POST HARVEST PROFILE OF MUSTARD-RAPESEED

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1.0 INTRODUCTION

Mustard flower

Mustard - Rapeseed group of crops is among the oldest cultivated plants in human civilization. It is a group of oilseed crops which assumes the significance in Indian national economy by occupying the second position next to groundnut and is considered as a 'cash crop'. Biologically, the rapeseed and mustard plants belongs to the family Crucifarae and under the genus *Brassica* with large number of species and sub species cultivated in India. Being a number of *Brasica* genus, the rapeseed is closely related with mustard. The word "rape" comes from the latin word "rapum", means 'turnip'. On the other hand, the word 'mustard' is derived from latin word "mustum" or "must", which denotes 'expressed juice of grapes and "ardens" means "hot & burning". The mustard - rapeseed is a versatile group of plants used in various ways historically. The mustard and rapeseed are closely related to each other and can share the same growing areas. However, the classification of mustard - rapeseed is summed up below to show it's different characteristics:

Classification of mustard – rapeseed

English name	Vernacular name	Botanical name	Identification characteristics of seeds
1) Indian mustard / Brown mustard	Rai, ryada, raya, laha, lahta, sasve, herbo	*Brassica juncea* (L.) Czern. & Coss.	Seeds are medium sized, round and dark brown or black in colour.
2) Indian rape / Rapeseed / Toria	Toria, tori, lahi	*Brassica rapa L. var. toria (syn. B..campestris* L. var. toria.)	Seeds are dark brown, bold and large sized.
3) Brown sarson /Rapeseed	Brown-sarson, Bhoori- sarson	*Brassica rapa* L. *var.* brown sarson *(syn. B. campestris* L. var. brown sarson)	Seeds are light reddish in colour, bold, large sized.
4) Yellow sarson /Colza/Rapeseed	Yellow sarson, Pilli sarson	*Brassica rapa* L. *var.* yellow sarson *(syn. B. campestris* L. var. yellow sarson)	Seeds are slightly smaller than sarson, size is ovoid in shape, yellow in colour.
5) Rapeseed	Gobhi sarson	*Brassica napus L.*	Seeds are brownish black and large sized.
6) Abyssinian mustard/Ethiopian mustard	Karan rai	*Brassica carinata A. Br.*	Seeds are small, round and reddish brown in colour.
7) Rocket Salad	Duan, tera, tara, saundh, taramira	*Eruca sativa* Mill	Seeds are light reddish brown coloured and distinctly ovoid shape.

Source: 1) National Research Centre on Rapeseed-Mustard, Sewar, Bharatpur (Rajasthan).
2) Department Of Botany, Nagpur University.

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Mustard plants

The cultivation of mustard-rapeseed dates back to 2000 B.C. both in sub-tropical and tropical countries. The mustard- rapeseed plants grow all over the world but their cultivation is mainly confined to India, China, Canada, Germany, France, Australia, USA, etc. The rapeseed was cultivated in Europe since 13th century. *Brassica* group of plants yields the oils which characteristically have large amount of long chain fatty acid called as "erucic acid". Prior to 1960s, the erucic acid content of this oil was not taken as important factor for evaluation of its oil quality. However, from 1960s, considerable research have been done to develop low erucic acid varieties as the researchers found that consumption of erucic acid in oil has negative effect on health. Due to this, new varieties with low erucic acid content were developed in Canada in late 1960s and early 1970s. During 1978, the rapeseed industry in Canada identified the new rapeseed varieties with low erucic acid content and glucosinolates as 'canola' quality standard. Production of canola is largely supplied by two species ie., *Brassica napus*. L and *Brassica rapa* L. and to a lesser extent by *Brassica juncea* Coss. (Brown mustard) and *Sinapsis alba* L. (Yellow Mustard). World Production of mustard-rapeseed has increased faster over past two decades than any other oilseed. At present, canola/rapeseed has now become the second largest produced oilseed in the world after soybean.

In India, the mustard - rapeseed is the most important oil seed crop after groundnut accounting around 25 per cent of total oilseed production. It is one of the important oilseed crop of the Indo-gangetic plains. Indian mustard (Rai) cultivation has occupied about 85-90 per cent of total area under cultivation of mustard - rapeseed. The traditional mustard-rapeseed grown in India contains high amount of erucic acid and glucosinolates and this does not conform the international standard 'canola' quality. Hence, at present the government agencies in Punjab are promoting the cultivation of hybrid mustard rapeseed namely, 'Hyola' as a drive for the crop diversification programme. Punjab Agro initiated the contract farming of hyola in around 10,000 acres of Punjab during 2002-2003.

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1.1 Origin:

The different types of mustard- rapeseed have different places of origins as follows:

Brown Sarson ---------- Eastern Afghanistan and adjoining parts of India and Pakistan.

Yellow Sarson ---------- Eastern Part of India.

Indian mustard or Rai -- Originated from China to India via North Eastern India and spread to Afghanistan via Punjab.

Gobhi Sarson ---------- It is a native of Europe.

Taramira ---------- Introduced in India though it is a native of southern Europe and North America.

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1.2 Importance :

The oil obtained from mustard seeds is known for it's culinary fats for over 3000 years by the Indians, West Asians (Indian sub-continent) and Chinese. Being a rich source of unsaturated fatty acid and with low concentration of saturated fatty acid, now-a-days the oil of mustard- rapeseed has become nutritionally better than other oilseeds specially after the introduction of 'canola' quality mustard-rapeseed in North America, European Union and Australia. The term 'canola' is a registered trademark of 'Canada Canola Association' and refers to the mustard-rapeseed having low erucic acid and glucosinolate, which has gained a tremendous acceptance worldwide. Canola oil is widely used as cooking oil, salad oil and for preparation of margarine in different parts of the world. World trade of canola quality rapeseed has achieved a tremendous growth. Globally, the volume of canola/rapeseed export is the second largest volume of oilseed traded following soybean.

In India, the oil obtained from mustard- rapeseed accounts for 2/3rd edible oil consumption in the country. In India, the oil is traded in kacchi-ghani type for it's traditional characteristic flavour and to some extent in refined form. The projected demand for oilseeds in India by 2020 is around 34 million tonnes which is to be met by mustard-rapeseed. It is estimated that about 90 per cent of domestic production of mustard-rapeseed is crushed for extracting edible oil, which is mostly traded and consumed in northern, north-eastern eastern and central India. The recently promoted 'canola' quality hybrid rapeseed namely 'Hyola' has a good potentiality as a profitable enterprise for farmers as it gives a higher yield, more oil content, healthy export quality oil and an assured market.

Besides, the utilities of oil obtained from mustard-rapeseed, the seeds, sprouts, leaves, tender plants are also useful to human health, when they are consumed as spices and vegetables. They contain selenium, calcium, magnesium, iron, phosphorus, zinc, magnesium, manganese, etc.

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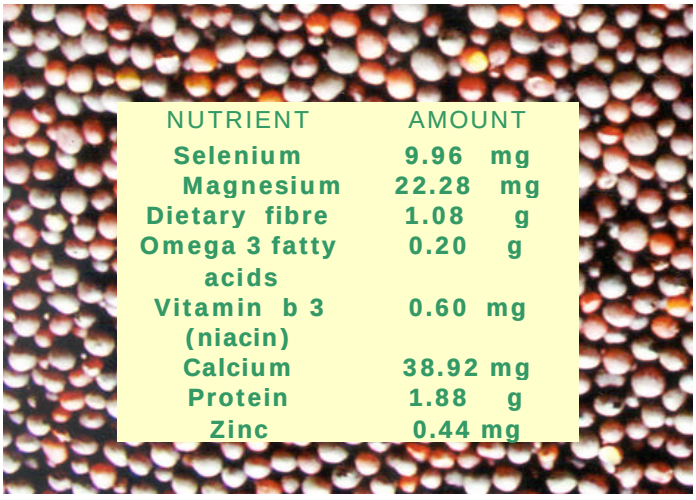
Two teaspoons (10 gms) of mustard seeds provide nutrients as follows:



NUTRIENT	AMOUNT
Selenium	9.96 mg
Magnesium	22.28 mg
Dietary fibre	1.08 g
Omega 3 fatty acids	0.20 g
Vitamin b 3 (niacin)	0.60 mg
Calcium	38.92 mg
Protein	1.88 g
Zinc	0.44 mg

SOURCE : Health and Nutrition, Issue- January 2004.

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2.0 PRODUCTION

2.1 Major producing countries in the world:

Mustard-rapeseed is grown in more than 50 countries in Asia, Europe, America and Australia with a production at about 36778 thousands tones during 2003. Out of 53 mustard - rapeseed growing countries in the world, India and China together accounted for 42 percent of total production. However, out of global production, Canada, China, Germany, India, France and Australia share more than 80 per cent of total production among which India contributed 10 per cent to the total world production as can be seen from following chart. The country-wise production during the period 2001 – 2003 have been presented in Table no.– I.

Table no.– I

Production of major mustard- rape seed producing countries during 2001 to 2003

(Production in thousand tonnes.)

COUNTRY	Production		
	2001	2002	2003
China	11345	10565	11425
Canada	5122	4332	6895
India	4187	5083	3842
Germany	4164	3853	3642
France	2879	3319	3343
Australia	1757	841	1622
Others	6837	6539	6009
All World	**36291**	**34532**	**36778**

[**Source**: Food and Agriculture Organisation (FAO)]

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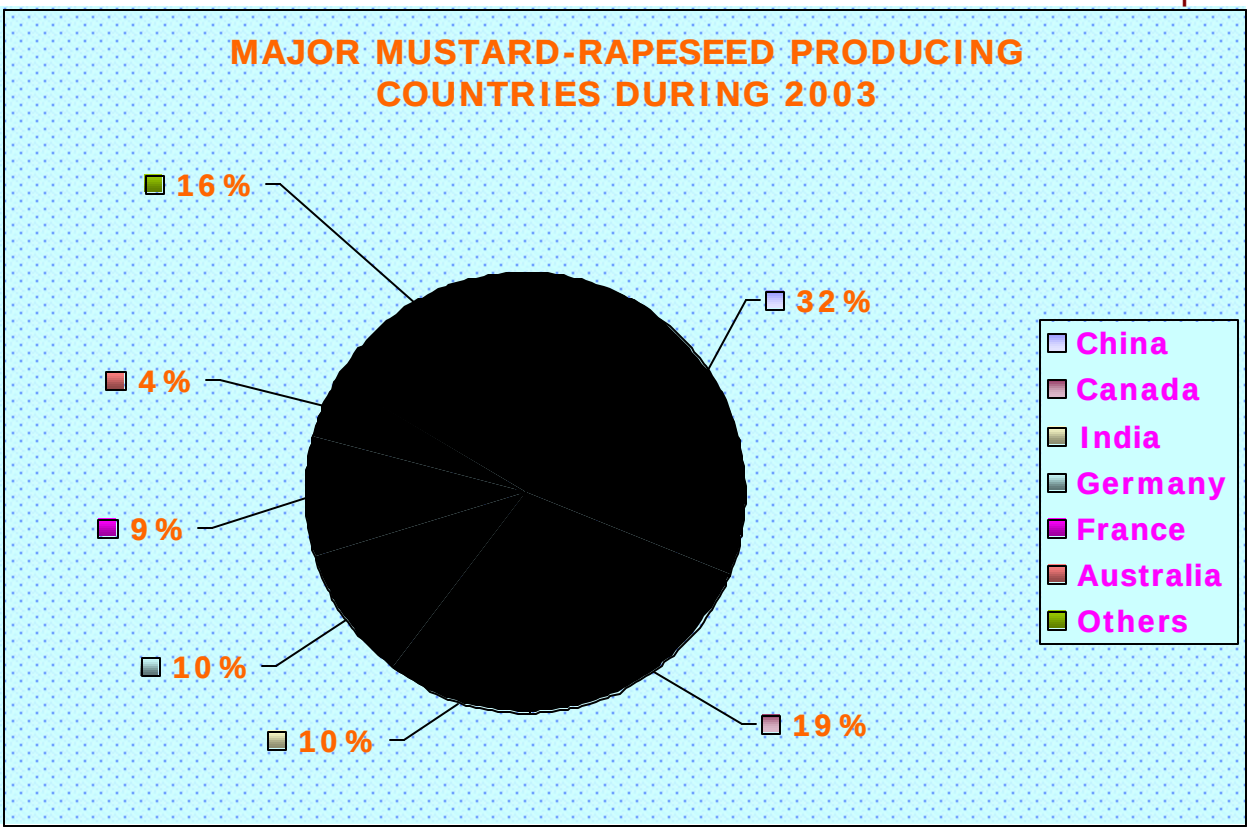

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2.2 Major producing states in India:

In India, among all types of mustard - rapeseed, Indian mustard is cultivated in Assam, Gujarat, Haryana, H.P., M.P., Orissa, Punjab, Rajasthan and West Bengal. It's cultivation has been extended to southern states on a limited scale. The brown Sarson is grown in Kashmir and Himachal valley, whereas, the yellow sarson is grown in Eastern U.P., Assam, Bihar and West Bengal. Toria is a short duration crop cultivated largely in Assam, Bihar, Orissa and West Bengal. Taramira is grown in drier parts of North west India comprising of Haryana, Punjab, Rajasthan and U.P. However, the seven states i.e, Rajasthan, U.P, Haryana, West Bengal, M.P, Gujarat, Assam contribute a lion's share of production as can be seen from the Table no.- II as well as from the chart. From the chart, it is seen that during 2002-2003, Rajasthan, U.P, Haryana, West Bengal, M.P, Gujarat, Assam contributed 92 per cent of total production.

Table no. – II

State-wise production of mustard-rape seed during 2000-2001 to 2002- 2003

STATE	Production		
	2000-2001	2001-2002	2002-2003
Rajasthan	1312.8	1943.0	1318.3
U.P.	945.7	845.4	759.1
Haryana	554.0	796.0	694.0
West Bengal	417.0	336.9	328.5
M .P.	323.6	459.2	210.3
Gujarat	230.6	292.1	172.3
Assam	141.2	137.0	129.8
Others	262.3	273.0	305.8
All India	**4187.2**	**5082.6**	**3918.1**

Source: Department of Agriculture & Co-operation, Ministry of Agriculture, Govt. of India.]

