

## Current Scenario, Challenges And Solutions Of Oil Seed Production In North East

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### Introduction

The North Eastern region of India comprising the State of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura lies between 21.5°N to 29.5°N latitude and 85.5°E to 97.5°E longitude. It covers an area of 2.6 Million sq.km with 54% of the geographical forest cover which is characterized by diverse agro-climatic and geographical condition. Northeast India has a subtropical climate that is influenced by its relief and influences from the southwest and northeast monsoons. April to late October are the months where most of the rainfall in Northeast India occurs with June and July being the rainiest months. Temperatures vary by altitude with the warmest places being in the Brahmaputra and Barak River plains and the coldest at the highest altitudes. In the Brahmaputra and Barak valley river plains, mean winter temperatures vary between 16 to 17 °C (61 to 63 °F) while mean summer temperatures are around 28 °C. The highest summer temperatures occur in the West Tripura plain in Agartala, ranging between 33 to 35°C (91 to 95°F) in April. (<https://en.m.wikipedia.org/wiki/Northeast>).

Majority of the population, predominantly tribal is dependent on agriculture and land based activities with a total cropped area of 5.3 million hectares and a population of around 39 millions. Agriculture provides livelihood support to 70 % of the region's population. The state of Assam is having maximum cultivated area followed by Nagaland and Meghalaya. Cropping intensity is highest in the state of Tripura (184%) and lowest in Mizoram (106%). Traditionally, farmers both at upland terrace and valley land follow the monocropping practice in rainfed agriculture, where rice is the major crop occupying more than 80% of the cultivated area followed by maize.

The NER of India has 8 distinct agro-climatic zones starting from subtropical to temperate to Alpine zone. Each state has been again divided into agro-ecozones for



agricultural planning and development. Rice is main crop of Arunachal Pradesh and tropical and temperate fruits are also grown. In Assam, double cropping of rice is practiced in plains. Fish farming is also common. Tea husbandry is common in hills of Assam and Tripura. In Manipur rice, oilseeds, vegetables are major crops. Rice, maize, ginger, turmeric, citrus etc. are important crops in Meghalaya. Rice is grown on terraces of Mizoram with horticultural crops such as orange on slopping areas. Rice is cultivated in valleys and horticultural/plantation crops on hills of Nagaland. Sikkim is only state where agriculture is well established in bench terraces and no jhum cultivation is prevalent. Maize and cardamom are the important crops of Sikkim. In Tripura, there are three agro ecological regions where double cropping of rice is prevalent in plains. and pineapple, arecanut and vegetables are other important crops. (nass.india.org).

The North Eastern Hill (NEH) region of India is primarily under the acidic soil zone with high rainfall area. Oilseed crop are important for North East as oil is utilized through the region for cooking and frying purposes. The oilseeds are extensively used as condiments in preparation of pickles, curries and vegetables. The leaves of young plants are also used as green vegetables as it supply enough sulphur and materials in the diet. The by- products (hull, meal and oil) of oilseed crops had been integrated into human and animal diets due to its nutrient compositions. Majority of the oilseed meal consists of proteins and high contents of essential amino acid which are beneficial to human health and wellbeing. Likewise, the fat yields of oilseed crops are generally high, though varied from crop to crop (species), and methods of extraction; high polyunsaturated fatty acids contents also prevent against coronary heart disease. Apart from the food value of oilseeds, several industrial products such as biodiesel, fertilizer, medicine, cosmetics, animal feeds, fibers, paint, button etc. have also been reported (<https://doi.org>).

The oilseed that are commonly grown in the North Eastern States in India are Rapeseed and mustard, soybean, sesame, groundnut. However, oilseed cultivation in the NEH region faces several constrains, such as soil acidity problem, water scarcity during post-monsoon season, lack of irrigation facilities, short time lag after rice harvest for seed sowing and lack of soil test based fertilizer recommendations. As a result, only mono-cropping of rice is practiced and the farmers leave their land fallow during *rabi* season. The per capita

availability of oilseed in the region is 8 g day<sup>-1</sup> as against moderate requirement of 50 g day<sup>-1</sup>.

**Table 1: Oil content of oilseed (Sandeep et al., 2014)**

Sl No	Crop	Oil Content
1	Groundnut	40-45
2	Rapeseed	34.9-44.9
3	Soybean	8.1-27.9
4	Sesame	48-55
5	Sunflower	49-53
6	Cotton	18-26
7	Castor	40-55
8	Niger	4-14
9	Linseed	22-27

**Table 2: Protein content(%) of common oilseed (Kumar et al., 2014)**

Sl No	Oilseed	Protein(%)
1	Rapeseed	17.8-22.0
2	Soybean	34.1-56.8
3	Groundnut	18.92-30.53
4	Mustard	17.8-22.0
5	Sunflower	10-25
6	Sesame	20-28
7	Castor	12-16
8	Cotton	15.7

### Current Scenario of Oilseed Production in India

India is one of the significant oilseed's growers and importer of edible oils. India's vegetable oil economy is the world's fourth-largest after USA, China & Brazil. The oilseed accounts for 13% of the Gross Cropped Area, 3% of the Gross National Product and 10% value of all agricultural commodities. On Global basis, India ranks first in the production of



castor, safflower, sesame and niger, second in groundnut, rapeseed and mustard, third in linseed, fifth in soybean and sunflower (Rai et al., 2016).

