35300	2.15
	Siwan	Rajendra Suflam	30.0	100	8.5	11.8	38.8	14212	21900	2.25
	West Champaran	Rajendra Suflam	30.0	47	7.25	11.5	58.62	14200	28850	2.38
	Banka	RGN-48	45	61	7.1	9.2	29.57	26050	54250	1.95
South Bihar Alluvial Zone	Bhagalpur	RGN-48	30	60	12.6	18.05	43.25	29350	41635	2.48
	Jamui	RGN-48	28.4	67	8.8	13.9	57.95	15900	31500	1.77
	Munger	RGN-48	30	77	9.65	14.5	50.25	26630	54080	2.44
	Arwal	RGN-48	30	105	10	12.15	21.5	25900	27600	2.29
										2.41



## 8.5 Performance of CFLDs on Rapeseed & Mustard in Jharkhand during Rabi 2016-17

NRCDR-2, Pusa Mahak, Pusa-26, Pusa Vijay, Pusa-29, Pusa-28 and NDR – 8501 are the varieties of Rapeseed and Mustard demonstrated in Jharkhand under CFLD programme during rabi 2016-17 with other improved technologies in different agro-climatic Zones of Jharkhand

**Table: 8.5.1 Performance of CFLD on Rapeseed & Mustard in Jharkhand during Rabi 2016-17**

Agro Climate Zone/Climate	KVs	Variety demonstrated	Area (in ha)	No. Of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)	Demo Check	BCR
					Check	Demo				
Central Western Plateau Zone	Bokaro	NRCDR-2	30	84	6.5	9.6	47.7	16200	25900	2.67
	Chatra	Pusa Mahak	30	60	8.4	11.7	39.3	14500	36580	2.07
	Garwah	Pusa Mahak	30	120	5.4	8.4	55.5	4900	13400	1.35
	Gumla	Pusa-26, Pusa Vijay Pusa-29, Pusa-28	30	76	9.24	14.04	51.9	8698	25392	1.37
	Hazaribag	PM-30	30	76	13	15.59	19.9	23060	41860	2.12
	Latehar	Pusa Mahak	30	25	7	10.3	47.1	24465	40155	2.3
	Lohardaga	Bharat -2, Pusa Mahak	30	76	8.5	11.4	34.1	7000	31600	1.33
	Palamu	Pusa Mahak	30	50	5.6	7.5	33.9	7800	18500	1.61
	Ranchi	Pusa Mahak	50	125	9	13.1	45.5	14408	26087	1.72
	Simdega	Pusa-26	30	75	9.9	12.61	27.4	19630	28657	2.15
Central & North Eastern Plateau Zone	Deoghar	NDR - 8501	30	131	6.8	9.3	36.8	8970	18912	2.06
	Dhanbad	Pusa Mahak	30	68	7	10.6	51.4	3000	26000	1.14
	Dumka	Pusa Mahak	30	34	6	8.2	36.6	11700	37495	1.81
	Giridih	Pusa Mahak	30	60	5.7	8.5	49.12	7300	21300	1.79
	Goddha	Pusa Mahak	30	65	8	11.8	47.5	8750	23450	1.38
	Jamtara	Pusa Mahak	30	75	6.8	8.2	20.6	7900	12600	1.63
	Koderma	Pusa Mustard-30	20	67	5	7.6	52	9350	13910	2.32
	Sahibganj	Pusa Mahak	30	74	5.6	8.5	51.8	2260	17175	1.13
	East Singhbhum	NC-1, Pusa-30, Pusa Bold	30	91	5.1	6.8	33.3	7050	15600	1.69
	Saraikela	RGN-236	30	60	7.85	13.13	67.3	9270	33616	1.4
South Eastern Plateau Zone	West Singhbhum	Pusa mahek	30	70	9.4	11.7	24.5	45940	56690	5.2



## 8.6 Performance of CFLDs on Sesame in West Bengal during Summer 2017

TG 37 A, TAG 24 and TG-51 are the varieties of Sesame demonstrated in West Bengal under CFLD programme during Summer 2017 with other improved technologies in different agro-climatic Zones of West Bengal.