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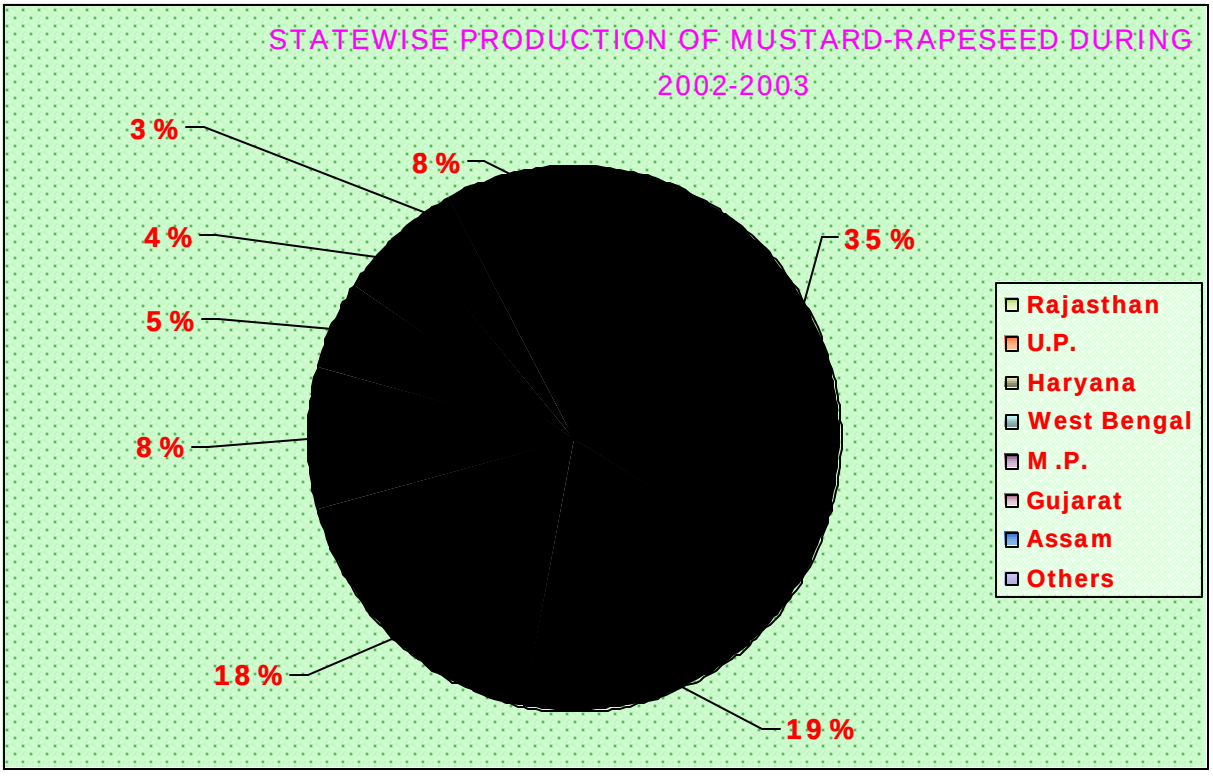

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2.3 Zone-wise major commercial varieties:

Table no. –III

Mustard – rapeseed varieties suitable for different zones in India

Zone	State	Type of mustard - rapeseed	Name of variety	Yield (kilogram per hectre)	Oil per cent
North-west & North-east zone	Haryana	Indian mustard	Pusa Agrani	1700	40
	U.P.	Indian mustard	Narendra	1150	43
	Punjab	Indian mustard	PBR 97	1900-2200	41
	Punjab	Indian mustard	PBR 91	1600-1800	40
	U.P.	Indian mustard	Laha-101	1500-2000	45
	U.P. U.P. ,Rajasthan	Indian mustard Indian mustard	Rohini(KRV 24) Kranti (PR-15)	2200 1500-1800	43 40
	Haryana & Rajasthan	Yellow sarson	Pusa Gold	1800	45
	Haryana & Rajasthan	Indian mustard	RH-30	1600-2000	39
	Punjab & Rajasthan	Gobhi sarson	GSL-2	1700-2200	45
	Haryana & Rajasthan	Gobhi sarson	PGSH 51	1950-2150	44
	Rajasthan	Indian mustard	Pusa Jai Kisan (BIO902)	1600-2200	40
	Rajasthan	Indian mustard	Durgamani	1000-1200	39
	U.P. & Rajasthan .	Toria	T-9	1200-1500	40
Central zone	M.P.	Indian mustard	Vaibhav(RK-1418)	1300-1500	38
	M.P.	Indian mustard	Vardan(R.K.-1467)	1000-1600	40
	M.P.	Indian mustard	Jawahar Mustard 1	2000	42
East zone	West Bengal	Indian mustard	Seeta (B-85)	1200-1400	38
	West Bengal	Yellow sarson	Benoy	1400-1500	46
	West Bengal	Indian mustard	Bhagirathi	1400-1600	36
	Assam	Indian mustard	TM-4	1500	42
	Assam	Indian mustard	TM-2	1400	33
	Orissa	Toria	M-27	1000-1200	45
	Bihar	Indian mustard	BR-13	1200-1400	42
	Bihar	Toria	BR-23	800-1000	43
	Bihar	Indian mustard	BR-40	1200-1400	40
	West Bengal	Indian mustard	Varuna(T59)	2000-2200	43
West zone	Gujarat	Indian mustard	Gujarat Mustard 1	2200	38
	Gujarat	Indian mustard	Gujarat Mustard 2	2400	38

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2.4 Characteristics of international qualities of mustard-rapeseed

❒ Canola quality of mustard – rapeseed

'Canola' is genetically altered and improved version of rapeseed. 'Canola' quality varieties are presently developed from either or two species of *Brassica napus* and *Brassica campestris*. 'Canola' is a registered trade mark of Canadian Oil Association. The name 'canola' denotes the seed having less than 2 per cent erucic acid in it's oil and less than 30 micro-moles of glucosinolate per gram of it's deoiled meal. The rapeseed, which does not conform to the above qualities is not termed as ''canola", which is a quality standard and not a biological classification. Canola varieties, which are having both low erucic acid (less than 2 per cent) and glucosinolates (less than 30 micromoles per gram of defatted meal) are also termed as 'double low' or '00' rapeseed or sometimes as LEAR (Low Erucic Acid Rapeseed). The rapeseed oil was used in Europe and Asia as a cooking medium and for other uses since long, but this oil contained high amount of erucic acid and glucosinolate, which was not good for health. But with development of canola cultivars in Canada, it's use has increased manifold. After 1970s, the 'canola' quality oil has gained the acceptance worldwide. Now-a-days, it is major edible oil in Australia, Japan, Canada, and many European countries.

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However, the following characteristics of canola have made it highly acceptable worldwide:

Characteristics Of Canola	☞ Higher yield
	☞ Identified as a short duration crop
	☞ Oil having less than 2 per cent erucic acid hence it is a healthy cooking medium
	☞ Oil meal contains less than 30 micromoles glucosinolates per gram of defatted meal, hence used as highly demanded livestock feed
	☞ Contains around 42 per cent oil by weight and being high quality oil, it is used as top notch salad oil for it's light colour and texture, and also used in baking industry as the baking with canola reduces the saturated fatty acid intake. It also modifies the texture of baked product by making it more moist and softer
	☞ One of the largest traded oilseed in the world

Source : 1) www.ca.uky.edu/agc/pub.
2) www.canola-council.org.

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❒ Characteristics of Hyola :

It is a "canola" quality hybrid rapeseed mustard recently introduced in India. The Hyola (variety PAC-401) is only hybrid 'canola' quality gobhi-sarson notified by Govt. of India after extensive trials by Indian Council of Agricultural Research (I.C.A.R.). It has the yield potential with high oil percentage. In current crop diversification programme, Hyola is gaining wide acceptance among the farmers in Punjab. The acreage of Hyola has already crossed 50,000 acres. Besides farmers, it has also been accepted by the traders and consumers. As a result, Punjab Agro Industries Corporation Ltd (PAIC) is promoting the Hyola cultivation through contract farming system and has identified the Hyola (variety PAC 401) as a suitable alternative in place of wheat during rabi season. By realizing it's benefits, the Govt. of Punjab has given more emphasis on it's cultivation and set a target to extend the cultivation to more than 1 lakh acre by 2004-05 and which will be 5,00,000 acres by 2007-08.

However, Hyola has the following beneficial characteristics:

Characteristics Of Hyola	
	☞ Higher yield (around 12 quintals/acre)
	☞ Identified as a well suitable crop for diversification
	☞ Returns more than wheat
	☞ An ideal intercrop with autumn sown sugarcane
	☞ Tolerant to white rust disease and frost, hence acceptable to farmers than other varieties
	☞ Fetch more price in the mandi due to higher oil percentage
	☞ Higher oil content(41-44 percent)in the seeds
	☞ Contract farming facility as provided by Punjab Agro-Industries Corporation (PAIC) is available
	☞ Export quality oil meal (contains less than 30 micromoles glucosinolates per gram of defatted meal)
	☞ Export quality oil (contains less than 2 per cent erucic acid)
	☞ More acceptable to the consumers as it contains less than 2 per cent erucic acid, which is healthier

Source: 1) Views of Mr. H. Singh, Chairman, Punjab Agro-Industries Corporation (PAIC).Chandigarh. [www.commodityIndia.com, Issue-September2003, page no.- 8]
2) www.punjabenvioronment.com/agriculture_sustain.htm.

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❒ Characteristics of Teri-Uttam:

The scientists of 'The Energy and Resources Institute' (TERI),New Delhi have developed a new variety of gobhi-sarson and named as "Teri-Uttam". Oil obtained from Teri-Uttam is nutritious with better fatty acid profile and is comparable to the Internationally recognised "Canola " oil. This variety has shown immense potential because it contains high oil content, early maturity period within 135 days and more than 20 per cent yield as compared to the *Brassica napas* National check variety GS-1. It has also potential of earning foreign exchange as it's oil meal contains low glucosinolate.

However, the following characteristics of Teri-Uttam have made it a potential cultivar to expand its growth in India:

Characteristics Of Teri-Uttam	
	☞ Owing to low in erucic acid content, the oil quality is comparable to internationally recognised 'Canola oil'
	☞ It has a potential to earn foreign exchange as the oil meal contains low glucosinolate which has a high international demand
	☞ Yields 25 per cent more than other gobhi-sarson varieties
	☞ Short duration variety than conventional varieties of gobhi-sarson

Source: The Energy and Resources Institute (TERI), New Delhi.

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3.0 POST HARVEST MANAGEMENT

3.1 Post harvest losses:

Losses of mustard - rapeseed occur during post harvest operations like handling, transportation and storage by producer's, trader's, wholesaler's level, which vary from 0.2 per cent to 2.0 per cent as given in Table no.-IV.

Table no. – IV

Percentage of losses occurred at different levels

State	Level	Percentage of Losses
Madhya Pradesh	Producer	0.2 per cent
	Wholesaler/Trader/Miller	0.5 - 2 per cent
	Exporter	1.5 - 2 per cent
Gujarat	Producer	0 .5 per cent
	Village Merchant	1.00 per cent
Uttar Pradesh	Producer	0. 25 per cent
	Wholesaler/Trader	2. 00 per cent
	Miller	1.50 per cent
	Govt Agencies	2.00 per cent
Haryana	Producer	0.5 -1 per cent
	Miller	1 - 2 per cent
Rajasthan	Negligible	
West Bengal	Producer/Village merchant/ Wholesaler/Trader	1-2 percent
Bihar	Producers	1 percent
	Village merchants	1 percent
	Wholesaler/Trader/Miller	0.5 percent

[SOURCE:- MARKETING OF MUSTARD SEED IN INDIA,(2002) Published by Directorate of Marketing & Inspection , Min. of Agriculture , Govt.of.India .]

Different losses of mustard – rapeseed may occur as following:

- Loss in weight in dry season.
- Due to improper method of harvesting and ignoring the symptoms of harvesting , deterioration of the quality of seeds of mustard -rapeseed is occurred.
- During handling/ lifting of bags, use of too much hooks by labourers causing spillage loss.
- Due to rodent attacks on bags which results in spillage waste and losses during storage.

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3.2 Harvesting care

Maturity period of harvesting for mustard -rapeseed:

Sl. No.	Type of Mustard-Rapeseed	Period of maturity for harvesting
1.	Toria	70-100 days
2.	Indian mustard	105-160 days
3.	Yellow sarson	120-155 days
4.	Brown sarson	100-235 days
5.	Taramira	140-150 days

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Following care is to be taken during harvesting.

☞The harvesting of toria & rai should be done when the pods begin to turn yellow. The sarson is less liable to shattering hence can be left in the field for relatively longer period and can be harvested it in comparatively dry ripe stage.

☞When harvesting is done manually, care is to be taken to harvest the entire plant by pulling out or by uprooting the plant a few cm. above the ground by sickles.

☞Harvesting should be done in the early hours during morning as the moisture accumulated during night prevent the splitting of pods.

☞ Crop should be harvested when the pods have lost their greenness but not at the dead ripe stage as it may cause the shattering of pods.

☞When grown as mixed crop with food grain, then both the crops should be harvested separately.

Following care is to be taken after harvesting:

☞After harvesting to separate the seeds from plants, threshing is to be done always on pucca floor instead of kuccha floor because threshing on kuccha floor increases the amount of impurities of soil, stone, dust, dirt particles mixed with seeds.

☞After threshing, the seeds separated should be subjected to winnowing in which the mixture of seeds and chaff is allowed to fall from a height by which the chaff is blown away and seeds are gathered on the floor.

☞ Pack the seeds of gathered on floor in a sound B-twill gunny bag.

☞Before transportation, drying of harvested plant in sun is also advisable since drying in farmers field involves low cost whereas the same operation in the market involves not only higher cost but also the unavoidable transportation of moist seeds.

☞Care should be taken as not to sent 'moist 'oilseeds to the market. Because, it affects the quality; oil content and crushing quality of the seeds. Hence, dry harvested plant in sun for four to ten days by tying up into small sheaves.

3.3 Post harvest equipments:

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CIAE Multicrop Thresher: It is suitable for threshing of mustard which was developed by CIAE, Bhopal during 1981-85. **Cost:** Rs.20,000/-

Specifications

Dimension: 1.95 X1.65 X 1.45
Weight(kgs.): 450
Cylinder Size(mm.): 500 dia X 584
No. of beaters & size : 92 Nos., 25x 8x80 mm flats
No.of blowers & size : 1 No. , 672mm dia, 4 bladed
Size of straw thrower : 540 mm,4 bladed
Power source: 5 hp electric motor.
Labour requirement(man-h/q): 0.24-1.

CIAE Multicrop Thresher

Source: Central Institute of Agricultural Engineering, (CIAE) Bhopal

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3.4 Grading:

It is the sorting out of homogenous lots according to the laid down quality specifications. Produce is graded according to fixed tolerance limits for various quality factors wh ich are universally accepted.

Grading benefits the oilseed farmers / traders / consumers :

Cleaning before grading

- It facilitates to get higher price for the produce being graded according to specific grade standards, which are well known to both the parties.
- It widens the marketing process because buying and selling can take place between two parties at distant places and reduce the cost of marketing and storage losses.
- It facilitates the keeping quality of the produce and easy finance, when the produce is stored and getting claims settled by the always or insurance organizations.
- It facilitates the future trading and help the consumers to get standard quality of produce at fair prices.

❒ Quality factors for grading of mustard-rapeseed:

- Foreign matter, immature, shriveled/dead seeds, admixture of other oilseeds, weevilled/damaged seeds, moisture content etc.
- It should be free from fermented, musty odur,insect/fungas infestations, any other toxic seeds, seeds of *Argemone maxicana*, rodent hair and excreta.

❒ Steps for grading:

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➔ **Cleaning and sorting:** After arrival, entire produce should be cleaned and sorted manually /mechanically to separate the foreign matter, dust, dirt and stone particles, admixture of other seeds, husks, immature split, shriveled, damaged and diseased grains.

➔ **Packing and sealing:** The cleaned and sorted homogenous produce should be filled in gunny bags and then packed and sealed.

➔ **Sampling and analysis:** For successful grading of a lot, the drawing of truly representative sample is essential and it is done in such a way so that it reveals the exact composition of the commodity. Subsequently, the grading process is done by physical analysis of the samples and in addition to it, it is analysed separately by separate instruments for determining oil content and moisture percentage of seeds.

❒ Salient features of sampling:

1. **Primary sample:** Each sample drawn from the heap or bag by parkhi or tube sampler from a single position of the lot.
2. **Composite sample:** Primary samples drawn from the same lot shall be thoroughly mixed and blended to form homogeneous composite sample in a sample divider.
3. **Test sample:** One portion of composite sample weighing 500 gms is packed in cloth bag.
4. **Sample for Moisture:** Part of the composite sample weighing about 250gms. packed in polythene bag and heat sealed kept in airtight container.
5. **Labeling of sample:** Appropriate labels are attached with cloth bagged and polythene bagged samples showing the following particulars:
   a) Name of the commodity and variety
   b) Lot number
   c) Quantity, whether in bags or in bulk

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d) Place and date of sampling
e) Details of wagon/truck/warehouse in the case of bulk samples
f) Name of sampling officer
g) Signature

6. Sampling from bags: Starting from any bag, count all bags in one order as 1,2,3... up to r and so on. Every 'r'th bag so counted shall be withdrawn to give a sample for test where r = N/n, where N= No. of bags in the lot and n= Number of bags to be chosen. The scale of sampling is shown below:

Total number of bags	Number of bags to be sampled
Upto 30	All
31 to 300	30
301 to 1000	50
1001-2000	100
Above 2001	5 per cent

7. Sampling from bulk or heaps: The scale of sampling from bulk or heap is shown below:

Quantity	Number of spots from which sample is to be drawn
Up to 300 tonnes	30
301 to 1000 tonnes	50
Above 1001 tonnes	100

❒ **List of equipments required for physical analysis of mustard-rapeseed:**

Sl.no.	Name of the equipments
1.	Parkhi
2.	Tube Sampler
3.	Sample bag (cloth)
4.	Sample bag (Polythene)
5.	Enameled tray
6.	Sample Scoop
7.	Sample divider
8.	Standard set of sieves
9.	Magnifying glass
10.	Physical balance with weight box
11.	Sample slips
12.	Electronic moisture meter

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❒ **Steps of physical analysis of mustard- rapeseed:**

Step no.	Steps of physical analysis
1.	Checking of particulars of sample and entering in a register
2.	Emptied on a flat surface in a circular layer of 1.5 - 5 cm thick
3.	Oilseeds should be smoothly scooped from centre, sides and different points
4.	If seeds of *Argemone maxicana* are found, then it should be sieved out to avoid health hazards.
5.	Sample is poured through a set of sieves to strain out foreign matter at different levels.
6.	Sieves are separated and foreign matter is picked out by hand.
7.	Bold seeds will be accumulated in top sieve and smaller ones in lower sieve.
8.	The contents of upper sieve should be mixed and spread out in a thin layer from which 10 grams sample is taken for analysis for determining various refractions as perlaid down grade specifications..