In India, annual oilseeds are cultivated over 24.67 million hectares of area producing 30.62 million tonnes annually (Ministry of Agriculture and Farmers Welfare 2019). Majority of the oilseeds are cultivated under rainfed ecosystem (70%). Nine oilseeds are the primary source of vegetable oils in the country, which are largely grown under rainfed condition over an area of about 26 million ha. Among these, soybean (34%), groundnut (27%), rapeseed & mustard (27%) contributes to more than 88% of total oilseeds production and >80% of vegetable oil with major share of mustard (35%), soybean (23%) and groundnut (25%). Depending upon the season, the crops are sown in two seasons i.e; Kharif-Soybean, Castor, Niger, Sesame and Rabi- Rapeseed and Mustard, Linseed, Safflower. Groundnut and Sunflower can be sown on both Kharif and Rabi.

During the year 2017-18, oilseeds were cultivated in >246 lakh hectare of land with a production of >306 lakh tons. The major oilseed growing states in India are Madhya Pradesh (20.3%) Rajasthan (18.9%) Maharashtra (13.3%) Gujarat (12.6%) Andhra Pradesh (10.5%) Karnataka (10.3%) Uttar Pradesh (3.9%) Tamil Nadu (2.5%) contributing > 90% of the total oilseed production in the country. Out of the total area of 246.98 lakh ha, Madhya Pradesh occupies 66.41 lakh ha area and produces 22.3% of entire annual oilseed crops thereby leading in both area and production in the country followed by Rajasthan (20.5%), Gujarat (16.7%) and Andhra Pradesh (7.3%). The Statewise contribution in area and production of oilseeds in the country is presented in Table(3). Indian edible oil market is the largest after China & the European Union. Each year India consumes around 10 mt of edible oils. The expected demand for oilseeds production is 44, 55 and 65 MT by 2010, 2015 and 2020 respectively. Oilseeds are major sources of energy and nutrition. (www.nfsm.gov.in/StatusPaper/NMOOP, 2019). The crop wise contribution of area, production and yield of oilseeds in the country is presented in (Table 4).

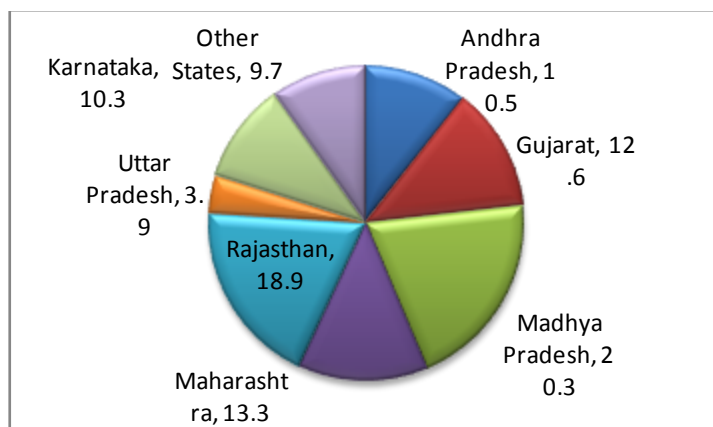
**Table3: State wise contribution in area and production under oilseed in the year 2017-2018.**

(Area lakh ha, Production lakh tons)

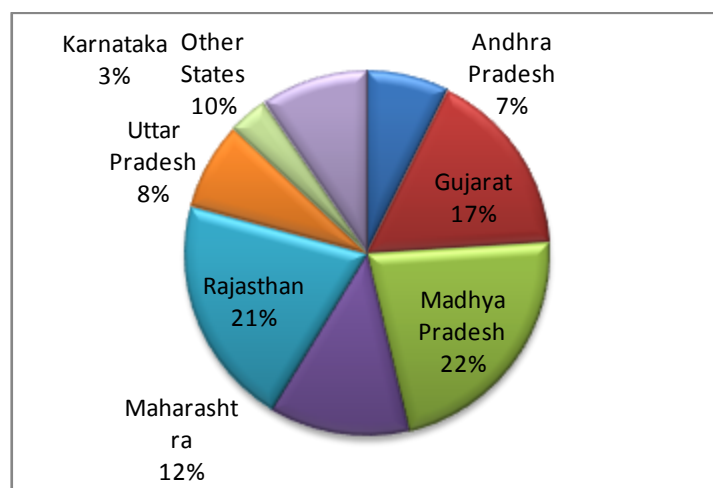
States	Area	% contribution	States	Production	% contribution
Andhra Pradesh	8.19	10.5	Andhra Pradesh	10.68	7.3
Gujarat	27.25	12.6	Gujarat	57.10	16.7
Madhya Pradesh	<b>66.41</b>	<b>20.3</b>	Madhya Pradesh	<b>69.48</b>	<b>22.3</b>
Maharashtra	43.00	13.3	Maharashtra	42.33	12.4
Rajasthan	52.07	18.9	Rajasthan	60.64	20.5
Uttar Pradesh	10.99	3.9	Uttar Pradesh	11.58	7.8
West Bengal	9.32		West Bengal	10.03	
Tamil Nadu	32.95	2.5	Tamil Nadu	9.65	
Karnataka	12.15	10.3	Karnataka	8.12	3.5
Other States	17.59	9.7	Other States	16.72	9.5
All India	246.98		All India	306.38	

Source: www.nsfm.gov.in/Status Paper/NMOOP, 2019

**Graph 1: State wise % contribution in area under oilseed in the year 2017-18.**



Graph 2: State wise % contribution in production under oilseed in the year 2017-18.