**Table: 8.6.1 Performance of CFLD on Sesame in West Bengal during Summer 2017**

Agro Climatic Zone/Climate	KVks	Variety demonstrated	Area (in ha)	No. of Demo.	Yield (q/ha)		% increase	Net Return (Rs./ha)		BCR
					Check	Demo		Check	Demo	
Gangetic Alluvial Zone	Burdwan	TG 37 A	20	59	17.4	18.3	5.17	38000	42750	1.79
	Hooghly	TAG 24	30	138	18.75	21.0	12.0	82500	105500	2.69
	Howrah	TG-51	30	170	26.3	32.9	25.1	47000	72040	2.26
	Murshidabad	TG-37A	30	75	27.75	34.87	25.65	15930	35333	1.22
	Nadia	TG-51	30	90	21.3	24.2	13.6	50600	63200	2.1
Terai-Teesta alluvial Zone	Jalpaiguri	TG -51	30	90	14.45	17.95	24.22	52410	68410	2.66
	West Medinipur	TG-37-A	30	62	16.2	21.25	31.17	27230	38960	1.92
Undulating Red & Latarite zone	Purulia	TG-37-A	40	214	9.1	14.5	59.34	15100	33950	1.49
										1.87



## 8.7 Performance of CFLD on Sesame in Jharkhand during Summer 2017

RT-351, GT-2, RT 346, Sekhar, N-28 and Tilotamma are the varieties of Sesame demonstrated in Jharkhand under CFLD programme during Kharif 2016 with other improved technologies in different agro-climatic Zones of Jharkhand.

**Table: 8.7.1 Performance of CFLD on Groundnut in Jharkhand during Summer 2017**

Agro Climatic Zone/Climate	KVNs	Variety demonstrated	Area (in ha)	No. of Demo.	Yield (q/ha)	% increase	Net Return (Rs./ha)		BCR
							Check	Demo	
Central Western Plateau Zone	Bokaro	TG-38	30	64	9.5	14.2	49.5	22000	38800
	Garwah	Kadri 6	30	102	7	9	28.6	17000	24000
	Gumla	K-6	30	86	13.18	16.6	25.9	21637	32777
	Lohardaga	K-6	30	90	12.2	18	47.5	22700	43000
	Ranchi	M-13	30	75	11.16	18.3	61.3	23400	53376
	Simdega	TG-37-A	30	93	11.1	14.1	27.8	20142	31386
Central & North Eastern Plateau Zone	Deoghar	TPG-41	30	75	6.25	4.8	30.2	1625	2705
	Dhanbad	K-6	30	38	4.6	7	52.2	40000	65500
	Dumka	K-6	30	106	12	18.8	56.7	39700	72200



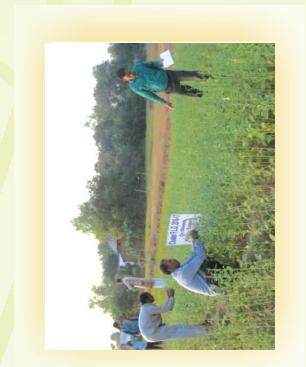
## 9. Success Story

### 9.1 Success Story: Kharif

Name of KVK	:	Birbhum (West Bengal)
Name of farmer & Address	:	Sri Asutosh Biswas Village: Srichandrapur Block: Illumbazar
Crop & Variety	:	Sesame / SWB-32-20-1
Details of technology demonstrated	:	<ul style="list-style-type: none"> <li>● Seed rate(kg/ha): 6 kg/ha</li> <li>● Nutrient management (kg/ha): Foliar Spray of Micro-Nutrients ( Zn EDTA @ 1 gm./ lit. of water) at 25 and 45 DAS.</li> <li>● Weed management: Application of herbicides Pendimethalin @ 3 lit. / ha at 1 – 3 DAS</li> </ul>
Farmer's feedback	:	<ul style="list-style-type: none"> <li>● Short duration variety.</li> <li>● More numbers of siliqua.</li> <li>● Better production.</li> <li>● Effective result by weed and nutrient management.</li> </ul>