➔ Moisture content of mustard -rapeseed is determined by moisture meter or hot air oven method.

Source: Handbookon Grading of Foodgrains and Oilseeds.(Marketing Series-185), Directorate of Marketing & Inspection , Govt. of India.

❒ **Analysis of oilseed sample for oil content by NMR analyser:**

Steps of oil analysis by NMR (Nuclear Magnetic Resonance) Analyser

1. Taking 1.5 grams seeds in a vial.
2. Inserting it in a NMR analyser.
3. Then to analyse the sample through NMR instrument and getting results of oil content within 40 seconds.

SOURCE: Department Of Botany, Nagpur University.

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3.4.1. Grade specifications :

There are different agencies responsible for grading and standardization of agricultural produce. Among them, the Directorate of Marketing and Inspection (DMI) is the main agency, which undertakes grading under AGMARK. Mustard -rapeseed are graded under AGMARK since 1964 and the grade specifications have been laid down by the Central Govt. under relevant grading and marking rules. The other agencies have also formulated their own set of grade standards which are based on the AGMARK grade specifications.

i) Agmark specifications:

Table no – V

Agmark standards of mustard-rapeseed comprising *Brassica campestris* variety *sarson / toria / dichtoma* and *Brassica juncea / Brassica nigra* (Rai) grown in India.

Grade designation	Special characteristics maximum percentage by weight					General Characteristics
	Foreign matter	Dead, discoloured & damaged	Unripe shriveled and slightly damaged	Small atrophied seeds	Admixture * of other varieties of mustard	
1.	2.	3.	4.	5.	6.	7.
Special Standard	1.0	1.0	1.5	5.0	5.0	The seed shall – (a) have shape, size, colour and pungency characteristic of the variety. (b) be mature, hard, wholesome & well dried, moisture not exceeding 6 percent. (c) not have any trace of Argemone seeds. (d) be free from moulds or insect damage and deleterious substances. (e) not bear the grains of any other species and (f) be in a sound merchantable condition.
General	2.0	1.5	3.0	10.0	10.0	
	3.0	2.0	4.0	20.0	15.0	

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Note :

1. Foreign matter includes dust, dirt , stones, lumps of earth, chaff, stems or straw, food grains including oil seeds of any other variety or any other impurity.
2. Dead seeds include seeds which are duds and can easily be crushed by hands.
3. Discoloured and damaged seeds are those seeds which are internally damaged or discoloured, damage and discolouration materially affecting the quality.
4. Unripe and shrivelled seeds are those seeds which are not properly developed.
5. Slightly damaged seeds are those seeds which are superficially damaged or discoloured, damage and discolouration not materially affecting the quality.
6. Small atrophied seeds means seeds not retained in sieves with 14 meshes per linear inch (1" = 2.54 cm.) . This factor will not be applicable to the *juncea* or *nigra* group of seeds.
7. Other coloured seeds mean seeds of any colour other than that of the specific variety.

✸ This will not apply to *Brassica juncea or Brassica nigra* if mixed with *Brassica campestris* variety sarson /toria/ dichotoma.

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Table no. – VI

Agmark standard of oilseed known commercially as Taramira (*Eruca sativa*)

Grade designation	Special characteristics maximum percentage by weight				General Characteristics
	Foreign matter	Dead, discoloured & damaged	Unripe, shriveled and slightly damaged	Admixture of other ✸ coloured seeds	
1.	2.	3.	4.	6.	7.
Special	2.0	3.0	2.0	10.0	The seed shall – (a) have shape, size, colour and pungency characteristic of the variety. (b) be mature, hard, wholesome and well dried, moisture not exceeding 6 percent. (c) not have any trace of *Argemone* seeds. (d) be free from moulds or insect damage and deleterious substances. (e) not bear the grains of any other species except to the extent provided under column 5 of the schedule and (f) be in a sound merchantable condition.
Standard	4.0	5.0	4.0	15.0	
General	6.0	8.0	8.0	20.0	

Note:

1. Foreign matter includes dust, dirt, stones, lumps of earth, chaff, stem or straw, foodgrains including oilseeds of any other variety or any other impurity.

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2. Dead seeds include such seeds that are duds and can easily be crushed by hand.
3. Badly discoloured and damaged seeds are those seeds which are internally damaged or discoloured, damage and discolouration materially affecting the quality.
4. Unripe and shriveled seeds are those seeds which are not properly developed.
5. Slightly damaged seeds are those seeds which are superficially damaged or discoloured, damage and discolouration not materially affecting the quality.
6. 'Other coloured seeds' means seeds of any colour other than that of the specific variety .

✸Will not apply if mixed with rape and mustard seeds.

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ii) PFA standards:

The Prevention of Food Adulteration Act, 1954 and Prevention of Food Adulteration Rules,1955 (PFA Rules) have been notified to carry out the provisions of the Act. These rules define the standards of quality and fix the limit of variability permissible in respect of article of food. These rules also provide guidelines of packing and labeling of an article of food. Standards framed under the provisions of the rules are popularly called PFA standards prescribe minimum limit for Quality as well as Safely parameters. PFA standards are minimum standards and are **mandatory**. They do not differentiate between quality. **Food articles being sold in the market should comply with PFA standards.**

Following standards of mustard are prescribed in PFA Rules, 1955

❒ Quality parameters

Description: MUSTARD (Rai, Sarson) WHOLE means the dried seeds of *Brassica alba*.(L). *Boiss* (Safed rai), *Brassica campestris* L. var, *dichotoma* (Kali Sarson), *Brassica campestris*, L. var, yellow sarson, Syn, *Brassica campestris* L. var, glauca (Pili Sarson), *Brassica campestris* L. var, toria (Toria), *Brassica juncea*, (L). Coss & Czern (Rai, Lotni) and *Brassica nigra* (L), Koch (Benarasi rai).

Extraneous matter : The proportion of extraneous matter which includes dust, dirt, stones, lumps of earth, chaff, stem , straw, edible food grains, edible oilseeds of any other variety or any other impurity shall not exceed 7.0 per cent by weight.

Insect damaged matter : Insect damaged mater shall not exceed 5 percent by wt.

It shall be free from seeds of *Argemone maxicana* Linn.

- **It shall be free from added colouring matter**.

❒ Safety parameters

Limits for insecticides and pesticides

Following maximum limits are prescribed for residues of insecticides and pesticides

Sl. No.	Name of insecticides	Tolerance Limit Mg/Kg. (ppm)
1.	Cypermethrin (sum of isomers) (fat soluble residue)	0. 20
2.	Carbofuran (Sum of carbofuran and 3 -hydroxy carbofuran expressed as carbofuran)	0.10
3.	Phenthoate	0.03
4.	Phorate (sum of phorate, its oxygen analogue and their sulphoxide and sulphones, expressed as phorate)	0.05
5.	Trichlorfon	0.1

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❒ **Poisonous metals**

Following limits are prescribed for poisonous metals

Sl. No.	Name of Poisonous metal	Parts per million by weight
1.	Lead	2.5
2.	Copper	30.0
3.	Arsenic	1.1
4.	Tin	250.0
5.	Zinc	50.0
6.	Mercury	1.0
	Methyl mercury	0.25

(Calculated as the element)

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iii) Specifications followed by NAFED for procurement: National Agricultural Co-operative Marketing Federation (NAFED) is the nodal agency for conducting procurement under Price Support Operations. It follows specifications for procurement operations as given below;

Table no - VII

Grade specifications of mustard – rapeseed followed by NAFED for price support scheme during 2004-2005 marketing season

Sl.no	Special characteristics	Maximum limit of tolerance (per cent by weight per quintal)
		FAQ
1.	Impurities/foreign matter (including Tara Mira)	2
2.	Admixture with other types (including Toria)	10
3.	Unripe, shrivelled or immature	4
4.	Damaged & weevilled	2
5.	Small atrophied seeds	10
6.	Moisture content	8
	Support price	**Rs 1600/-** per quintal for FAQ

Note :

Presence of all non-edible oilseeds like *Argemone* seeds, Castor, Mahua, Neem is prohibited.

Definitions :

1. Impurities & foreign matter includes dust, dirt stones, lumps of earth, chaff, stems/straw, Taramira and any other impurity ;
2. Admixture means other type of Sarson (including Toria);

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3. Unripe and shriveled or immature seeds are not properly developed;
4. Damaged and weevilled seeds are those which are internally damaged or discoloured, damage and discolouration materially affecting the quality;
5 Small atrophied seeds means seeds not retained in sieves with 14 meshes per linear inch (1"= 2.54 cms). This factor will not be applicable to the *juncea* or *nigra* group of seeds.

(SOURCE : NAFED **)**

IV) Codex standards:

Mustard and Rapeseed shall comply with following maximum pesticide residue limits.

(a) Mustard seed :

Sl. no.	Pesticide	MRL✦	(Mg / kg.)
1.	TERBUFOS	MRL	0.05

(b) Rapeseed :

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Sl.no.	Pesticide	MRL or EMRL✸	(Mg / kg)
1.	CARBENDAZIM	MRL	0.1
2.	CYCLOXYDIM	MRL	2
3.	CYFLUTHRIN	MRL	0.05
4.	DIMETHIPIN	MRL	0.1
5.	DIQUAT	MRL	2
6..	FLUCYTHRINATE	MRL	0.05
7.	FLUSILAZOLE	MRL	0.05
8.	GLUFOSINATE-AMMONIUM	MRL	5
9.	GLYPHOSATE	MRL	10
10.	IPRODIONE	MRL	0.5
11.	LINDANE	MRL	0.05
12.	METHAMIDOPHOS	MRL	0.1
13.	METHIDATHION	MRL	0.1
14.	METHIOCARB	MRL	0.05
15.	PERMETHRIN	MRL	0.05
16.	PIRIMICARB	MRL	0.2
17.	PROCHLORAZ	MRL	0.5
18.	PROPICONAZOLE	MRL	0.05
19.	TEBUCONAZOLE	MRL	0.05
20.	TERBUFOS	MRL	0.05
21.	VINCLOZOLIN	MRL	1

✦ **MRL -** Maximum Residue Limit
✸ **EMRL -** Extraneous Maximum Residue Limit

Hygiene :

Mustard and Rapeseed, after cleaning and sorting, and before further processing :

- Shall be free from microorganisms in amounts which may represent a hazard to health.
- Shall be free from parasites which may represent a hazard to health.
- Shall not contain any substance originating from microorganisms, including fungi, in amounts which may represent a hazard to health.

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V) ISO standards:

Table no - VIII

International Standard (ISO) specification of mustard seeds

1. Description :	Mustard seed is the dried clean seed of one or more of the following plants ; *Sinapis alba* linn ---- White mustard, yellow mustard *Brassica nigra* (Linn) Koch. ---- Black mustard *Brassica juncea* (Linn) Czern. & Coss. --- Indian mustard
2. Odour and flavour :	The odour and flavour of the seeds when ground and moistened shall be fresh and pungent, and free from rancidity and mustiness.
3. Freedom from moulds, insects, etc.	The seeds shall be free from living insects, mites and moulds, and shall be practically free from dead insects, fragments and rodent contamination visible to the naked eye (corrected, if necessary, for abnormal vision), using such magnification as may be necessary in any particular case. If the magnification exceeds X 10, this fact shall be stated in the test report..
4. Extraneous matter, shrivelled and damaged seeds	The seeds shall be whole and mature and shall not contain more than 0.7per cent (m/m) of extraneous matter or other vegetable material, determined by the method specified in ISO 927. Extraneous seeds include charlock (*Sinapis arvennsis* Linnaeus), rape (*Brassica napus* Linnaeus), and *Melilotus species*. The proportion of damaged or shrivelled mustard seeds shall not exceed 2 per cent (m/m).
5. Chemical requirement	The mustard seed shall comply with the requirement as given below : **Characteristics** — **Requirement** Loss in mass at 103° C per cent (m/m) max. — 10 Total ash, percent (m/m) on dry basis, max — 6.5 Acid insoluble ash, percent (m/m) on dry basis, max — 1.0 Non-volatile ether extract, per cent(m/ m) on dry basis, min. — 28 Allyl isothiocyanate. percent(m/m) on dry basis a) in *B. nigra,* min — 1.0 b) in *B. juncea*, min. — 0.70 p. hydroxybenzyl isothiocyanate, percent(m/ m) on dry basis in *Sinapis alba*, min. — 2.3

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3.4.2 Adulterants and toxins:

The *Argemone mexicana* Linn. is originally an American herbaceous annual which is well known through different names in different languages and belongs to family and characteristics as follows:

English – Mexican prickly poppy
Hindi – Shialkanta, Satyanashi
Bengali – Shialkanta
Gujarat – Darudi
Tamil – Kutiyotti
Sanskrit – Srigalkanta
Family :- Papavaraceae

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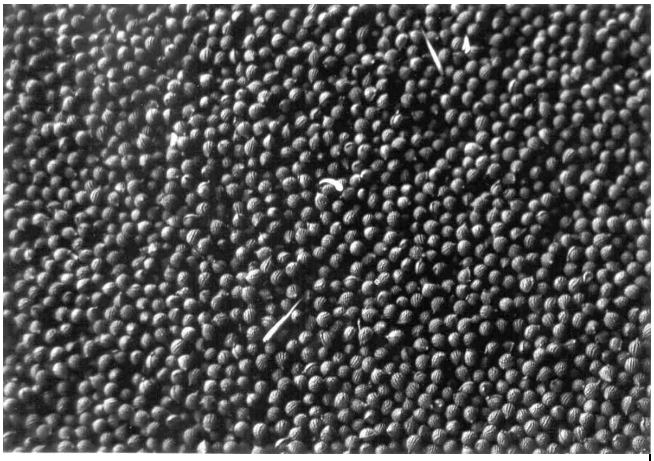

Argemone seeds

Mustard seeds

Argemone seeds are blackish in colour. Surface is wrinkled whereas mustard seeds are similar in colour but having smooth round surface. The *Argemone* seeds yield 22-36 per cent non edible, nauseous, bitter, pale yellow oil, which is known as *Argemone* oil. It contains two alkaloids which are responsible for dropsy disease.

Symptoms of dropsy: Symptoms of dropsy are acute nausea, vomiting, loose motions, bloated stomach, involvement of kidney, swelling of hands and feet known as Oedema. In extreme cases, it is reported that glaucoma and death due to cardiac arrest occurs.

The line of treatment is symptomatic and it has been suggested that diuretic, bio antioxidants, steroids, vitamins, calcium and protein rich diet have beneficial effect on epidemic dropsy cases.

Preventive measures:

The mustard oil be consumed which has undergone thorough quality tests. Following types of laboratory tests are used for detection of *Argemone* oil:

Screening test - Nitric Acid
- Ferric Chloride test

Confirmatory test - Paper Chromatography test

Source: www.hort.purdue.edu/newcrop/CropFactSheets/argemone.html

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3.4.3 Grading at producer's level:

In order to ensure proper price to the producers as well as gaining confidence of the consumers the mustard - rapeseed should be graded at producers' level. Some of the varieties like Maghi-Lahia, RH-30, Pusa Bold fetch good price in market. In order to ensure the correctness of description of particular variety, the grading should be done at producer's level. Grading not only facilitates the dissemination of market information but also facilitates the distribution at various stages.

The scheme of 'Grading at Producer's level' was introduced in 1962-63 by the Directorate of Marketing and Inspection (DMI). The main objective of the scheme is to subject the produce to sample tests and assign the grade before it is offered for sale. The programme is being implemented by state governments for which 1345 grading units have been established in India up to 31/3/2001.

Table no.-IX

Grading of mustard-rapeseed at producer's level

Commodity	2000-2001		2001-2002	
	Quantity graded (in tonnes)	Estimated value (Rupees in lakhs)	Quantity graded (in tonnes)	Estimated value (Rupees in lakhs)
Mustard-Rapeseed	122798.40	13201.11	172783	20929.47

Source: AGMARK GRADING STATISTICS , 2001-2002,Directorate of Marketing & Inspection (DMI) ,C.G.O Complex, Faridabad.

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3.5 Packaging:

Materials used for packaging of mustard - rapeseed:

- **Plastic film bags:** Two types of polythene films are available viz. low-density polyethylene film (LDPE) and high density polyethylene film (HDPE) for packaging purposes. But in most cases, LDPE is used as plastic film bags for packaging mustard -rape seeds. It protects the oilseeds against dust, dirt and moisture. It is convenient for packing of smaller quantities of oilseeds like 1kg., 5kg., and 10kg. packs.