Sources: www.nsfm.gov.in/StatusPaper/NMOOP, 2019

**Table 4: Crop wise distribution in area, production and yield under oilseed in the year 2018-19.**

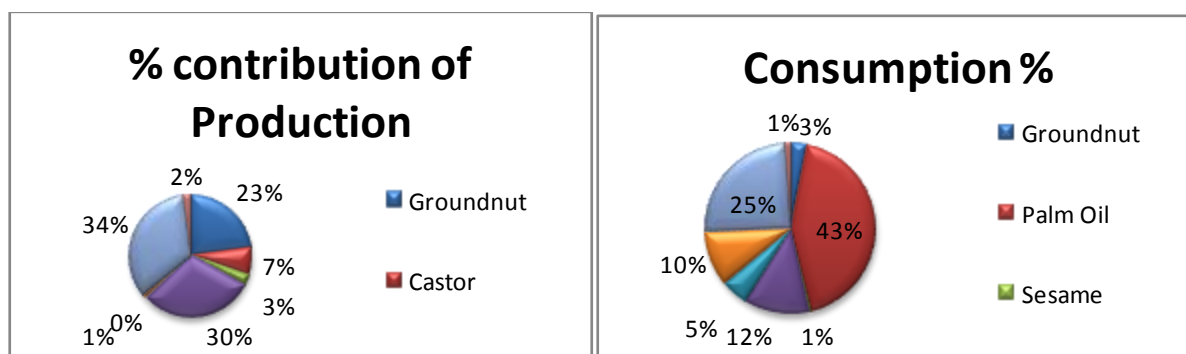
(Area- lakh ha, Production- lakh tons, Yield- lakh kg/ha)

Crop	Season	Area	Production	%contibution	Yield
Groundnut	Kharif	40.76	73.65	23	18.07
	Rabi	8.2	15.77		19.17
	Total	48.98	89.42		<b>18.25</b>
Castor	Kharif	8.32	14.89	7	18.10
Niger	Kharif	2.23	0.75		3.37
Sesame	Kharif	16.66	7.43	3	4.78

Rapeseed and Mustard	Rabi	60.06	80.41	30	13.39
Linseed	Rabi	3.3	1.72	0.1	5.23
Safflower	Rabi	0.81	0.45		5.57
Sunflower	Kharif	1.35	0.73	1	5.45
	Rabi	1.93	1.2		6.22
	Total	3.28	1.9		5.9
Soybean	Kharif	<b>104.4</b>	<b>109.33</b>	<b>34</b>	10.47
Total oilseeds	Kharif	172.64	206.81		10.98
	Rabi	74.33	99.56		12.23
	Total	246.98	306.38		11.29

Sources: Ministry of Agriculture and Farmers Welfare (2019)

**Graph 3: Crop wise percentage contribution in production under oilseeds in the year 2018-19.**



**Graph 4: Consumption of different vegetable oil in India (2018-19)**

Sources: Ministry of Agriculture and Farmers Welfare (2019)

**Scenario of Oilseed Production in North East**

Oilseed production in the North East is very low although more than half of the population are engaged in agriculture. Water scarcity during the post monsoon season and short time lag after rice harvest for seed sowing led to the low production since majority of the farmers practiced mono cropping of rice and left the land fallow (www.kiran.nic.in ). The major oilseed crop grown in North East are Rapeseed & mustard, soybean, sesame,

groundnut, linseed and sunflower. Rapeseed & mustard and soybean contributes >90% of the total oilseeds produced in the North East. During the year 2015-16, the total area under oilseed cultivation, production and yield in North East was recorded as 668000 ha, 415700 Mt and 7465 kg/ha ([www.nsfm.gov.in/RedyReckoner/Oilseeds/Stats-OS2018](http://www.nsfm.gov.in/RedyReckoner/Oilseeds/Stats-OS2018)). The production of oilseed is increase to a marginal extend in some States as indicated in Table 5. Below are the State wise contribution in area, production and yield of oilseed:

**Table 5: Five years data on production of oilseed in North East**

State	2012-13	2013-14	2014-15	2015-16	2016-17
Arunachal Pradesh	30800	31400	33900	36400	<b>36600</b>
Assam	186800	186300	205700	<b>215200</b>	204300
Manipur	32100	31000	31700	31800	<b>32300</b>
Meghalaya	6900	14100	14900	<b>15200</b>	14900
Mizoram	2200	2400	2400	<b>3000</b>	2500
Nagaland	67500	67900	68100	68600	<b>68900</b>
Sikkim	<b>7200</b>	7100	7100	6300	6400
Tripura	2400	4600	7100	9000	<b>12500</b>

Source: Ministry of Agriculture and Farmers Welfare (2019)

### Assam

The agro ecological conditions of Assam are favourable for growing different kinds of oilseed crops. The State contribution in the oilseed production is 60%. Assam has 345000 ha area under oilseed cultivation in which Rapeseed and Mustard occupies most of the area (295000 ha) and a production of 190000 Mt. The State total oilseed production accounts for 225000 Mt (Statistical Handbook of Assam 2017). The important oilseed crop grown in the state are Rapeseed & Mustard, Sesame, Linseed, Niger, and Groundnut (Table6). Most of the oilseed crops are grown in Assam during Rabi season. Rapeseed& mustard(Toria) is predominant oilseed crop in Assam because of the prevailing climatic condition and early duration of the crop which enable the farmers to go for the summer crop after the harvest of Toria. Rapeseed & mustard crops contribute to 85.5% of the total oilseeds in the State(Graph5). The State area under cultivation, production and yield of oilseeds is presented in (table 6).