### Performance of technology vis-à-vis local check (increase in productivity and returns)

Crop & Variety	Technology	Yield q/ha	Net income (Rs/ha)	BCR
Sesame / SWB-32-20-1	Demonstration	11.8	33265	3.4
	Check	7.95	22775	2.75
	% increase over check	48.4		



Name of KVK	:	Burdwan
Name of farmer &Address	:	Mahadeb Porey Village: Bharatpur Block: Glasi-I District: Burdwan
Crop & Variety	:	Groundnut/ TG-37-A
Details of technology demonstrated	:	<ul style="list-style-type: none"> <li>● Seed rate (kg/ha): 15kg/ha</li> <li>● Nutrient management: 35 kg/ha N, 40 Kg/ha P, 130 kg/ha K, 20 kg/ha S, 7-8 tonnes FYM and micronutrient mixture (Agromin)</li> <li>● Seed Treatment: Trichoderma harzianum and Pseudomonas fluorescens @ 10g/kg seed</li> </ul>
Farmer's feedback	:	<ul style="list-style-type: none"> <li>● Higher yield</li> <li>● Better germination rate due to seed treatment.</li> </ul>

#### Performance of technology vis-à-vis local check (increase in productivity and returns)

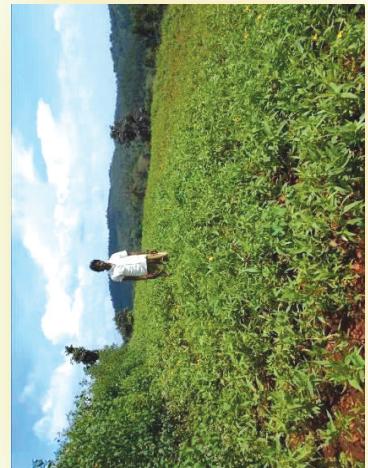
Crop & Variety	Technology	Yield q/ha	Net income	BCR
Groundnut/ TG-37-A	Demonstration	22.3	42750	1.88
	Check	17.4	38000	1.79
	% increase over check	28.16		



Name of KVK	:	Ranchi (Jharkhand)
Name of farmer &Address	:	Sri Bhadawa Bediya Village: Badari Block: Angara
Crop & Variety	:	Niger/JNC-6
Details of technology demonstrated	:	<ul style="list-style-type: none"> <li>● Seed rate(kg/ha): 10 kg/ha</li> <li>● Seed treatment: PSB @ 200 gm per 10 kg seed</li> <li>● Nutrient management (kg/ha): 20 kg/ha N, 40 Kg/ha P and 20 kg/ha K</li> <li>● Insect pest management: Use of liquid bio pesticides (Dasparni), Neem oil on every 15 days interval. Yellow sticky trap was also used @ 20 sticky trap per ha</li> </ul>
Farmer's feedback	:	<ul style="list-style-type: none"> <li>● Oil content of JNC-6 is nearly 7 to 8 more in comparison to local variety</li> <li>● There was less incident of disease in this variety</li> <li>● Variety suitable for rainfed farming.</li> </ul>

#### Performance of technology vis-à-vis local check (**increase in productivity and returns**)

Crop & Variety	Technology	Yield q/ha	Net income	BCR
Niger/JNC-6	Demonstration	5.75	5272	1.39
	Check	4.0	900	1.08
	% increase over check	43.75		



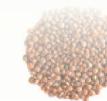
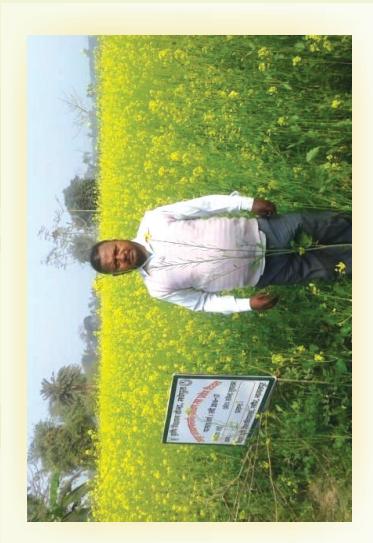
## 9.2 Success Story: Rabi