- **Corrugated fibre board:** These are paper board cartons used for keeping the plastic bags filled with mustard - rapeseed. It protects the oil seeds from dust, dirt and to some extent from moisture.

- **Jute bags:** Gunny bags made of jute are widely used by producers, traders, processors, etc,. for packing of mustard - rapeseed. Traders use gunny bags for storing oilseeds and keep them in go-down by stacking. Seeds of mustard – rapeseed are generally packed in 'B' twil jute bags of 95kg., capacity. Sometimes the oilseeds are stored in 50kg. jute bags also.

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Table no. – X

Convenience of jute vs plastic film bags

Jute bag	Plastic film bag
1) Cost per bag is more than plastic bag.	1) Cost per bag is less than jute bag.
2) They are biodegradable and environment friendly.	2) These are synthetic and not environment friendly.
3) Disposal of old unserviceable bags is not a problem.	3) Disposal of unserviceable bags is a problem
4) Not slippery surface, convenient during handling operation in small and bigger quantities	4) Slippery surface, hence handling of such bags in bigger quantity is not convenient
5) Convenient for stacking.	5) Not convenient for stacking and probability of stack collapse.
6) Protection against tearing and snagging is good.	6) Protection against tearing and snagging is not good.
7) Repairing of bags damaged by hooks is easy.	7) Repairing of bags damaged by hooks are not possible
8) Oilseeds preservation efficiency is not good as moisture absorption is high and protection against insect penetration is nil.	8) Oilseeds preservation efficiency is good as moisture absorption is almost nil and well protected against insect penetration.
9) It can be used once, twice or even more.	9) It can not be used for more than one occasion.

Criteria for selection of packaging material for mustard - rapeseed:

- ⇨ It should be specific to the characteristics of the produce.
- ⇨ It should be suitable according to transportation and storage method.
- ⇨ It should be suitable according to climatic and environmental conditions.
- ⇨ The material must provide protective strength to the produce.
- ⇨ It should be safe to handle during transportation.
- ⇨ The material should be economical, readily available, easy to handle and store.
- ⇨ It should be convenient and suit the need of the customer.
- ⇨ It should be attractive for display.
- ⇨ It should be environment friendly and biodegradable.

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The packages of mustard-rapeseed should be properly labeled with following marking:

- ❒ The name of the commodity, brand name, trade name of the produce.
- ❒ Name and address of the packer / farmer
- ❒ Net weight of the content in the package.
- ❒ Batch No. / lot No./ Code No.
- ❒ Date of packaging indicating the month and year
- ❒ Year of harvest, if available
- ❒ Grade of the material as per national grade standards
- ❒ Name of the producing country (to be mentioned in case of export).

For scientific packaging of mustard - rapeseed, following care should be taken:

☞ The produce should be packed in suitable packaging material as approved by the competent authority

☞ Quality of the packaging material should conform to the requirements as laid down under PFA standards as amended from time to time.

☞ The size of the pack shall be as per the provision under the standards of Weights and Measures Act.

☞ The oilseeds should be packed in clean, hygienic bags of any material, which does not affect the produce and prevents it from absorbing moisture.

☞ The packing material used should have sufficient aeration facilities.

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3.6 Transportation :

❒ Pathways:

Head load:

Among all modes of transportation, the head load is the convenient and cheapest transportation method for smaller quantity of produce. It is convenient for a village or other areas where human being is the only means of transport. Bags of oilseeds are carried on the head or back of human being. Coolies are used for such purpose which is common in urban areas.

Head load

Pack animals: Suitable for carrying oilseeds in smaller quantities by animals like camel or donkeys in a village, hilly or desert tracks where other transport like bullock/camel carts are not suitable.

❒ Road transport:

Thelas: It is two or four wheeler vehicle driven by human being and commonly used for carrying oilseeds from door to door in nearby areas.

Rickshaws: In some semi-urban and urban areas, cycle rickshaws and rickshaws are very convenient and popular mode of oilseed transport to short distant places.

Tongas: These are horse driven vehicle suitable for carrying oilseeds in narrow roads.

Bullock / camel cart:

Bullock or camel carts are the primary means of transport in most rural areas of India. Capacity varies between 187kgs. to 933kgs. It is convenient due to following reasons.

⇨ Cheap and easily available conveyance for the farmers having small quantity of produce to be transported to short distant areas.

⇨ Operational cost is low.

Bullock cart

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⇨Easily manufactured by village artisans from materials(wood) available at village and the repairing facilities are also readily available there.

⇨No special type of road is required, can be operated on Kaccha road, muddy or sandy path also.

⇨Multi-purpose transport system creates employment to village artisans.

Tractor trolley:

Transportation by tractor trolley is convenient due to following reasons.

⇨ To carry larger quantity of produce than bullock carts in less duration of time.

⇨ Suitable in surplus producing areas than the trucks for carrying produce to the primary assembling markets where there is absence of proper pucca road connecting to the villages.

Tractor trolly

Yugad :

It is a kind of four wheeler which is widely used in the rural areas of Rajasthan and Uttar Pradesh states for carrying mustard-rapeseed.

Yugad

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Truck:

For larger or bulk quantity, the truck is the most convenient mode of transport throughout the country and in some cases better than railway wagons since the railway wagon transportation poses some difficulties like timely non-availability of wagons, safety of goods and problems of loading-unloading of produce directly at godowns. Capacity of truck varies between 8-12 tonnes. It is convenient due to following reasons.

⇨Easy Availability

⇨Time saving

⇨Quick movement of stocks

⇨Door to door delivery

⇨Comparatively cheaper for short / medium distances

⇨Suitable for smaller quantities at a given time.

⇨Flexibility in operation and reliability in handling of produce.

⇨Lower transit losses due to least handling of loading and unloading.

Truck

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❒ Railway transport:

Railway system in India is Asia's largest and world's fourth largest in terms of route kilometers. The railway system is developed in India in a manner so that it can transport bulk commodities for long distance at a cheaper and economical rate. But the transportation of mustard-rapeseed through railways is not common in India.

The transportation of mustard-rapeseed by railway wagons may become convenient for following reasons.

⇨Suitable for carrying larger quantity of produce over long distances through out India.

⇨Comparatively cheaper and safer mode of transport available through a wide network of railways.

⇨Facilities of subsidised tariff for agricultural commodities is available depending upon the situation.

Railways

During transportation, following care should be taken:

☞ The packages of oilseeds should be handled and transported in such a way so that they remain well protected from sun, rain or other sources of excessive heat, objectionable odour and from any type of cross infestation.

☞ During transportation, there should be proper arrangement of sufficient aeration and insulation to reduce the heat.

☞ Stacking height should be kept up to 6 to 10 tiers.

☞ While handling and lifting of bags during transportation, too much use of hooks by labourers should be avoided, as it may cause spillage losses.

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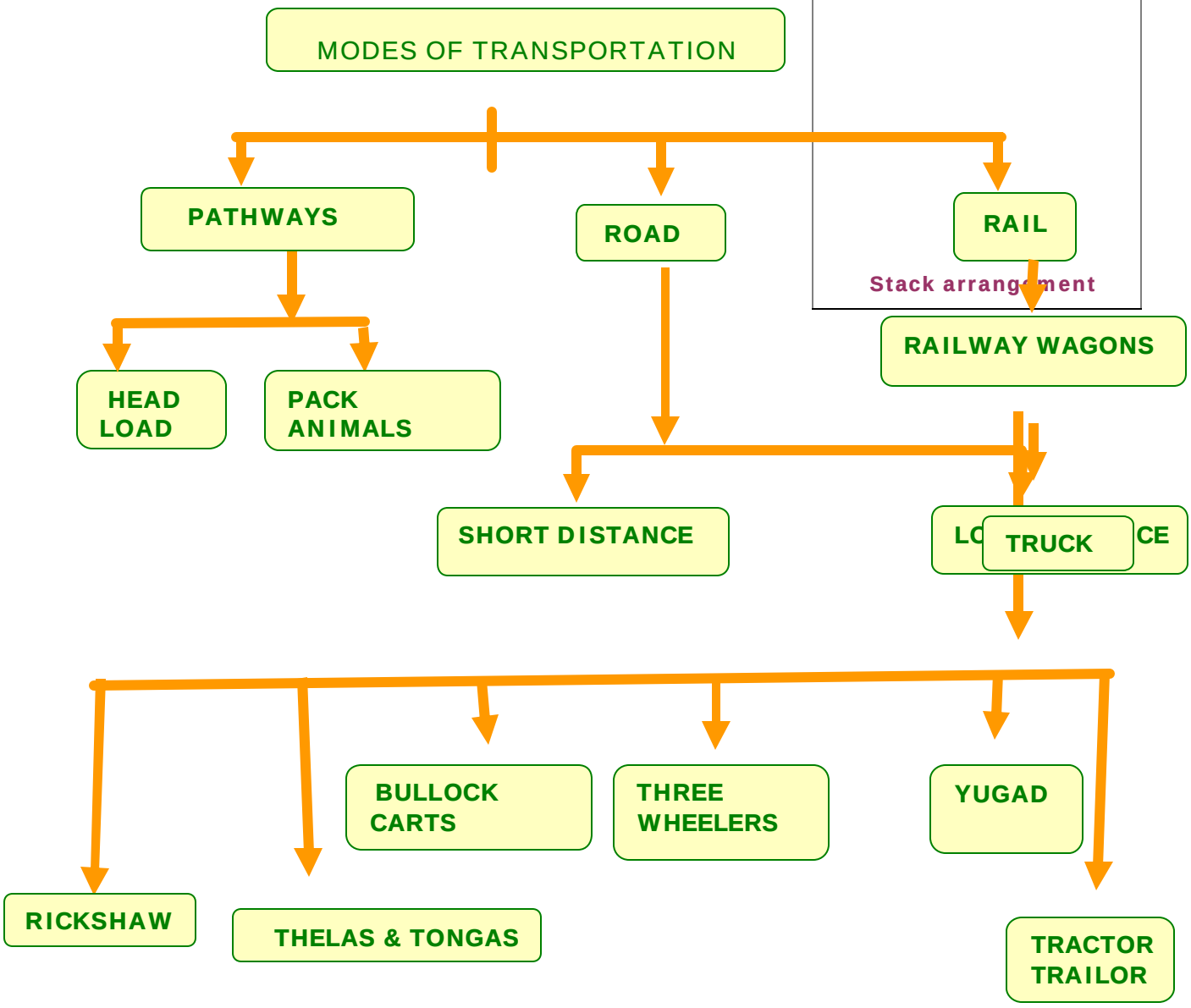
Different modes of transportation of mustard - rapeseed:



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3.7 Storage:

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Mustard–rapeseed is living organism and therefore, develop carbon-dioxide and water at the expense of sugar and starch. Such activities are enhanced by moisture, temperature and relative humidity. Before storage, it is essential to clean oilseeds and remove plant foliage and stems etc which initiate the heating, development of carbon-di-oxide and quality deterioration in seed mass. Hence, the mustard-rapeseed should be stored under low moisture content (8 per cent) and temperature (25°C). In storage, the mustard - rapeseed is protected from the time of plenty during production period to the future consumption during the scarcity period.

Requirements for safe storage:

The following requirements should be fulfilled for safe storage of oil seeds like mustard - rapeseed:

I) Selection of godown: The bags of mustard seeds should be stored in covered premises, which are well protected from moisture, excessive heat, insects and rodents. The godown should be made on a well built platform of a height of not less than 1ft. from ground level to prevent soil moisture and dampness. The roof of the godown should have sufficient height from the mustard seed stacks for keeping minimum possible temperature in godown. Sufficient space should be provided between stacks for proper air circulation in storage.

II) Cleaning of godowns: For safe storage, godown should be properly cleaned so that there should be no left over grains which may harbour infestation and contaminate the new stock. The walls of godown should be whitewashed alongwith painting of walls with coal tar up to the height of 1 ½ meter. Before storage, the godown should be sprayed with Malathion or DDVP. Besides, care is to be taken also for filling up of cracks and crevices of godowns, which also harbour crawling infestation.

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III) Cleaning and drying of oilseeds: Before storage, the oilseeds should be properly cleaned and dried so that it should be free from dust, dirt particles, moisture which results in quality deterioration of oilseeds.

IV) Separate storage of old and new stock: To check crawling infestation and to maintain hygienic condition of godown, the old and new stocks are to be stored separately.

V) Cleaning of bags: Always new and dry gunny bags should be used for oilseeds storage. But the old gunny bags can be used only after cleaning and drying in sun and also fumigating by Alluminium Phosphide.

VI) Cleaning of vehicles: The vehicles used for transporting oilseeds should be cleaned with phenyl.

VII) Use of dunnage: Bags of oilseeds should not be stored directly on the floor of the godown. These should be kept by arranging wooden crates or bamboo mats along with a cover of polythene sheet. Otherwise, the bottom layer of oilseed bags of the stack may be damaged by absorbing moistures from the floor.

VIII) Aeration of godown : To provide regular aeration to the stock in the godown is very essential to maintain the quality of the stock. Hence, proper aeration should be given during clear weather but care is to be taken to avoid aeration during rainy days.

IX) Regular inspection of stocks: To maintain health and hygiene of the stocks, regular inspections every fortnight (15 days interval) is essential.

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3.7.1 Major storage pests and their control measures:
Table no.– XI

Insects: Insects do not directly damage the mustard seeds stored in godown/storage. Therefore, no curative treatment is needed for control of infestation in case of such oilseeds. But following crawling insects are seen on the bags of mustard seeds and floor of godown which deteriorates the hygienic condition of the godown and mustard seed bags and may be controlled as below.

Name of insect (Scientific& Common Name)	Control/ Remedial measure	Name of insecticide	Dose	Method of application
Tribolium casteneum Confused grain beetle 	Spraying	DDVP 76per cent E.C.	Mix 1 litre DDVP in 150 litre of water and then spray 3 litre this prepared solution per 100 sq. metre area.	Not to be sprayed directly to the stock, maybe done on the walls and floor of the godown as and when required or once in a month
Oryzophilus surinamensis Saw toothed grain beetle 	-do-	-do-	-do-	-do-

Rodents: The rodents/rats cause mechanical damage to gunny bags of stored oilseed by cutting it which results in spillage and quantitative loss of the produce. Moreover, the rodent's excreta, hair, etc., deteriorates the hygienic conditions of oilseeds. To check the attack of rodents ,measures are to be taken as below.

Name of rodent	Method of remedial measure	Name of pesticide	Dose	Method of application

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Rats 	Use of rat cage	-----	-------	Rats caught by these rat cages can be killed by dipping in the water.
	Use of poison baits.	Zinc Phosphide	2 grams Zinc Phosphide per 100 grams. of bait made of food stuff (e.g. atta / besan and edible oil)	At first stage, false baiting is done without applying Zinc Phosphide and after one or two days, anti-coagulant pesticide like Zinc Phosphide is to be mixed with Atta or any other food stuff (bait). This kind of pesticide affects gradually the body of rodents which ultimately kills them.
	Rat burrow fumigation	Alluminium Phosphide	2(Two) Alluminium Phosphide tablets per rat burrow.	Fumigate the rat holes/burrows if any found inside the godown/surrounding areas by putting Aluminium phosphide tablets into it and sealing the mouth of the hole/burrow by mud mixture.

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3.7.2 Storage structures :

◆ **Earthen pots:** These are cylindrical shaped structures made up of unburnt clay mixture with straw or cowdung mixture, mud and bricks. Generally used by farmers at rural areas.

◆ **Bamboo baskets:** Baskets made of bamboo are used by some producers in villages to store mustard - rapeseed in smaller quantity.

◆ **Gunny bags:** Bags made of jute are widely used throughout India by the producers, traders, processors, packers, etc., for storing of mustard seeds in larger quantities.

◆ **Circular steel bins (anaj kothi):**

It is convenient for storing smaller quantities of mustard - rapeseed up to 3 tonnes. Assembling 4-6 pieces of corrugated or plain M.S. Sheets makes it. Useful for preserving mustard seeds at domestic level.

◆ **Godown:** It is a pucca constructed storage structure where traders generally store the bags of mustard-rapeseed by building the stacks in it. It is made of cemented brickworks wall and floor along with corrugated roof.