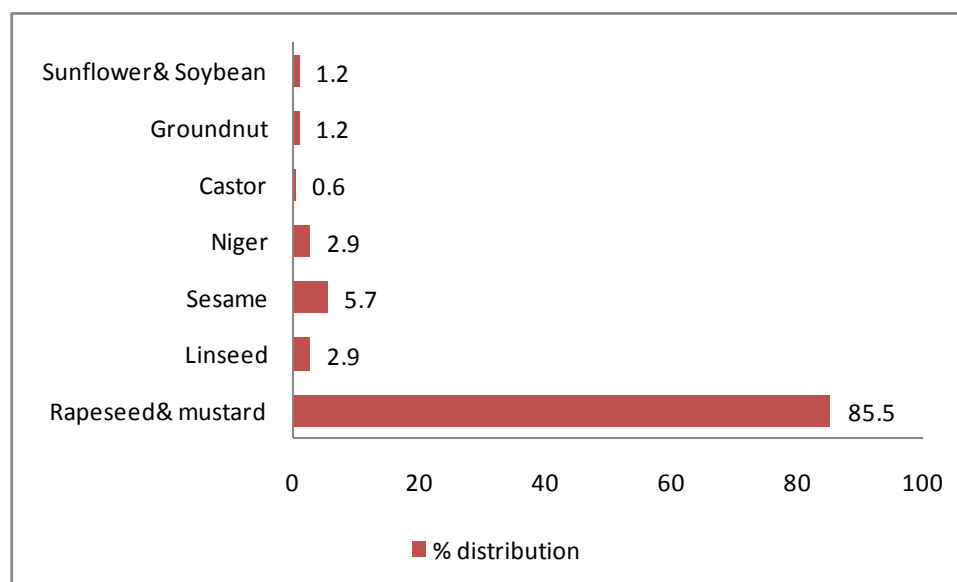


**Table 6: Status of Oilseed Crops in Assam in the year 2015-16**

(Area- ha, Production- Mt, Yield- ka/ha)

Crop	Area	% Distribution	Production	Yield
Rapeseed& Mustard	295000	85.5	190000	620
Linseed	10000	2.9	7000	658
Sesame	20000	5.7	15000	750
Niger	10000	2.9	6000	628
Castor	2000	0.6	1000	590
Groundnut	4000	1.2	4000	880
Sunflower& Soybean	4000	1.2	1000	340
Total	345000		225000	648

Sources: Statistical Handbook of Assam 2017

**Graph 5: Area distribution (%) of oilseeds crop in the State. (2015-16)**

Sources: Statistical Handbook of Assam 2017

**Arunachal Pradesh:**

Rapeseed & mustard, sesame and soybean are the major crops grown in the State. Arunachal Pradesh has 35000 ha area under cultivation of oilseed crop with a production of 32000 Mt. Rapeseed & mustard along with soybean contributes >90% of the area and

production in the State. The crop wise area, production and yield of oilseeds grown in the State is presented in (Table7).

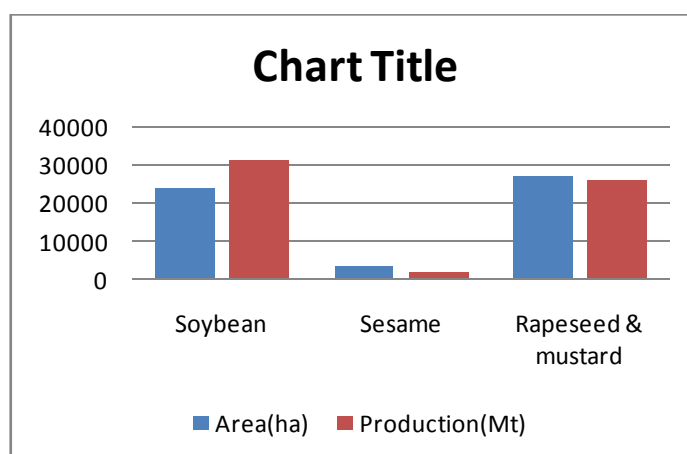
**Table 7: Crop wise area, production and yield of oilseed (2015-16)**

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Rapeseed & Mustard	29000	31000	1089
Soybean	29000	3000	991
Sesame	1000	700	444
Total oilseeds	35000	31800	1040

Source: [www.nmoop.gov.in](http://www.nmoop.gov.in)

Graph 6: Crop wise contribution of area and production in Arunachal Pradesh (2015-16)



Source: [www.nmoop.gov.in](http://www.nmoop.gov.in)

### Manipur :

In Manipur, the major oilseed crop grown are Rapeseed & mustard, sesame and soybean. Also, groundnut is grown in small scale (Table 8). The area under oilseed cultivation accounts for 36900 ha and a production of 31700 Mt. Rapeseed & mustard accounts for >90% of the oilseed produced in the State. The State wise area, production and yield of oilseed crop is presented in (Table7).