Name of KVK	:	Madhepura (Bihar)
Name of farmer & Address	:	Ravi Kumar Village: Tamotpara Block: Murliganj
Crop & Variety	:	Mustard / Rajendra sulfam
Details of technology demonstrated	:	<ul style="list-style-type: none"> <li>• Seed rate(kg/ha): 6 kg/ha</li> <li>• Seed treatment: Carbendazim @ 2gm/kg seed</li> <li>• Nutrient management (kg/ha): 80 kg/ha N, 40 Kg/ha P and 40 kg/ha K and 25 kg/ha S.</li> <li>• Weed management: Hand weeding</li> </ul>

Farmer's feedback	:	<ul style="list-style-type: none"> <li>• The variety performs better in late sowing condition</li> <li>• Seed treatment prevented seed borne disease.</li> <li>• Better production.</li> <li>• Application of sulphur increases oil content and pungency of oil.</li> </ul>
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### Performance of technology vis-à-vis local check (increase in productivity and returns)

Crop & Variety	Technology	Yield q/ha	Net income	BCR
Mustard / Rajendra sulfam	Demonstration	11.5	45580	4.82
	Check	7.55	21000	2.95
	% increase over check	52.31		



Name of KVK	:	Ramgarh (Jharkhand)
Name of farmer & Address	:	Birsra OraonVillage: GeggdaBlock: Patratu
Crop & Variety	:	Linseed / Sekhar
Details of technology demonstrated	:	<ul style="list-style-type: none"> <li>● Seed rate(kg/ha): 20 kg/ha</li> <li>● Spacing: 30x10 cm</li> <li>● Nutrient management (kg/ha): Foliar spray of N:P:K 19:19:19@2.5kg/ha</li> </ul>
Farmer's feedback	:	<p> </p> <ul style="list-style-type: none"> <li>● Higher yield</li> <li>● Variety resistant to powdery mildew.</li> </ul>

#### Performance of technology vis-à-vis local check (increase in productivity and returns)

Crop & Variety	Technology	Yield q/ha	Net income	BCR
Linseed / Sekhar	Demonstration	6.2	14350	2.89
	Check	4.4	12150	2.47
	% increase over check	40.9		



## **10. Constraints in Oilseed production:**

Despite Oilseeds being more profitable compared to other crops, farmers are allocating less area to it, due to the high degree of risks in oilseeds cultivation. The oilseed growers face a variety of risks such as technological, institutional, agro-climatic, marketing and economic. The extent of risk depends on the personal characteristics of farmers, probability of occurrence of constraints and the severity of that constraint.

- **Environmental constrain:** Oilseeds are energy rich crop but grown under rain fed condition comprising mostly marginal and sub marginal lands with poor fertility.
- **Technological constrain:** Though a large number of high yielding variety and improved technologies are developed still there is a lack of improved farm implements, low cost technology for control of insects, pests and diseases, appropriate post-harvest technology to prevent post harvest losses and deterioration in quality.
- **Socio-economic constrain:** For small and marginal farmers Oilseed crops become high risk due to poor economic condition of the farm resulting low yield.
- **Organizational and infrastructural constraints:** Inadequate production and distribution of quality seeds, timely supply of inputs, credit, irrigation, and transfer of improved technology from researcher to farmer, storage, grading and marketing of oilseeds are also responsible for low output of oilseeds.

## **11. Conclusion:**

Generally cultivation of Oilseed crops is not labour-intensive, so Oilseed crops can be managed in labour scarce areas. Cultivation of Oilseed crops is very economical and remunerative, thus, it helps in improving socio-economic status of the farmers. It was observed that the area having low water availability the drought resistant variety of Groundnut and Rapeseed & Mustard resulted better income in place of rice and wheat cultivation. Cluster front-line demonstration on oilseeds project under NMOOP was conducted to promote Oilseed cultivation under the guidance of KVK scientists to encourage the farmers for application of better technologies to get better yield. Adaptation of location specific efficient dry farming technologies will result drought proofing and sustainable oilseeds production. Effective transfer of technology with assured input, market and technological backstopping by both public and private sector agencies will help to achieve the goal in oilseed production bridging the yield gaps. Increased amount of oilseed production leads to involvement of greater number of farmers, scientists, policy makers and private sector industry and the strong linkages among them will definitely improve the current scenario of oilseed crop production in India.



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