◆ **Warehouse:**

This scientific storage structures are created and widely used by organizations like Central/State Warehousing Corporations (CWCs,SWCs), National Agricultural Co-operative Marketing Federation (NAFED) and other co-operative marketing organisations on a large scale in different parts of India. These storage structures are always built as per prescribed guidelines for scientific storage of agricultural commodities.

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3.7.3 Storage facilities:

i) Producers' storage: The farmers generally use two types of storage structures, i.e., indoor and outdoor storage structures. In case of quantities up to 5 tonnes, indoor facilities can be used but for larger quantities, outdoor structures are preferred. As regards indoor structures, farmers generally prefer metal bins whereas in case of outdoor structures they prefer steel, aluminum or concrete godown /sheds.

ii) Rural godowns: The godowns / warehouses generally used by the farmers or village traders are not always scientifically built and maintained, which sometimes results in storage losses. However, for building up of scientific godown at the village level, the benefit of Gramin Bhandaran Yojana scheme of Govt. of India should be availed.

However, the following points should be kept in view during construction of buildings of rural godowns:

⇨Topography of the area of construction

⇨Ground condition, elevation etc.

⇨The foundation, floor and walls should be of sound designed concrete based structures.

⇨Roof should be constructed with galvanized steel having wide span and no supporting pillar.

⇨There should be provision of sufficient ventilation and lighting facilities.

iii) Mandi godowns:

The Agricultural Produce Market Committee(APMC) complexes are constructed with storage facility so that the agricultural produce brought to the market should be stored safely by market committees. During storage, the goods are weighed in presence of seller /producer and receipt is issued indicating the nature and weight of goods to be stored and it is issued by the licensed general commission agents, brokers depending upon the case. In most of secondary and terminal regulated markets, Central and State Warehousing Corporations also provide scientific storage facilities at prescribed storage charges and issue warehousing receipt against pledge of produce, which is a negotiable document for obtaining finance from the scheduled bank.

According to a survey conducted by the Directorate of Marketing & Inspection (DMI), out of 89 markets, 66 markets (74per cent) were provided with storage facility and rest 23 (26per cent) were without storage godowns.

iv) CWC & SWC warehouses :

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◆ **Central Warehousing Corporation (CWC):** It was established in 1957.It is the biggest public sector warehouse operator in the country. The CWC has godowns in important markets of all states.It is the largest public sector warehouse operator with their godowns established in almost all the states of the country. At present, CWC has already established and operating 464 warehouses being managed by 15 regional offices. These are scientifically constructed warehouses which facilitate the farmers to store their produce safely and to device the benefit of pledge finance for safeguarding against distress sale during the period of glut situation in the markets. The warehouses of CWC provide storage and ancillary services for more than 250 groups of commodities and products. It provides specialized arrangements and high degree of professional cares and skill for many of these products.These storage facilities are utilised for all commodities including mustard-rapeseed.

All India storage capacity of C.W.C (in lakh tonnes)
(As on 29-02-2004)

Owned	Hired	Total
80.30	12.95	93.25

Source: www.fcamin.nic.in/stor _ware.htm

◆ **State Warehousing Corporations (SWCs):** The Central Warehousing Corporation (CWC) has 17 associates in State Warehousing Corporations(SWC) which were established in different states and located at distant places. The total share capital of SWC's is contributed equally by CWC and the concerned state governments i.e. it is under dual control. The SWCs also provide storage facilities for oilseeds like mustard-rapeseed.

v) Co-operative storage:

In Co-operative sector, National Co-operative Development Corporation (NCDC) has been making systematic efforts to assist to establish scientific storage facilities in co-operative sector. Till the end of March,2001, NCDC increased it's financial assistance to build storage capacity upto 137.67 lakhs tones. The corporation has been implementing it's storage programmes under the following schemes:

- Centrally Sponsored Schemes.
- Corporation Sponsored Schemes.
- EEC assisted Rural Growth Centre Project.

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3.7.4 PLEDGE FINANCE SYSTEM:

The Indian farming community mostly consist of small and marginal farmers . They do not have the economic strength to retain the surplus produce till favourable market price and often compelled to sell their produce immediately after harvest when the prices are low. The solution to this problem lies in providing safe and scientific storage of their produce and availing easy marketing credit against the stored produce. Hence, the system of pledge finance have emerged as an unique avenue of finance to farmer.

Table no. – XII

Facilities of loan

Loan system	Loan availability	Eligibility	Rate of interest	Types of participating banks
As per guidelines of Reserve Bank of India, loan/ advances can be given against hypo-thecation/pledge of agricultural produce.	From 29/4/02, under Rural Godown Scheme, the pledge loan is available up to 75per cent of the value of produce pledged up to maximum limit of Rupees Five Lakhs per borrower and is repayable within one year .	They met I'm All types of farmers are eligible. They can avail this facility of pledge loan by storing their produce in rural godown.	It is determined as per Reserve Bank of India's directives.	Commercial Banks / Cooperative Banks /Reserve Bank/ Regional Rural Banks.

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4.0 MARKETING PRACTICES AND CONSTRAINTS

4.1 Assembling :

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4.1.1 Major assembling markets: There are a large number of assembling markets of mustard - rapeseed are situated throughout the country. Some of the major assembling markets of mustard - rapeseed in major producing states in India are listed below:

Table no.-XIII
Major assembling markets

Sl. no.	Name of state	Name of district	Name of major markets/ mandies
1.	Rajasthan	Ajmer	Ajmer, Bewar, Vijayanagar, Kekri, Madanganj-Kisangarh
		Bhilwara	Bhilwara, Mudlegarh
		Tonk	Deoli, Malpura, Niwai, Tonk, Uniwara.
		Alwar	Alwar, Khairtal, Kherli
		Bharatpur	Bayana, Bharatpur, Delg, Kama, Nadbai, Nagar
		Dhoulpur	Dhoulpur
		Bikaner	Bikaner, Khiju Bala, Lunkaransher, Nokha
		Churu	Churu, Shadulpur, Sujangarh, Ratangarh, Sridungarh
		Hanumangarh	Bhadra, Golubala, Hanumangarh, Nohar, Pilibanga, Rabatsar, Shadulsher, Sangaria, Suratgarh
		Dousa	Bandikui, Dousa, Lalsot, Mahua – Mandabar
		Jaipur	Chaksu, Choumu, Jaipur, Kisangarh – Renwal, Kotputli
		Barmir	Balotara, Barmer
		Jaisalmer	Jaisalmer
		Jalaur	Bhinmal, Jalaur, Sanchor
		Jodhpur	Bhilwara, Jodhpur, Pipadsher
		Pali	Jaitaram, Pali, Sojat Rd., Sumerpur, Rani
		Bangra	Anta, Atru, Barang, Chhabra
		Bundi	Bundi, Keshoraipatan, Sumergunj
		Jhalawara	Bhawani Mandi, Eklera, Jhalarapatan, Khanpur
		Karoli	Hindon
		Kota	Itwa, Kota, Ramganjmandi
		Udaypur	Fatehnagar, Udaipur
		Swaimadhopur	Gangapur City, Swaimadhopur
		Jhunjhunu	Chiraba, Jhunjhunu, Navalgarh, Surajgarh
		Nagaur	Didwana, Degana, Kuchmancity, Mertacity, Nagaur
		Sikar	Fathepur, Nimkathana, Sikar, Sri Madhopur
		Sriganganagar	Anupgarh, Gahsinghpur, Ghadsana, Jetsar, Raisinghnagar, Keshrisingpur,Padampur, Rawla, Ridmatsar, Sriganganagar, Srikaranpur,

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			Srivijaynagar
		Chittorgarh	Badi sadri, Begu, Chittorgarh, Kakpason, Nimbohera, Fathegarh
2.	Haryana	Sirsha	Sirsha Dabwali, Rattakhera, Chtha, Chautala Kalanwali, Odhan, Rori, Baraguda, Malekan, Rasulpur, Jivannagar, Elanabad Danijattan, Ding
		Fatehabad	Fatehabad, Lalani, Bhattu
		Hissar	Hissar Uklana, Prahuwal, Adampur, Dhobi, Asrana, Dabra, Pabran, Sarsod, Barwala, Babua, Narnaund, Bass, Hansi, Mundhal, Sorkhi Balsmand, Siswal
		Bhiwani	Bhiwani, Tosham, Bhiwani Khera, Charkhidadri, Loharu
		Mohindergarh	Mohindergarh Ateli, Narnaul, Rewari, Bawal
		Rewari	Rewari, Bawal
3.	Madhya Pradesh	Moreina	Subalgarh, Kailarash, Pourash, Moreina
		Gwaliar	Bhitarwara, Atari, Dabra, Gwaliar
		Shibpuri	Chourpura, Shibpuri
		Syopur	Vijaypur, Syopurkala
		Bhind	Gohad, Mehgaon, Bhind
		Mendsor	Sitamad, Piplya, Mendsor
		Neemach	Monasa, Neemach
4.	West Bengal	Bankura	Bishnupur, Jhanti Pahari, Bankura
		Birbhum	Bolpur, Rampurhat
		Burdwan	Kalna, Katwa, Asansol, Burdwan Sadar
		Cooch Behar	Cooch Behar Sadar, Dinhata, Tufanganj, Mathabhanga, Mekhliganj
		Jalpaiguri	Alipurdwar
		Midnapur(East)	Ghatal
		Mushidabad	Kandi
		Malda	Samsi
		Nadia	Bethuadahari
		Purulia Uttar Dinajpur	Balarampur Islampur, Kaliaganj
		Meerut	Meerut
		Ghaziabad	Hapur, Ghaziabad
		Bulandshahar	Bulandshahar, Siyana, Dibai, Anoopshahar
		Gautam Budhnagar	Jewar
		Saharanpur	Saharanpur
		Muzaffarnagar	Muzaffarnagar, Shamli, Shahapur
		Aligarh	Aligarh, Khair, Chharra, Atrauli
		Hathras	Hathras, Sikandrarau
		Mathura	Mathura, Kosikalan
		Agra	Agra, Fatehbad, Samshabad
		Etah Firozabad	Etah Tundla, Shikohabad, Sirsaganj
		Bareilly	Bareilly

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5.	Uttar Pradesh	Badaun	Bilsi
		Pillibhit	Pillibhit
		Bijnaur	Chandpur, Dhampur
		Moradabad	Bahjoi, Chandausi
		Jyotibaphulenagar	Hasanpur
		Etawah	Etawah, Jaswantnagar
		Auraiya	Auraiya, Achhalda
		Kanpur Nagar	Kanpur
		Kanpur Dehat	Rura, Jhinjhak, Pukhrayan
		Fatehpur	Fatehpur, Bindki, Kishanpur
		Allahabad	Allahabad
		Kaushambi	Ajuha
		Pratapgarh	Pratapgarh
		Chitrakoot Dham	Karvi
		Jhansi	Jhansi, Mauranipur, Gursarai
		Lalitpur	Lalitpur
		Jalaun	Orai,Jalaun
		Mahoba	Charkhari
		Hamirpur	Maudha, Rath
		Banda,	Banda
		Varanashi	Varanasi
		Jaunpur	Jaunpur, Mugra Badshahpur
		Gazipur	Yusufpur
		Deoria	Barhajbazar
		Basti	Basti
		Balrampur	Balrampur
		Sidharthnagar	Tulsipur, Shohratgarh, Bansi
		Balia	Balia
		Lucknow	Lucknow
		Raibareilly	Raibareilly, Jais
		Sitapur	Sitapur
		Hardoi	Hardoi, Sandila
		Khiri	Golagokaran Nath
		Faizabad	Faizabad
		Gonda	Gonda
		Bahraich	Bahraich, Nanpara, Mihipurma, Risia, Rupaidiha
		Sultanpur	Sultanpur
		Barabanki	Safdarganj

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4.1.2 Arrivals: Besides, the quantity of produce retained for farm family purpose, remaining quantity forms the marketable surplus which is brought to markets by various market functionaries. In the regulated market system, the producers can bring their produce directly to the market and without intermediaries also they can dispose it more competitively. Seeds of mustard - rapeseed begin to move to the market shortly after the harvesting of the crop. The season of marketing varies from variety to variety, region-to-region and time of harvesting. Following are the period of arrivals of different kinds of mustard-rapeseed:

Toria - December to February

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Sarson & Rai - March to June.

The detailed information about the quantity of arrivals of mustard - rapeseed in major assembling markets of major producing states is shown in Table-XIV.

Table no.- XIV

Arrivals of mustard - rapeseed in major assembling markets of major producing states

Name of state & number of markets	Marketing year	Total quantity. of arrivals (in thousand quintals)
1) Rajasthan (28 Markets)	1998-1999	3328.6
	1999-2000	3416.9
	2000-2001	3014.5
	2001-2002	3028.9
2) Haryana (23 markets)	1998-1999	252.5
	1999-2000	282.6
	2000-2001	251.6
	2001-2002	291.9
3) Madhya Pradesh (48 Markets)	1998-1999	601.2
	1999-2000	692.2
	2000-2001	1110.3
	2001-2002	632.4
4) Uttar Pradesh (135 markets)	1998-1999	2774.3
	1999-2000	3453.5
	2000-2001	3089.4
	2001-2002	3094.3
4) Gujarat (46 markets)	1998-1999	1389.7
	1999-2000	1748.1
	2000-2001	1623.2
	2001-2002	1426.2

[**Source :** Quarterly Bulletin of Market Arrivals from villages (April-June,2002). Deptt. Of Agriculture & Co-operation, Ministry of Agriculture, Govt. Of India.]

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4.1.3 Despatches : During 1998-99, major quantities were despatched from Rajasthan to Uttar Pradesh, Tamil Nadu and West Bengal including Kolkata area. Besides, some quantities were also despatched from Bihar to Kolkata, Delhi to Orissa and also from West Bengal (excluding Kolkata) to Bihar State.

During 1999-2000, major quantities were despatched from Rajasthan to Delhi, Jammu & Kashmir, Punjab, Tamil Nadu (excluding port area), and West Bengal (including Kolkata). Besides it, some quantities were also despatched from West Bengal (including Kolkata) to Bihar State.

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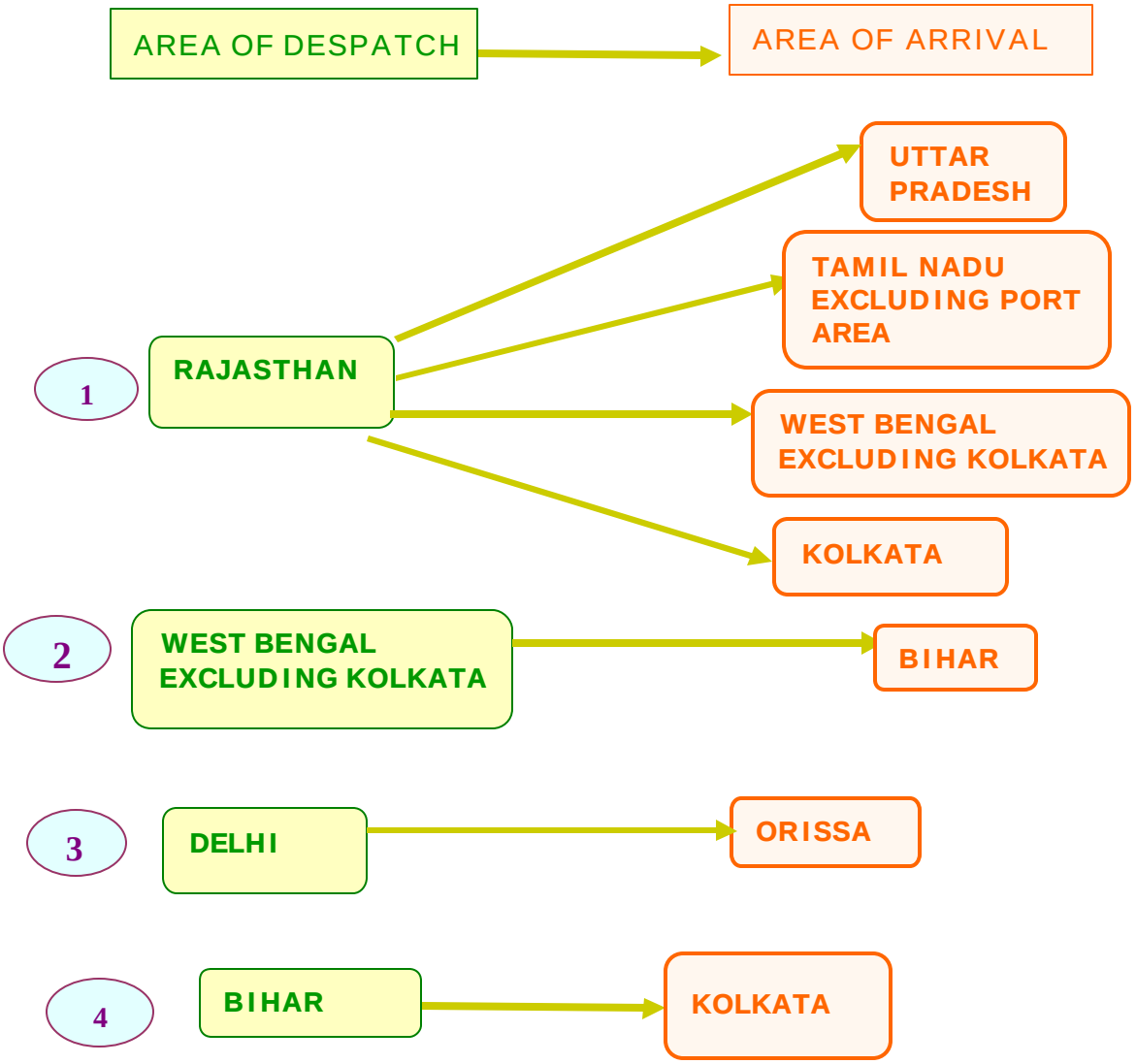
Trend of despatches of mustard-rapeseed during 1998 - 1999:



[Source: Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata**]**

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Trend of despatches of mustard -rapeseed during 1999-2000:

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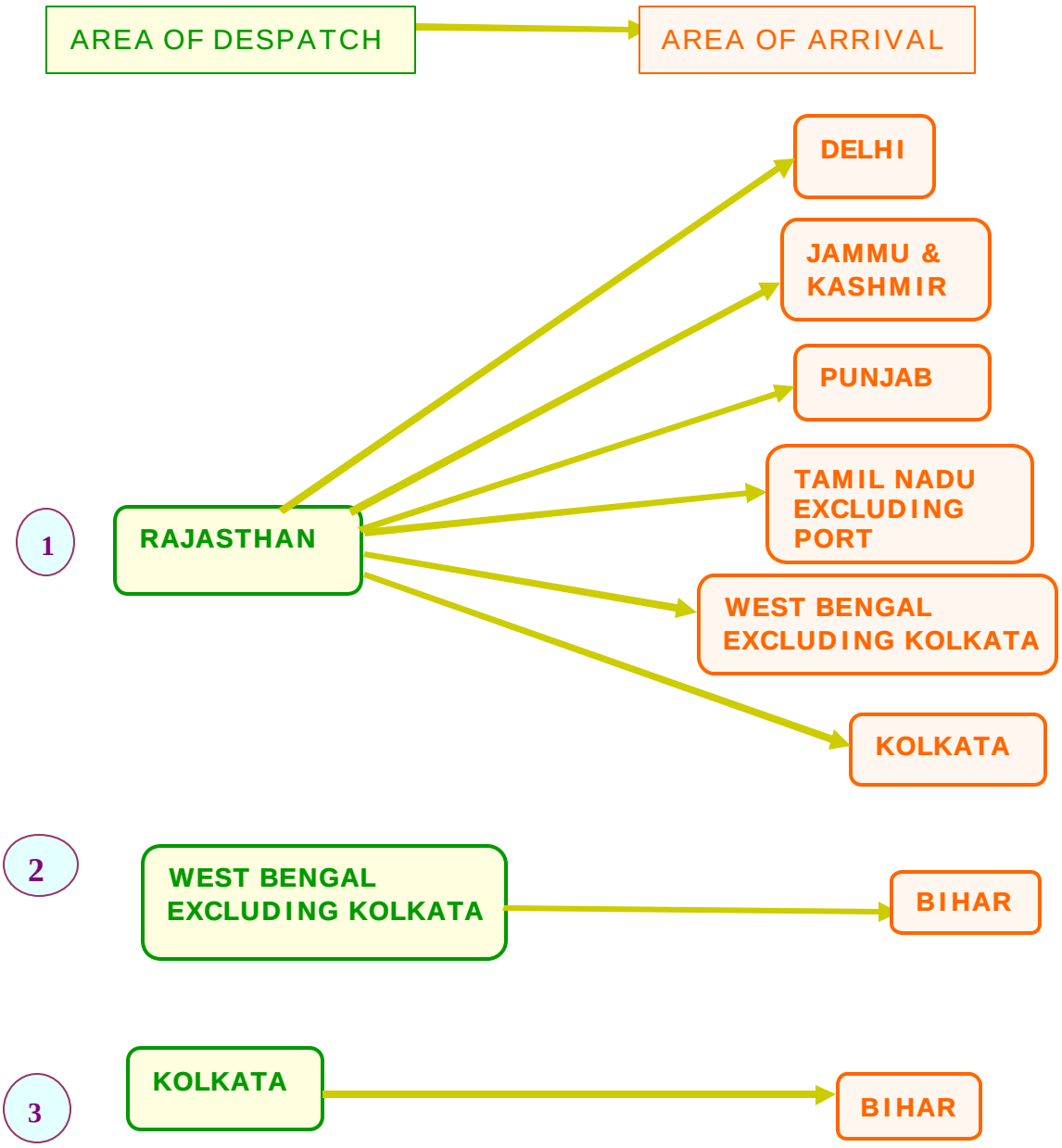

[Source: Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata**]**

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4.2 Distribution:

The following agencies are involved in the distribution of mustard –rapeseed:

(A) Producer

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(B) Itinerant merchants
(C) Commission agents
(D) Representatives of oil mills
(E) Representatives of co-operatives
(F) Wholesalers

4.2.1 Inter state movements:

The transport of mustard –rapeseed takes places by rail, road and river. The is no coastal steamer transport of the seeds of mustard-rapeseed. Apart from the rail and river borne trade, considerable quantity of mustard-rapeseed are transported by road, mostly by trucks. Road transport has been increasing and getting popular day by day. The despatches from Rajasthan to Kolkata were increased to 7015 quintals during 1999-2000 from 1982 quintals during 1998-1999. Among the surplus states, Rajasthan is most important from where the seeds of mustard-rapeseed were despatched to states like Punjab, U.P., Delhi, West Bengal, Tamil Nadu etc. The movement of mustard-rapeseed from surplus state continues throughout the year but they are in peak immediately after harvest i.e March-June in case of sarson and rail and Jan-April incase of toria. As the toria is harvested eartier than sarson and rai.

The interstate movements of mustard-rapeseed during different years are given in Table no- XV & XVI .

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Table no. -XV

Inter-state movement of mustard - rapeseed by rail, river and air during 1998 -1999 (Quantity in quintals)

Sl.No.	Despatched from	Despatched to	Quantity despatched	Total quantity despatched from State / Area.	Grand Total
1.	Bihar	West Bengal – Kolkata	8014	8014	127883
2.	Delhi	Orissa	540	540	
3.	Rajasthan	West Bengal – Kolkata	1982		
4.	Rajasthan	Tamilnadu excluding PORT	83		
5.	Rajasthan	Uttar Pradesh	66780		
6.	Rajasthan	West Bengal excluding Kolkata	1204	70049	
7.	West Bengal excluding Kolkata	Bihar	49280	49280	

[Source: Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata]

Table no. - XVI

Inter-state movement of mustard - rapeseed by rail, river and air during 1999-2000(Quantity in quintals)

Sl.No.	Despatched	Despatched to	Quantity	Total quantity	Grand

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	from		despatched	despatched from State/Area.	Total
1.	Rajasthan	Delhi	470		
2.	Rajasthan	Jammu & Kashmir	56		
3.	Rajasthan	Punjab	756		
4.	Rajasthan	TamilNadu excluding Port	690		
5.	Rajasthan	West Bengal excluding Kolkata	2561		742868
6.	Rajasthan	Kolkata	7015	11548	
7.	West Bengal excluding Kolkata	Bihar	413290	413290	
8.	Kolkata	Bihar	318030	318030	

[Source: Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata]

4.3 Export and Import:

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❒ Export:

India is exporting a number of oilseeds among which the quantity of mustard - rapeseed is not very high and the Govt. has adopted certain short and long-term policy measures to enhance oilseed export. Besides common mustard seeds and rape/ colza seeds, the other items like low level erucic acid varieties of mustard seeds and cakes have good export potential. Quality control through pre-shipment inspection, development of port, research & development, extension programmes, phytosanitary measures essential are critical parameters for securing export market . The quantities of mustard seeds and rape/colza seeds exported from India are given in following table :

Table no.-XVII

Quantity of mustard- rapeseed exported during 1998-99 to 2001-2002

Sl.no	Commodity	Year	Quantity in tonnes	Exported to
1	Mustard Seeds	1998-99	314,970	Australia, Canada, Germany , Japan, Kuwait, Mauritius Nepal, Pakistan, Sri Lanka, U.K., Japan.
	Rape/Colza seeds	1998-99	108,000	
2.	Mustard Seeds	1999-00	747,738	Australia, France, Kenya, Kuwait, Mauritius, Nepal, Netherlands, Oman Singapore, South Africa, Spain, Sri Lanka, USA, Yemen Republic
3.	Mustard Seeds	2000-01	229,950	Bahrain, Canada, France, Germany, Israel, Kenya, Maldives, Mauritius, Nepal, Netherlands, Norway, Singapore South Africa, Sudan, Trinidad.
	Rape/ Colza Seeds	2000-01	510,000	Japan, Malaysia.
4.	Mustard Seeds	2001-02	7281,907	Australia, Bahrain, Belgium, Brazil, Canada, Chile, Czech Republic, Denmark, France, Germany, Greece, Hong Kong, Hungary, Israel, Japan,

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	Rape/Colza seeds 2001-02 5810,000	Kenya, Kuwait, Malaysia, , Mauritius, Nepal, Netherlands, New Zealand, Norway, Poland, Saudi Arab, Singapore, South Africa, Sri Lanka, Turkey, USA, UAE. Taiwan, Korea, Oman, Singapore, Sri Lanka, U.A.E, U.K

[**Source:** Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata]

❒ **Import:** In order to regulate and prohibit the import of agricultural articles in India, the Ministry of Agriculture, Govt. of India had issued new quarantine rules on 18th November, 2003. By this order, permit for import has come into effect from 1st Jan, 2004.
In this order, no consignment of plants and plant products and other regulated articles can be imported into India without a valid permit. The import permit issued is valid for six months from the date of issue and it is valid for successive shipments provided that the exporter and importer, bill of entry, country of origin and phytosanitary certificate should be same for entire consignment. For importing 10 per cent extra quantity mentioned in import permit, an additional inspection fee and import permit fee is charged. Commercial import of consignments of oilseeds is only permitted by the recommendations of EXIM Committee of Department of Agriculture and Co-operation, Govt. of India. As per import policy of Govt. of India, the import of mustard seed, rape/colza seed has been made free. The import duty on mustard seeds, rape/colza seeds levied at the rate of 30 per cent (Basic) with 4 per cent Special Additional Duty (S.A.D). The quantities of mustard-rapeseed imports by India are given in Table no.- XVIII.

Table no. - XVIII

Quantities of mustard - rapeseed imported during 1998-1999 to 2001-2002

Sl. no	Commodity	Year	Quantity in tonnes	Imported from
1.	Mustard Seeds Rape/Colza seeds	1998-99 1998-99	618,307 3,925	Canada Canada
2.	Mustard Seeds Rape/Colza seeds	1999-00 1999-00	1590,764 57,000	Canada Australia
3.	Mustard Seeds	2000-01	1488,854	Canada, Netherlands
4.	Mustard Seeds	2001-02	2632,733	Canada, Germany, Netherlands, U.S.A.

[**Source:** Director General of Commercial Intelligence & Statistics (DGCIS) , Kolkata]

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4.3.1 Sanitary and Phytosanitary requirements: The Agreement on the application of the Sanitary and Phytosanitary (SPS) measures is an integral part of export trade, GATT (1994). Under SPS Agreement, the standards should be such that the minimum level of protection required by an importing country may be attained. With this view, the agreement to set up international standards and guidelines under the aegis of Codex Alimentaries Commission (CODEX) which was set up in 1963 by Food and Agriculture Organisation(FAO) and World Health Organisation (WHO) to develop food standards, lay down guidelines and related texts such as codes of practice under the Joint FAO / WHO Food Standards Programme. The main purpose of this programme are protecting health of the consumers and ensuring fair trade practices in the food trade, and to promote coordination of all food standards work undertaken by international governmental and non-governmental organizations.

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The SPS measure is applied in various ways to protect animal and plant life or health within the territory of the member countries from risk arising from --

⇨ The entry, establishment or spread of pest, disease or any disease causal organisms.

⇨ The additives, contaminants, toxins or disease causing organisms on food stuffs.

⇨ The disease carried by animals, plants or their products.

By Sanitary and Phytosanitary (SPS) Agreement, the signatory country can lay down rules and regulations for the protection of life and health of human beings. The signatory country is allowed to maintain a higher level of SPS protection than the international standards provided it conforms to the following basic principles:-

i) The SPS measure should not lead distortion in trade.

ii) The SPS measure should not create any barrier in trade.

ii) The SPS measure should also conform to scientific principles and standards accepted internationally.

Under SPS measure, the standard should be applied in such a way that a minimum level of protection can be achieved by importing country.

? During export, in order to make the plant/seeds free from any quarantine pests and diseases, the exporter should give a dis-infection treatment by keeping the viability of the plant/seeds unaffected.

The dis-infection treatment before shipment should be carried out by authorized expert/technical personnel since the above process is hazardous. To assure the pest free product, the dis-infection treatment should be done just before shipment of produce.

In this process, the exporter has to apply to the officer in-charge for Phyto Sanitary Certificate (PSC) in the prescribed form at least 7 – 10 days in advance of the export. Before submitting the application for PSC, it is to be ensured that the cargo is treated properly by any licensed PCO to avoid any last minute detention by the P.Q. authority who is authorized to issue P.S.C.

? During import, no consignment of agricultural products is permitted to be imported without Phytosanitary Certificate, issued by authorised officer in-charge of Department of Agriculture and Co-operation.

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4.3.2 Procedures for export: The exporter may follow the following points during the export of seeds of mustard-rapeseed:

☞ Export procedure has been simplified under Open General Licence (OGL), and there is no licence or restrictions is imposed. Generally, the buyers have to mention the quality in the contract. Accordingly, the exporter has to approach the recognised laboratories with samples to carry out the formalities of sample analysis for export.

☞ Product is then to be shifted to ports.

☞ Marine insurance cover is to be obtained from any insurance agency.

☞ Contact clearing and forwarding (C&F) agent for sorting of goods in godowns. They collect the shipping bill for allowing shipment by custom authority.

☞ Shipping bill is to be submitted by C&F agent to custom houses for verification.

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☞ Verified shipping bill is given to Shed Superintendent by C&F agent and carting order is to be obtained.

☞ The C&F agent presents shipping bill to the Preventive Officer for loading in to the ship.

☞ After loading, a mate receipt is to be issued by the Captain of the ship to the Superintendent of the port who calculates the port charges and collect the same from C&F agent.

☞ After that payment is made, the mate receipt is obtained from the port authority to prepare bill of loading for the respective exporter.

☞ Then the C&F agent sends the bill of loading to the respective exporter.

☞ After receiving the documents, the exporter obtains a certificate of origin from chamber of commerce i e the goods are of Indian origin.

☞ Exporter informs the importer regarding the date of shipment, name of vessel, bill of loading, customer's invoice, packing list etc.

☞ The exporter for verification of documents submits all papers to the concerned bank.

☞ Bank sends documents to the foreign importer to enable him to take delivery of goods.

☞ After receiving papers, importer makes payment through bank and also sends documents called GR Form to RBI.

☞ Then exporter applies for various benefits from duty drawback schemes.

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4.4 Marketing constraints:

I) Due to week financial position, farmers generally resort to sell their produce just after harvesting resulting in glut in the market and slump in prices. Because farmers face the difficulty of inadequate storage facility and high storage charges to store their produce. Farmers can avoid this paradoxical situation by postponing the sale of mustard - rapeseed during peak season to mid / lean season if they avail the proper storage facilities of their produce. For this purpose, they should avail the facility of centrally sponsored "Gramin Bhandaran Yojona" scheme rural godowns at village level.

II) Lack of regular flow of up-to-date market information.
Farmers can get such information regularly from Radio, T.V. bulletins, concerned APMC Offices, websites of different organisations namely AGMARK, SEA, etc. There is a strong need to promote direct /contract marketing.

III) Large number of middlemen.

Farmers can avail the facilities to market their produce direct to the agencies like NAFED, Oilseeds Co-operatives etc. to get better return of produce.