**Table 8: Crop wise area, production and yield of oilseed (2015-16)**

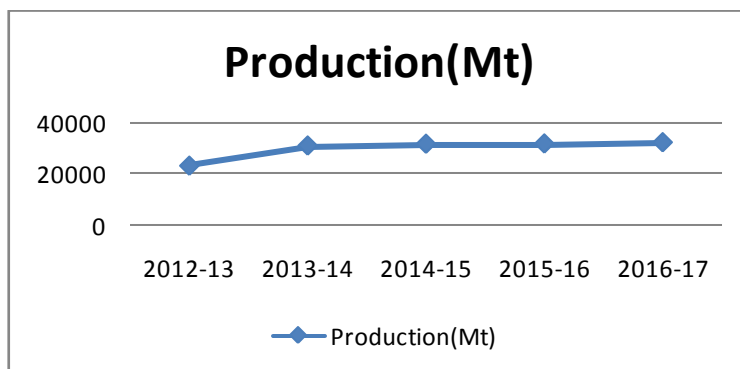
(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Rapeseed & Mustard	29000	24500	846

Soybean	5000	4000	742
Groundnut	3800	2900	879
Total oilseeds	37000	31000	847

Sources: [www.nmoop.gov.in](http://www.nmoop.gov.in)

**Graph 7: Five years data on production of oilseed in Manipur (2012-17).**



Sources: Ministry of Agriculture and Farmers Welfare 2019

### Meghalaya:

Rapeseed & mustard accounts for majority of oilseed production in the State. Apart from this crop, sesame and soybean are also cultivated in small area. The State has 37000 ha area under cultivation for oilseed crop with a production of 15000 Mt. The State wise area, production and yield of oilseed crop is presented in (Table 9).

Table 9: Crop wise area, production and yield of oilseed (2015-16)

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Soybean	1700	3440	1982
Rapeseed & mustard	9800	9400	967
Sesame	2200	2100	968
Total oilseeds	37400	15000	1091

Source: [www.nmoop.gov.in](http://www.nmoop.gov.in)

### Mizoram:

In Mizoram, cultivation of oilseed is done in small area of 26600 ha and the production of oilseeds accounts for 29600 Mt. Soybean and Rapeseed & mustard is the main oilseeds crop grown in the State along with sesame which is grown in small scale. The State wise area, production and yield of oilseed crop is presented in (Table 9).

**Table 10: Crop wise area, production and yield of oilseed (2015-16)**

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Rapeseed & mustard	7400	6900	934
Sesame	8700	6500	749
Soybean	1000	1600	1539
Total oilseeds	26600	29600	1112

Sources: [www.nmoop.gov.in](http://www.nmoop.gov.in)**Nagaland:**

The diverse agro-ecological condition in the state is favourable for growing eight annual oilseed crop which include six edible oil seeds like groundnut, soybean, sesame, rapeseed mustard, sunflower and one non edible oilseed- linseed Linseed and Sunflower is grown in Nagaland which accounts for 800 ha area under cultivation. The total area under oilseed cultivation is 65000 ha. Soybean, rapeseed& mustard contribute to >90% of the total oilseed produced in Nagaland. The State recorded a production of >60000 Mt in the year 2015-16. The crop wise area, production and yield of oilseed is presented in Table 11.

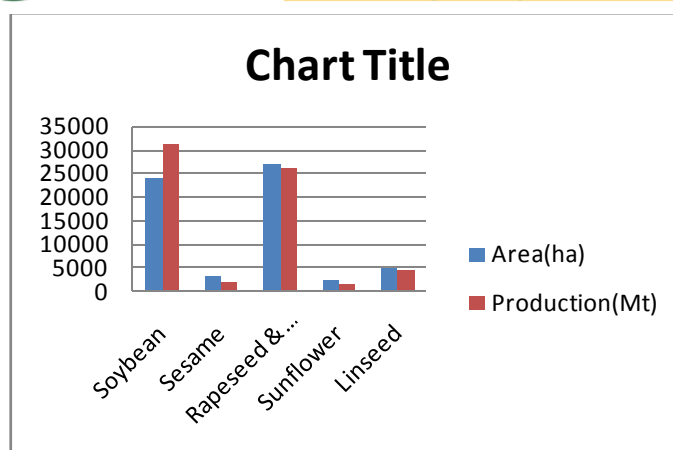
**Table 11: Crop wise area, production and yield of oilseed (2015-16)**

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Soybean	24000	31000	1254
Sesame	3500	2100	603
Rapeseed & mustard	27000	26000	1011
Sunflower	2400	1600	641
Linseed	5000	4600	808
Total oilseeds	65000	68000	1047

Sources: [www.nmoop.gov.in](http://www.nmoop.gov.in)

Graph 7: Crop wise contribution of area and production in Nagaland (2015-16)



Sources: [www.nmoop.gov.in](http://www.nmoop.gov.in)

### Tripura

Rapeseed & mustard, sesame and groundnut are grown in Tripura. The state total area under oilseed cultivation is 11000 ha and a production of 9000 Mt. The crop wise area, production and yield of oilseed is presented in Table12.

**Table 12: Crop wise area, production and yield of oilseed (2015-16)**

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Rapeseed & mustard	6400	5100	2000
Sesame	3900	2600	214
Groundnut	1300	1500	1154
Total oilseeds	11600	9000	771

Source: [www.nmoop.gov.in](http://www.nmoop.gov.in)

### Sikkim:

Sikkim is a minor state for oilseed crops. Rapeseed & mustard and soybean is cultivated in 53% and 47% of the total oilseed area (6900 ha) during 2015-16. The crop wise area, production and yield of oilseed is presented in Table13.

**Table 13: Crop wise area, production and yield of oilseed (2015-16)**

(Area- ha, Production- Mt, Yield- kg/ha)

Crop	Area	Production	Yield
Soybean	3200	3100	973
Rapeseed & mustard	3600	3100	852

Total oilseeds	6900	6300	909
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Source: [www.nmoop.gov.in](http://www.nmoop.gov.in)

### Constraints of Oilseed Production in North East

Oilseeds crops in North East are largely grown under rainfed condition (more than 85%) and are more prone to biotic and abiotic stresses. These crops are grown with minimum inputs due to high risk and poor resource based of farmers in rainfed areas. Some of the various factors leading to the reduction in production in the North East can be highlighted as:

#### A). Abiotic Stress:

- 1. High rainfall:** North east receives an abundant rainfall as compared to the other Indian states which becomes favorable for the weed growth and compete with the crop for nutrients. Oilseed crop are sensitive to water logging, water logging induce several physiological disturbances in growth, photosynthesis and pod formation resulting in lower yield (Celik and Turhan 2007). Excessive rainfall and water logging can hamper the root growth and led to the development of root rot disease.
- 2. Soil acidity problem:** The NEH region of India is primarily under the acidic soil zone with high rainfall area. Approximately, 84 % of the soils in the NEH region are acidic in reaction, having low available phosphorus and zinc whereas toxicity of iron and aluminum (Sharma *et al.*, 2006). Therefore, P is the most limiting nutrient for oilseed production in acid soil, since most of the oilseed crop requires phosphorus and zinc for increasing the oil content.
- 3. High Inputs:** Oilseeds are energy rich crops requiring higher inputs with better management practices, more than 85% of the area under oilseed cultivation falls under rainfed and grown in energy starved conditions with low inputs and poor management practices due to which the total genetic potential of the crop remains unexploited explaining the sharp fluctuations and giving rise to high risk (Singh *et al.*, 2017). The cultivation of oilseed or any other agriculture crop is still labour intensive in the north eastern state as most of our farmers involved in these operations are small and marginal farmers. Due to the low purchasing power of the inputs and machineries, leads to the low production of oilseed in the area.
- 4. More emphasis on food grains:** As rice is a staple food crop of the North east results in the higher emphasis on the field grains, the progress of oilseed has not really been substantial and these crops are generally grown in marginal and sub marginal areas

where the fertility status of the land is low and for the raising of field grains, so the farmers use these crops just not to keep the land fallow.

- 5. Water scarcity during pos-monsoon season:** As these crops are mostly grown under rainfed, farmers have to gamble with the monsoon to get the expected yield. These crops are thus subjected to the vagaries of monsoon and most of the crop suffers due to moisture stress during their critical stages of irrigation - flowering, peg initiation, and pod filling stages (Table 14). Also, there is a shortage of water at Rabi season in most of the north eastern state which is one of the constraints of oilseed production in NE.

**Table 14: Critical stages of irrigation in oilseed crop**

Crop	Critical Stages of Irrigation
Groundnut	Flowering, peg formation and pod development
Sesame	Blooming to maturity
Sunflower	Pre- flowering and pos-flowering
Soybean	Blooming and seed formation
Rapeseed & mustard	Flowering and siliqua formation

Source: (Singh et al., 2017)

- 6. Lack of quality seeds:** Most of the cultivars are drought susceptible and they are generally long duration and also have low level of oil content. Non- availability of short duration, high yielding seeds resistant to biotic and abiotic stress suited to the agro climatic condition of North east is one of the constraint in oilseed production as farmers are in need of sufficient amount of best quality seeds during sowing period .
- 7. Lack of irrigation facilities:** Similarly these crops are generally grown by small and marginal farmers under un-irrigated areas with poor management practices due to lack of irrigation facilities. The rate of inputs application is very low as farmers are not able to afford the cost of improve irrigation facilities like micro irrigation system and are also not adapted to new technologies and due to less land holdings, mechanization has also not been so much popular.

8. **Poor technology dissemination:** There has not been a proper transfer of technology from lab to farm. The supply of technology and desired inputs from farm institutions to farmers is very poor due to lack of communication between the farmers and researchers. Also, oilseed are generally grown as intercrop or in mixture with different crops and those places where these crops are grown as mono cropping, no crop rotations are practiced resulting in development of pests and diseases. Similarly since no legumes are taken in rotation the soil become quite drained out of fertility.
9. **Shattering of pods at harvest:** Lack of mechanization and sophisticated machinery for sowing and harvesting of crop leads to shattering of the pods as oilseeds like soybean, sesame etc has high shattering property at the time of maturity.
10. **Lack of post-harvest technology:** Similarly there is lack of suitable post-harvest technology to prevent post-harvest losses and lack of proper storage, grading and marketing facilities to avoid deterioration of quality.

**B) Biotic stress:** Biotic may include the reduction in yield or failure of the crop due to insect pest and disease and weeds infestation.

- **Weeds:** Weeds compete with the main crop for essential growth factors like nutrient, moisture, space and light. The agro- climatic factors in north east favours the prolific growth of the weeds causing serious problems on the cultivation of crop. The critical period of crop weed competition and yield losses varies among the crop (Table 15). Weed infestation in oilseed is one of the major causes of low productivity and causes 25-45 % yield reduction, depending on the type of weed flora and their intensity, stage, nature and duration of crop-weed competition (Singh et al.,2001). Due to severe weed competition, the yield reduction in oilseed particularly Indian mustard may go as high as 70 % (Tiwari and Kurchania, 1993). Some of the weeds associated with oilseeds in north east are listed on table 16.

Table 15: Critical period of crop-weed competition and losses in yield due to weeds.