IV) Lack of systematic grading procedure at producer's level.

The farmers / small traders and other agencies involved in marketing should follow the grade standards formulated by DMI for mustard seeds under AGMARK.

V) Procurement of mustard - rapeseed be undertaken on the basis of oil content which would protect the interest of the farmers .

VI) More modern processing plants should be established around the major producing regions / areas for higher extraction of oil.

VII) Lack of post harvest management services and out-dated processing technology. There is paramount need to provide an efficient post harvest management service to farmers for qualitative-cum-quantitative preservation of quality.

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5.0 MARKETING CHANNELS, COSTS AND MARGINS

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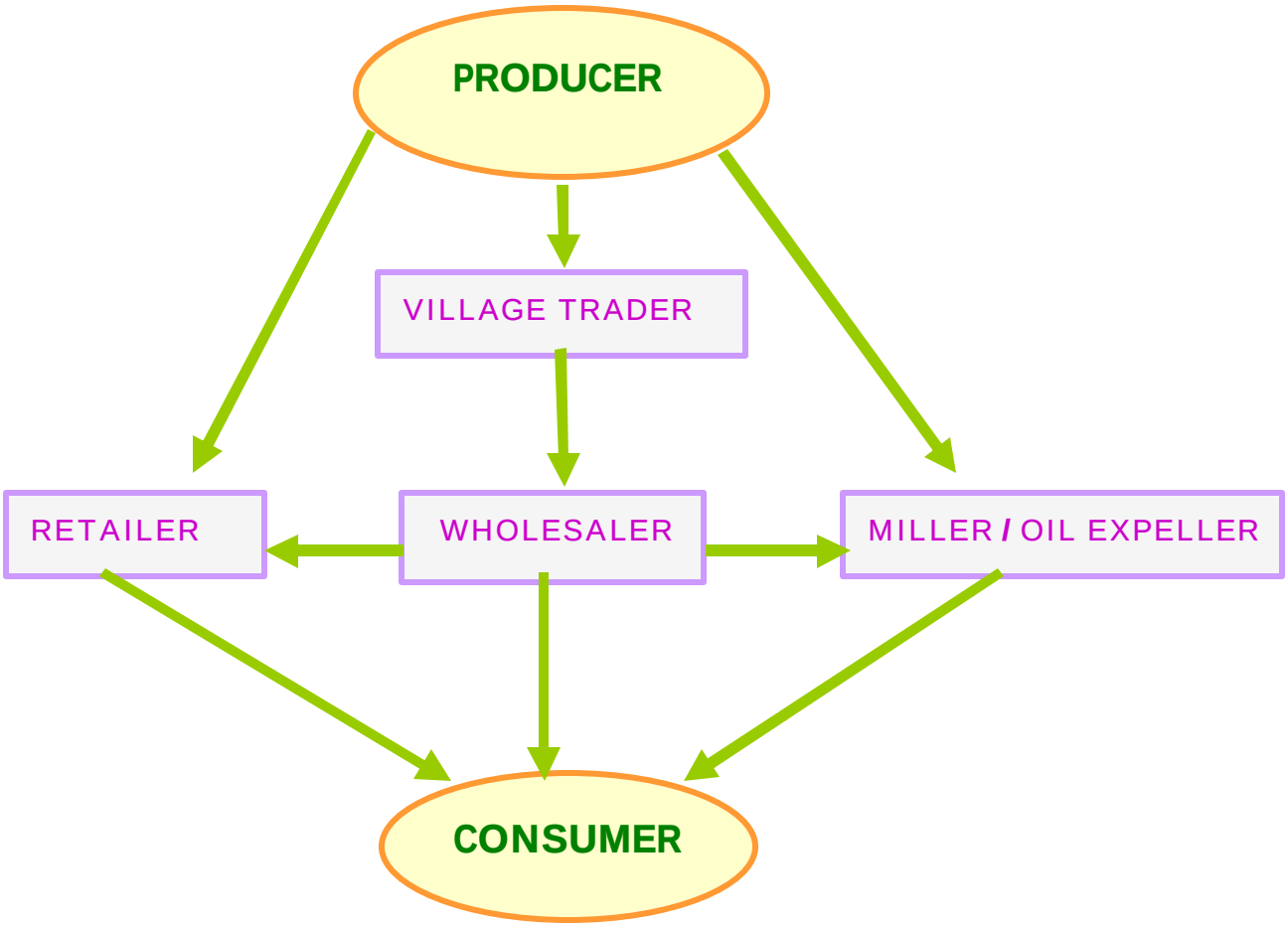
5.1 Marketing channels:

I) Private: The different private agencies such as village trader, wholesaler, oil miller, retailer are involved in the route of marketing channel of mustard - rapeseed as depicted below.

1) Producer ➔ Retailer ➔ Consumer
2) Producer ➔ Village Trader ➔ Wholesaler ➔ Retailer ➔ Consumer
3) Producer ➔ Village Trader ➔ Wholesaler ➔ Consumer
4) Producer ➔ Village Trader ➔ Wholesaler ➔ Miller/Oil Expeller ➔ Consumer
5) Producer ➔ Miller/Oil Expeller ➔ Consumer

However, it can be shown diagrammatically as below:



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II) Institutional: Due to sensitiveness of oilseeds crops in the market, some institutions have been entrusted with the marketing activities of oilseeds like mustard - rapeseed, namely National Agricultural Co-operative Marketing Federation (NAFED), Oilseeds co -operatives under apex organization National Dairy Development Board (NDDB) and different state govt. agencies. NAFED is entrusted as a nodal agency for procuring oilseeds like mustard - rapeseed by the way of providing Minimum Support Prices (MSP) to the farmers for their produce.

The different institutions involved in mustard – rapeseed marketing channel are as follows:

1) Producer ➔ Different State Govt. Agencies ➔ Retailer ➔ Consumer
2) Producer ➔ NAFED ➔ Retailer ➔ Consumer
3) Producer ➔ Oilseeds Co-operatives under apex organisation N.D.D.B. ➔ Retailer ➔ Consumer

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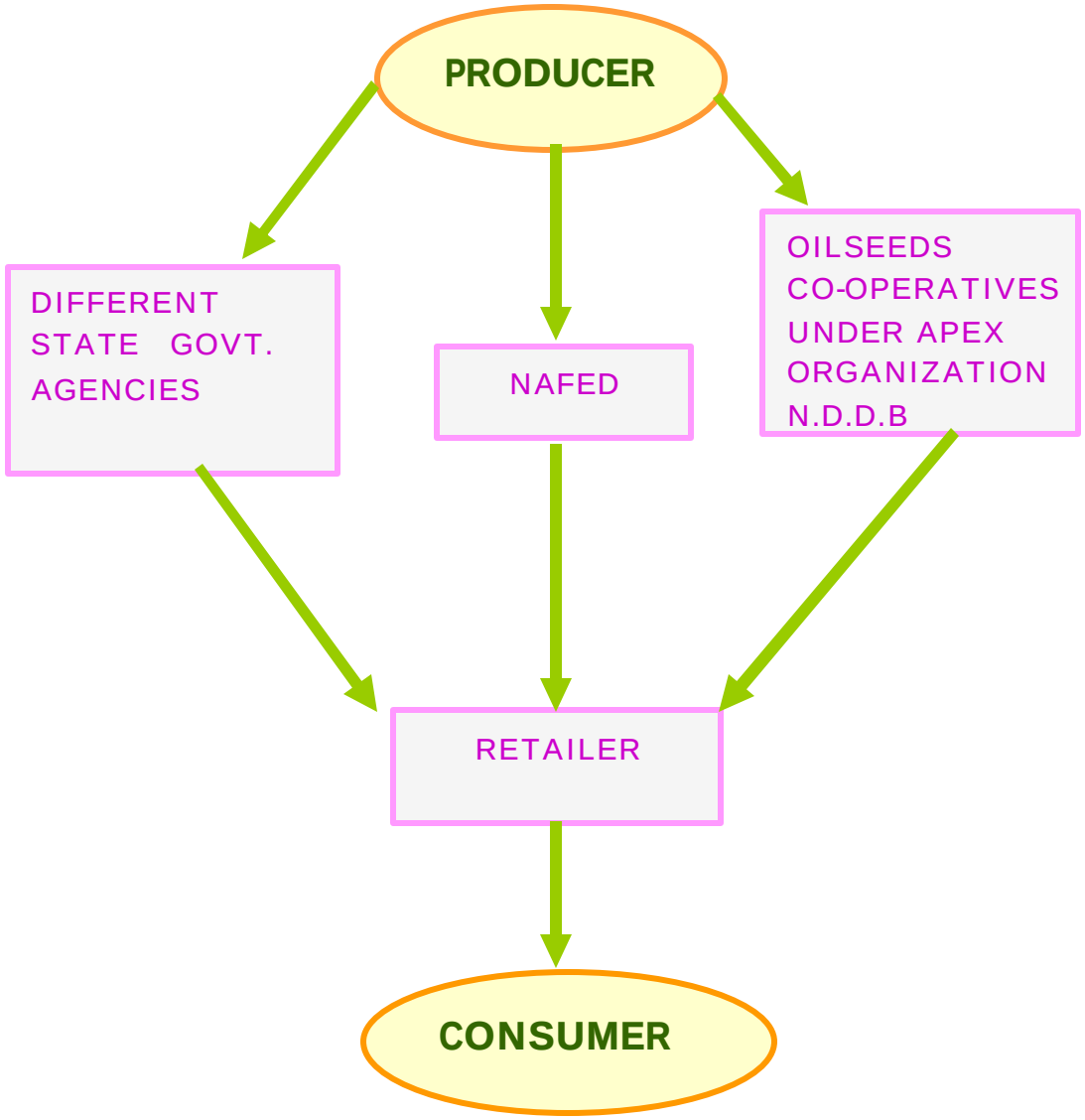
However, diagrammatically, it can be shown as under:



5.2 Marketing costs and margins:

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❒ **Marketing costs**: Marketing costs are the actual expenses required for bringing mustard-rapeseed from farm gate to the consumers. It includes the following:

- ✔ Handling charges at local points
- ✔ Assembling charges
- ✔ Transportation and storage costs
- ✔ Handling by wholesaler's and retailer charges to consumers
- ✔ Expenses on secondary services like financing, risk taking and market intelligence
- ✔ Profit margins taken out by different agencies.

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Marketing costs are incurred by the farmers and traders in regulated markets where mustard - rapeseed are sold:

I) Market fee: It is collected from buyers and not from sellers. The rates of market fees are determined by respective Agricultural Produce Market Committees in some states like Gujarat, Maharashtra while in most of the states these are fixed for the entire state under the respective State Marketing Regulation Acts.

Rajasthan	-	1.6 per cent
M.P.	-	2.0 per cent
U.P.	-	2.0 per cent
Gujarat	-	0.5 per cent
Haryana	-	2.0 per cent

ii) Commission charges: In some regulated markets, the commission agents exist and they collect the charges, which vary from 2 per cent to 2.5 per cent.

iii) Taxes : Though some states have exempted food grains, pulses and oilseeds from sales tax, some other states have imposed the sales tax ranging from 2per cent to 4per cent of sale value which is collected from buyers.

iv) Market charges : These are the charges, which are incurred towards loading, unloading, weighing, brokerage, cleaning, etc. These charges are fixed by the market committee and vary from market to market. The operational charges starting from unloading , cleaning, lot making for sale and sometimes weighments are borne by farmers /sellers . From weighing, the subsequent operational charges are borne by the buyers/ traders. In case of some regulated markets, entry fee is charged for the vehicle.

The incidence of state-wise market charges and taxation are furnished in the Table no.-XIX.

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Table no. - XIX

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Market fee, commission charges, taxes and miscellaneous charges for mustard – rapeseed in different states.

Sl. No	Name of State	Payable by Farmers(Sellers) / Traders(Buyers)		Payable by Traders/Others		Payable by Traders (Buyer)	
		Market Charges (Rupees Per Unit)	Commi-ssion Charges	License fee per annum	Market Fee	Sales Tax	Octroi
1)	Rajasthan	Unloading – 0.5 to 1 Broker – 2 Hamal – 1 to 4 Cleaning - 1 to 2 Weighing — 1 to 2	2 per cent	Traders – 200/- Commission Agent- 200/-	1.6 per cent	2 per cent	Nil
2)	Uttar Pradesh	Unloading – 0.20/Qtl. Cleaning – 0.60/Qtl. Lotmaking– 0.20/Qtl. Weighing — 0.50 /Qtl	1.5 per cent	Traders– 250/- Transport Agency- 200/- Oil millers - 150/- Retailers -100/-	2.0 per cent +0.5percent as Developmental charges = 2.5per cent	4 per cent	Nil
3)	Haryana	Unloading–0.70 for 85kg. Unit Cleaning (Manual) - 1.15 Cleaning (Machine)-1.50 Weighing —0.57 /Qtl	2.5 per cent	Big Traders - 60/- Oil miller- 100/- Retailer- 20/-	1-2 per cent	4 per cent	Nil
4)	West Bengal	Unloading] No fixed Cleaning] rate, varies Brokers] as per local Hamal] charges Weighing]	No fixed rate	Traders – 150/- Commission Agents- 200/-	1 per cent	N/A	Nil
5)	Madhya Pradesh	Unloading] No fixed Cleaning] rate, it Brokers] varies Hamal] in different Weighing] markets	2 per cent	Traders– 1000/- Processor - 1000	2 per cent	N/A	Nil
6)	Punjab	Unloading] Cleaning] Brokers] No Hamal] fixed Weighing] rate	2 per cent	Rupees-100 (under revision for 3 years)	2 per cent	4 per cent	Nil
7)	Assam	Unloading] Rs- 1/- to 5/- Cleaning] varies Brokers] from Hamal] market Weighing] to market.	Nil	Trader – 10/-	1 per cent	2 per cent	Nil
8)	Delhi	Unloading – 0.90/bag Cleaning - 0.40/bag Brokers - Nil Hamal - Nil Weighing - 0.70/bag Unloading – 2.5	Not available	Trader –100/-	1 per cent	3 per cent	Nil

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9)	Gujarat	Broker - 6 Hamal - 1/bag Cleaning - Nil Weighing - 1 to 2.5 depending upon bag weight.	1.0 percent	Commission Agent - 100/- Traders – 75	0.5 - 0.6 per cent	Nil	Nil

Source : Regional and sub-offices of Directorate of Marketing & Inspection (DMI) ,Govt. of India.

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❒ **Marketing Margins:** The marketing margins of mustard-rapeseed are the difference between the actual price paid by the consumer and the price received by the farmer for an equivalent quantity of mustard-rapeseed. It may be explained in terms of price spread applied for a particular situation. Studies on marketing margins and price spread reveal that as the number of market functionaries increases, they add cost to the commodity in the marketing channel, which results in the fall of producer's share in consumer's rupee.

A brief description of the study on price spread for mustard-rapeseed regarding a particular area of Punjab is summed up in Table no.- XX.

Table no. - XX

Price spread (rupees in quintal) in different marketing channel of mustard- rapeseed in Mansa market of Punjab (1995-96)

Particulars	Channels	
	Channel-I	Channel-II
Net price at the producer level	1050.00 (81.11)	1080.00 (90.86)
Cost of producer -		
1. Transportation		
2. Octroi	--	8.28
3. Unloading and cleaning charges	--	1.68
	--	1.55
Total	--	11.51(0.97)
Village Merchant's share		
Cost of village merchant	50.45 (3.90)	--
(Same as that of Producer)	11.51 (0.89)	--
Share of the wholesaler		
Cost of wholesaler	83.61(6.46)	--
1. Commission	16.68	---
2. Market fee	22.24	--
3.Rural Development Fund	11.12	--
4. Filling and weighing charges.	1.16	--
5. Sewing and sutli charges	0.65	
6. Transportation and stacking charges	2.50	--
		--
Total	54.35 (4.20)	

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Miller/Consumer purchase price	1249.92 (96.56)	1091.51(91.83)
Cost of miller		
1.Commission	--	16.37
2.Market fee	--	21.83
3.Rural Development Fund	--	10.91
4.Sales tax.	44.48	43.66
5.Filling and weighing charges	--	1.16
6.Sewing and sutli charges	--	0.65
7.Transportation and stacking charges	--	2.50
Total	44.48 (3.44)	97.08 (8.17)
Net price of miller/consumer	1294.40 (100.00)	1188.59 (100.00)
Total cost	110.34 (8.53)	108.59 (9.14)

Figures in the brackets indicate the percentage share in consumer's rupee

Channel – I: Producer → Village merchant →Wholesaler → Miller.
Channel-II : Producer → Miller (Consumer).