Crop	Critical period(DAS)	%reduction in yield
Sesame	15-45	15-45
Groundnut	40-60	40-50
Sunflower	30-45	30-60



Castor	30-50	30-35
Safflower	15-45	15-40
Rapeseed & mustard	15-40	15-30
Linseed	20-45	30-40
Soybean	20-45	40-60

Sources: Rana et al.,2015

**Table 16: Some of the weeds associated with oilseeds in North East.**

Season	Weeds
Kharif	<i>Digitaria sanguinalis</i> , <i>Xanthium strumarium</i> , <i>Euphorbia geniculata</i> , <i>Amaranthus viridis</i> , <i>Panicum repens</i> , <i>Cynadon dactylon</i> , <i>Cyperus rotundus</i> , <i>Cyperus irria</i> , <i>Echinochloa colona</i>
Rabi	<i>Chenopodium album</i> , <i>Argemone mexicana</i> , <i>Anagalis arvensis</i> , <i>Avena fatua</i> , <i>Brassica sinensis</i> , <i>Euphorbia spp</i> , <i>Melolitus indica</i> , <i>Solanum nigra</i> , <i>Vicia hirsute</i>

Sources: Rana et al.,2015

- **Insect Pest:** Insect pest pose a serious threat for oilseed production in north east resulting in reduction of yield or complete failure of the crop depending upon the infestation. Due to a favourable climatic condition of the region, oilseed crop are infested with a number of pest throughout the cropping season. Mustard aphids causes up to 9-96% yield and 31% seed weight loss, and 5-6% reduction in oil content (Bakhetia et al., 2002). Such losses may go up to 100% in certain mustard growing regions due to infestation (Mandal et al., 2012). Below are some of the pest associated with oilseed crop in north east.(Table 17).

**Table17: Insect pest of oilseed in North East**

Crop	Insect pest
Rapeseed & mustard	Mustard aphid, mustard sawfly, leaf minor, flea beetle, diamondback moth

Groundnut	Gram pod borer, leaf minor, thrips, aphids, termites, white grub
Soybean	Soybean cutworm, blister beetle, soybean aphid, soybean looper, spider mite
Sunflower	Capitulum borer, leaf hopper, semi looper, cutworm, stink bug, bihar hairy caterpillar
Sesame	Capsule borer, gall fly, leaf hopper, red hairy caterpillar
Linseed	Capsule borer

Source: [www.vikaspedia.in/./oilseed-insect-pest-management](http://www.vikaspedia.in/./oilseed-insect-pest-management)

- **Disease:** Due to high rainfall in North east, it leads to the occurrence of root rot and other disease problems. The estimated yield loss in oilseed (Groundnut) due to a disease would be 42 and 5.2% if infection is observed at 75 and 90 DAS respectively (Prasada Rao et al.;1979). Below are some of the major disease of oilseed in NE

**Table 18: Major disease of oilseed**

Disease	Casual Organism
Powdery mildew	<i>Erysiphe spp</i>
White rust	<i>Albugop candida</i>
Downey mildew	<i>Perenospora parasitica</i>
Leaf curl	<i>Leaf curl virus</i>
Root rot	<i>Rhizoctonia spp</i>
Wilt	<i>Fusarium oxysporium</i>
Phyllody	Micoplasma Like Organism(MLO)
Blight	<i>Pesudomonase sesami</i>
Rust	<i>Puccinia arachids</i>
Late leaf spot	<i>Cercospora personata</i>

Early leaf spot	<i>Cercospora aradichola</i>
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Source: [www.vikaspedia.in>agriculture>ipm-strategies-for-oilseeds](http://www.vikaspedia.in>agriculture>ipm-strategies-for-oilseeds)

### Enhancing Oilseed Production and Productivity

- 1. Zero tillage:** Water scarcity during post-monsoon seasons and lack of irrigation facilities and short time lag after rice harvest for seed are the some of the major constraints for oilseed cultivation in the NEH region. As a result, only mono cropping of rice is practice and the farmers left their land fallow after the harvest of the crop. Rapeseed & mustard which is a climate resilient crop can be grown in Rabi without water in the residual soil moisture after the rice harvest (M.P.Singh et al.; 2014). By adopting zero tillage, the farmers could increase the productivity of rapeseed & mustard, reduced cost of cultivation thereby increasing the cropping intensity and earning an additional income for themselves with less effort. Zero tillage also helps in timely sowing (October-November), conserves soil moisture and requires less water, saves tillage cost and time and the soil is protected from erosion due to the retention of surface residues and reduce organic matter depletion.
- 2. Mulching:** Use of various mulches is also important factor for increasing the production of oilseeds in NEH region because under hilly conditions soil water is the major constraints. Although, weeds are the universal problem in agriculture, but under upland condition and high rainfall areas, weeds create more problem. Mulching favourably influences soil moisture regime by controlling surface evaporation rate in summer and winter, mulching conserves soil moisture by reducing the evaporation rate. Mulches improve soil-moisture retention capacity as well as soil structure and suppress weed growth (Mutetwa and Mtaita, 2014). The mulching treatments store higher soil moisture compared to the bare soil (no mulch) (Zhao *et al.*, 2012).
- 3. Green manuring:** Green manuring play important role in supplying nutrients for crops, improving ecological environments of agricultural fields, reducing soil erosion and pollution, restraining global warming potentials, and contributes to higher crop yields. Green manures can be fitted into rice farming systems in either the pre-rice or post rice phase. Planting of winter green manures after the late rice has been proved to be an effective rotation pattern in improving soil conditions, soil fertility and rice yields. Many studies reported that the application of green manures changed the



chemical and biological characteristics of soils. Rape and ryegrass are commonly used as green manures, and have the potential to improve sustainable production of double cropping rice.

**4. Intercropping:** There is a vast scope for extending the crop area under oilseeds through intercropping and sequential cropping as per system suitability with the aim of maximizing profit and enhancing area of oilseeds. Intercropping of pulses and oilseeds is more advantageous than growing them as sole crops (Singh and Rajput 1996). Intercropping system which can be done in the North East

- Soybean intercrop with maize
- Soybean intercrop with pigeon pea

This inter-cropping helps in increasing the area under cultivation and production of the oilseed. Also some of the advantage of inter cropping is that it helps in weed control by reducing the inter cultural operations.

**5. Proper Extension Practices:** The National Mission on Oilseed and Oil Palm (NMOOP) was set up in 2014-15 with an objective of increasing production and productivity of the oilseed thereby decreasing the import of oilseeds in the country. Increasing seed production and distribution of newly released variety. Low cost technologies with high impact on productivity resulting in higher income.

The mission works on several parameters which led to the success story in Dhemaji, Assam where the people grow improved variety of Toria varTS-38 provided through Cluster Front Line Demonstrator (CLD) under the mission (NMOOP), sustain their living by increasing their production and productivity comparing to the local varieties. So, educating the farmers has to be done through Proper extension practices for transfer of technologies from research lab to farmers field via front line demonstrations, trials, and different trainings to convince the farmers as there has been a slow adoption of improved varieties and production technologies and in some cases, this is simply because they are unaware about those technologies.

**6. Mechanization:** Mechanization is very essential in order to increase the production of oilseed in North East. Adoption of mechanization reduces the cost of production and improves the input use efficiency. However, most of the farmers who are associated with oilseed cultivation are small and marginal farmers and do not have the capital for



the purchase of such machineries. So, the State government of each North East should take initiatives by providing subsidy to the farmer for the purchase of such machineries to improve labour efficiency and production.

7. **Rain water harvesting:**As mentioned earlier that NER receives an abundant rainfall during monsoon season, the farmers have to be educated to create storage structures and facilities in order to harvest rain water to tackle the problem of water scarcity during the post monsoon period.
8. **Quality seeds:**One of the major hinderance in spread of oilseeds is the unavailability of adequate quality seeds. Efforts are needed on production of hybrid seed and promotion of hybrids having short stature, high oil content properties and varieties with short durations.
9. Educating the farmers by creating awareness on good agronomic properties such as land levelling, seed treatments, good drainage facilities with proper weed and pest management practices should be done and practiced to increase the production since oilseed crops are highly sensitive to water logging and crop weed competition. Use of varieties resistant to pest and disease will be useful in minimizing the loss caused by the disease and insect pest. The farmers can be educated about the different integrated pest management strategies with the help of each state agricultural department which will help in minimizing the risk of the pest in the oilseed crop.
10. **Balance application of nutrient:** Several experiments conducted by several researchers has already shown that there has been application of primary nutrients i.e. N, P, K to some extent but the secondary and micro nutrients such as Zinc, Sulphur, Boron has always been neglected. The application of such inputs is capable of enhancing the productivity of these oilseed crops. So, educating the farmers through extension workers by providing soil health cards, soil fertility maps indicating the nutrients contents and recommendations had to be done for raising the production of oilseed in North East.
11. Educating the farmers on proper methods of harvesting as oilseeds crop have high capsule shattering properties and oil reduction if harvesting not done at the proper maturity stages. So harvesting have to be done at the right stage.



- 12. Strengthening the post-harvest storage:** NE region experiences hot and humid weather, which poses serious problems for post harvest handling. In humid weather, it becomes difficult to dry the agricultural produce to safe moisture levels and this results in huge post harvest losses. Installation of efficient processing and storage unit has to be initiate by each State government on a subsidized rate to the farmer will help in tackling the problem of post harvest loss. Mass awareness campaign regarding the adoption of scientific method of storage of oilseed will also greatly reduces the problem of storage pest and maintaining the optimum level of moisture
- 13. Marketing linkage and good transport facilities:** More concern should be given by the government on marketing channel of oilseed and construction of good road connectivity within the rural areas to ensure easy access of the farmers product from the buyer and to avoid post harvest lost.
- 14. Creating awareness to the farmers regarding the Government schemes** such as crop insurance with reasonable minimum support prices with added bonus to attract the new growers or avoiding the shifting of farmers towards other crops or professions in order to increase the production of oilseeds in the North East.

### **Conclusion**

The need of vegetable oil in every household of the North East is increasing day by day, so oilseed production is required for the north east. The production in the NER is still low comparing to the other States of the country. Rapeseed & mustard and soybean contribute more than 90% of the production in the area and they are grown in almost all states of north east. However, the production process is hamper by biotic and abiotic stress becoming the major constraints leading to low production in the area. In order to increase the area, production and productivity of oilseeds, a special approach had to be made which should be initiated by each state government. The approach may include intercropping of oilseed with pulse crop and cereal crop to increase in the area under cultivation, production and productivity. Water scarcity became a major problem during the pos monsoon season. To tackle this problem, a scientific method of rainwater harvesting should be practice by the farmers during the monsoon period by creating water storage structures so that irrigation of oilseed can be done during the Rabi season. Promotion of post harvest technology are equally necessary to encourage the farmers to invest more on oilseed production. Awareness has to



be created among the farmers on the shattering habit of oilseed crop other post harvest problems to check the post harvest losses and to store the seeds at optimum moisture level. Awareness regarding the pest & disease and weeds should be done as this hampers the production rate. Many of the farmers are unaware of such losses by the pest and disease incidence and they have to be warn ahead of time about the outbreak of such disease and pest. Providing farmers with government schemes such as crop insurance scheme which would help the farmers to grow oilseed without minimum risk.

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