In the above table, it is seen that the percentage of producer's share varied from 81.11 per cent in channel- I to 90.86 per cent in channel-II. It means that price spread is minimum (9.14per cent) when the miller directly purchases oilseeds from the producer and it is maximum (19.89 per cent), when the oilseeds are sold through village merchant.

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After purchasing the seeds of mustard - rapeseed from the producers, the village merchant sold it to the wholesaler. The total marketing and incidental charges incurred by village merchant were Rupees 11.51 per quintal , 0.89 per cent share of consumer rupee as can be seen from channel – I.

The total expenses incurred by the wholesalers included the expenditure of loading, unloading, sieving, filling charges, sales tax, market fee, commission which were Rupees 54.35 per quintal i.e., 4.20 per cent in Channel–I. The total costs incurred by miller was Rupees 44.38 (i.e. 3.44 percent share in consumer rupee) in Channel - I and Rupees 97.08 (i.e., 8.17 percent share in consumer rupee) in Channel–II.

From the above case study of price spread of mustard - rapeseed, it is evident that the direct marketing of oilseeds by producers to consumers is preferable and profitable.

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6.0 MARKETING INFORMATION AND EXTENSION

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❒ Marketing information:

Agricultural Marketing Information comprises of collection, analysis and compilation of agricultural marketing related information as well as dissemination of right information to the people in need, at right place, at right time and in right form. In a marketing system, market information is an important function which facilitates the marketing decisions and regulates the competitive market processes and mechanisms. It is helpful to the farmers for planning, production and marketing of their commodities. It is also the key to achieve operational and pricing efficiency in a marketing system. In the present context of global agricultural scenario, the small and marginal oilseeds farmers should change the habit of traditional farming to modern market / export oriented farming by improving the quality and productivity of the produce.

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Farmers / traders/ processors should reorient their mustard - rapeseed enterprises by using facilities of market information and information technology (I.T)for the following purposes :

- Planning for market oriented production of mustard - rapeseed.
- Preparation of produce for marketing.
- Adoption of modern storage techniques of mustard -rapeseed.
- Availing suitable transport facilities for mustard - rapeseed.
- Availing market intelligence for remunerative prices of mustard - rapeseed.

For effective dissemination of market-led information, almost all the state / U.T. Govt. organisations have some activities for the benefit of the producers, traders, millers, exporters and consumers, which are of conventional nature. Hence, to improve this entire system ,Govt. of India started “Market Research and Information Net work” (MRIN) Scheme through the Directorate of Marketing and Inspection (DMI) and its website i.e., AGMARKNET. Besides , there are also other organizations involved in the dissemination of market information of agricultural commodities.

❒ Marketing extension:

Marketing extension is a tool to educate the farmers, traders, consumers and other beneficiaries regarding the latest knowledge on post harvest management, marketing, value addition, and exploring new market opportunities. It aims to bring desired changes in their skill, attitude and behaviour towards post harvest management and marketing practices of agricultural produce. In the present context of globalisation of agricultural trade, it is essential to grow awareness among the producers and other beneficiaries regarding proper harvesting, grading packaging, transportation, storage, maintaining proper quality standards, Sanitary-Phytosanitary requirements, etc.

Functions of marketing extension for oilseeds

- To provide up-to-date information on the price and arrivals of mustard - rapeseed .
- To orient producers/traders about price trends, demand, supply position, etc.
- To guide the producers/farmers about when, where and how to market the produce.
- To educate farmers about different aspects of post harvest management.
- To guide the farmers about benefits of direct / contract marketing and future trading.

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Table no. – XXI

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List of Govt. and Semi Govt. organisations providing the services on marketing information and extension

Sl. no.	Organisation & it's website	Services provided
1.	**Directorate of Marketing & Inspection (DMI) , C.G.O Complex, Faridabad. website: www.agmarknet.nic.in .**	? It is at present implementing a plan scheme i.e. 'Market Research and Information Network'(MRIN) through NIC for establishing a network for speedy collection and dissemination of market information for it's effective utilization. Under the scheme, important agricultural markets, state agricultural marketing boards/departments are being linked through computerized internet services. Under this scheme, DMI has also created a website namely, AGMARKNET . By this website, the user or beneficiary may collect the detailed information on various aspects of agricultural commodities including mustard. ? Publishes journal, bulletin on Agricultural Marketing . ? Marketing extension
2.	**Directorate of Economics and Statistics, Ministry of Agriculture, Shastri Bhawan, New Delhi Website: www.agricoop.nic.in**	? Compilation of statistical data on agricultural commodities for planning and development. ? Dissemination of data/information on agriculture through publication and internet.
3.	**Director General of Commercial Intelligence and Statistics (D.G.C.I.S) 1, Old Court House Street, Kolkata-700 001**	? Collection, compilation and dissemination of marketing related data i.e., export, import and inter-state movement on agricultural commodities.
4.	**Central Warehousing Corporation (CWC), Hauz Khas, New Delhi-110016 Website: www.fieo.com/cwc**	? To promote Farmer's Extension Service (FESS) with the following objectives:- ➢To educate farmers about the benefits of scientific public warehouses for agro commodities. ➢Demonstration of spraying and fumigation to control storage pests of agro commodities. ➢Orientation about the facility of getting loans from banks against pledge of warehouse receipts.
5.	**Agricultural Produce Market Committees (APMCs) of regulated markets of different states.**	? Providing market information on arrivals, prevailing prices at different markets through display boards, public address system, etc. ? Providing information of other markets . ? Organising training programmes, tours, exhibitions for farmers and other beneficiaries.

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6.	**State Agricultural Marketing Departments/Directorates at State Capitals.**	? Provide agricultural marketing related information. ? Arranging publicity programme through demonstration, farmers' meetings etc. ? Dissemination of information through literature, Radio and T.V. Programmes
7.	**State Agricultural Marketing Boards at State Capitals.**	? Providing market related information by coordinating all market committees in the state. ? Arranging training facilities to farmers and other beneficiaries. ? Organising seminars, workshops and exhibitions on agricultural marketing.
8.	**Akashvani Kendras of New Delhi/ State capitals/ other cities**	? Broadcast programmes to disseminate the marketing information on agriculture.
9.	**Doordarshan Kendras of New Delhi/ / State capitals/ other cities**	? Telecast programmes to disseminate marketing information on agriculture.

❒ Kisan call centre:

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The Deptt. Of Agriculture & Cooperation (DAC), Ministry of Agriculture, Govt.of India launched Kisan Call Centres on January 21st,2004 throughout the country. It has the objective of affording instant solution to the problems faced by the farmers during crop cultivation under diverse challenging situations and facilitating their full comprehension by the use of local language. The call centres are acting as composite help centres which consist of a complex tele-communication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by farmers instantly in local languages. The subject matter specialists using telephone & computer are used to interact with farmers to understand their problems and answer their queries as soon as possible. This is a new dimension in agriculture extension management which makes the full use of on-going information and communication revolution by connecting the farming community in the remotest areas of the country with the experts of agricultural field. By tackling the difficulties of the farmers, a close linkage can be established among the key stakeholders in extension system – agricultural scientist, extension functionaries, farmers and marketing agencies.

Mustard-rapeseed farmers can avail this facility through a nationwide toll free number - 1551.

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7.0 ALTERNATIVE SYSTEM OF MARKETING

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7.1 Direct marketing: The direct marketing system enables the farmers to meet the specific demand of wholesalers, traders, consumers according to their preferences from the farmers inventory of graded and certified produce on one hand and on other hand helps the farmers to take advantage of favourable prices. This system encourages the farmers to undertake sorting, grading and quality marking at their farms. This model has been introduced in Punjab (APNI MANDI), and in Andhra Pradesh (RYTHU BAZARS), for fruits and vegetables. Concerted efforts are now being made to introduce this system in other agricultural commodities also.

7.2 Contract marketing: Contract Marketing is a type of agricultural marketing, wherein the perspective buyer or any trading / processing agency enters into a contract with the farmer and promises to purchase the farmer's produce under pre-negotiated prices and conditions. In this type of marketing, the trading / processing agency supports the farmers through inputs and other technical support and the farmers can get the established market at a fixed price. By entering in this type of contract, farmers do not require to rely on middleman and avoid risk of price also. In the present context of economic liberalisation and global scenario, contract marketing opens up the venues to adopt new technologies and access to the global markets.

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Table no. – XXII
Benefits / opportunities of contract marketing

Types of benefits / opportunities	To farmer / producer	To contracting agency
1) Access	Access to inputs	Access to required quality of produce.
2) Risk	Minimises price risk	Minimises risk of scarcity of consistent supply of raw materials
3) Quality	Use of good quality of inputs like seeds, fertilizers.	Getting supply of desirable quality supply of produce.
4) New skills of post harvest handling /practices.	Facilitates the adoption of new skills of post harvest handling/practices at low cost.	Adopt more efficient and better post harvest handling /practices.
5)Mutual Relationship	Strengthen long term relationship with buyer for mutual interests.	Strengthen long term relationship with farmer for mutual interest.
6) Profit	Increases	Increases.

As for example, the multi crop, multi year contract farming/ marketing scheme launched by 'Punjab Agro Foodgrains Corporation Ltd.'(PAFC)[a subsidiary of 'Punjab Agro Industries Corporation Ltd' (PAIC)] in which contract farming/marketing of Hyola(a hybrid canola quality mustard-rapeseed variety) was initiated during 2002-2003. In the crop diversification programme for Hyola, the response of the farmers is noticed as very encouraging in Punjab. The Punjab Agro Foodgrains Corporation was declared by NAFED as a nodal agency to procure Hyola in Punjab from contracted growers. The farmers are free to sells their produce in any market and to any agency / parson. If the price is below in the open market, then the Punjab Agro Foodgrains Corporation purchase their commodity at support price.

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The contract farming / marketing target plan for hyola for the period between 2004 to 2007 is taken as follows :

Crop	Year	Target plan in acres
Hyola	2004	2,00000
	2005	3,00000
	2006	4,00000
	2007	5,00000

SOURCE : www.punjabenvioronment.com/agriculture_sustain.htm

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7.3 Co-operative marketing: The Co-operative marketing is the system by which a group of farmers join together to carry on some or all the processes involved in bringing goods from producer to consumer. In other words, it is the association of cultivators / farmers for the purpose of helping them to market their produce in a more profitable way than private trade system.

Functioning: The members of an oilseed co-operative society sell their surplus produce to the society. When they supply their produce to the society they get an advance for their produce. After collecting the produce of the member, the society either processes it or sells it in the mandies or to the millers. Sometimes, considering the unfavourable prices at prevailing market, the society store the oilseeds and sell later at favourable price. As soon as the produce is sold, the society makes payment to the farmer. Thus, the co-operatives play a key role in the agricultural marketing process as they protect the farmer from exploitation of middlemen and secure better returns for their produce. For example., the **Rajasthan State Co-operative Oilseeds Growers Federation Ltd**. provides technical inputs to the mustard - rapeseed growers and purchase the oilseeds at open market price and process it. After marketing of final produce, the price difference is given to farmers in proportion to their produce.

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Different levels of co-operative organisation for mustard - rapeseed marketing

1) National – **National Agricultural Co-operative Marketing Federation (NAFED)**
2) State - **State Oilseeds Growers Federation Ltd.**
3) District - **District Oilseeds Growers Co-operatives.**
4) Village - **Village Oilseeds Growers Society.**

Besides, there are other organisations like **National Co-operative Development Corporation (NCDC)** which operates assistance scheme for promotion of co-operative marketing

Among above co-operative organisations, NAFED is a well known organisation because it functions as the national apex body of the co-operative marketing system in co-ordination with State level Marketing Federations, Regional and District level co-operative societies. NAFED was established with a aim to promote co-operative marketing of agricultural produce and to ensure the farmers to get ready market as well as remunerative price for their produce. In order to protect the farmers from steep fall in prices in market, the Govt. of India has appointed NAFED as central nodal agency to undertake the procurement operations of commodity like mustard-rapeseed by declaring support prices at every marketing season.

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Procurement of Mustard seeds by NAFED under Price Support System (P.S.S.) during 2000-2001 to 2002-2003

Commodity	Year	Crop season	Minimum Support Price (Rupees per quintal)	Quantity procured (in tonnes)	Value (Rupees in lakhs)
Mustard Seeds	2000-2001	Rabi 2000	1100	2,47956	26956.18
	2001-2002	Rabi 2001	1200	3,29524	39542.80
	2002-2003	Rabi 2002	1300	4,67629	60791.83

Source: Department of Agriculture & Co-operation, Ministry of Agriculture, Govt. of India

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7.4 Forward and future markets: In terms of price discovery and risk management the forward and future markets have been identified as an important tool for price stabilization. Presently, forward and future market system is followed in certain agricultural commodities including mustard.

? **The forward market** supports two economic functions namely price discovery and price risk management which enables the traders and stockist to protect against the risk of adverse fluctuation of prices.. It is governed in India under the Forward Contract Regulation Act 1952, where delivery of goods on payment is not completed within 11 days . During 1999, the Govt. had brought the mustard - rapeseed under the system of forward trading through member of associations by applying Section 15 of the Forward Contracts Act 1952.

? **The future market** facilitates the trading of mustard-rapeseed for the purchase or sale of the oilseeds for future delivery where contracts are made on a future exchange on the basis of standard quality, quantity, delivery time, locations and the price. The Central Govt. determines the policy by which the future trading is to be permitted and recognised for a particular commodity.

The benefits of future trading in commodity future markets

- Price risk management of an agricultural commodity .
- Facilitates production, as per recognised quality standards of produce.
- Acts as a price barometer to farmers and other trade functionaries.
- It benefits indirectly to the exporters / farmers through better information , lower and more stable marketing and processing margins.
- It gives an idea of prices to the consumers which enables them to enter forward contract markets .

Table no.- XXIII

Difference between future and forward contract

Future contract	Forward contract
1) Always through exchange.	1) Need not be through exchange.
2) Contract for range of varieties.	2) Contract for specific variety.
3) High liquidity.	3) No liquidity.
4) Well regulated.	4) Unregulated.
5) Standardised.	5) Negotiated between buyer and seller.
6) Requires margin payment.	6) No margin payment.
7) Follows daily settlement.	7)Settlement occurs at the end of the period.

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Table no. – XXIV

Exchanges for trading of mustard- rapeseed and it's products

Sl. no.	Name of exchange	Commodity traded
1)	Kanpur Commodity Exchange	Mustard -Rapeseed and it's products
2)	National Board of Trade, Indore	Mustard -Rapeseed and it's products
3)	NCDEX(National Commodity & Derivatives Exchange Ltd.)	Mustard -Rapeseed and it's products
4)	Rajadhani Oils & Oilseeds Exchange Ltd., Delhi	Mustard seed, its oil and oil cake
5)	The Chamber of Commerce, Hapur	Mustard seed
6)	Central India Commercial Exchange Ltd., Gwalior	Mustard seed
7)	Bullion Merchants Association, Bikaner	Mustard seed, its oil and oil cake

❒ **Besides above, the in principle approval for trading of mustard seed and its products has undergone to the following Exchanges:**

Sl. no.	Name of the association	Commodity traded
1.	Bullion Merchants Association, Bikaner	Mustard seed, its oil and oil cake

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8.0 INSTITUTIONAL FACILITIES

8.1 Marketing related schemes of Govt. and Public sector organisations:

Some of the schemes of Central Govt and public sector organisations are given in Table no.- XXV which are in operation for benefit of farmers and others.

Table no. - XXV

Sl. no	Scheme	Name of organisation	Facilities of scheme
1)	**Price Support Scheme (PSS)**	National Agricultural Co-operative Marketing Federation Ltd.	? Procurement of oilseeds like mustard - rapeseed under the Price Support Scheme (PSS) when its market price is at or below the declared support price for a particular year.
2)	**Agmark Grading and Standardisation**	Directorate of Marketing and Inspection.	? Grading of agricultural commodities like mustard.
3)	**Gramin Bhandaran Yojana (Rural Godown Scheme)**	Directorate of Marketing and Inspection.	? Construction/renovation/expansion of scientific storage/ godowns for fresh and processed farm produce, prevention of distress sale immediately after harvest by providing facilities of pledged finance.
4)	**Scheme of Procurement**	The Rajasthan State Cooperative Oilseeds Growers Federation Ltd .	? To provide technical inputs and purchase the produce at open market price and process it. After marketing of the final product, the price difference is given to farmer in proportionate to his produce.
5)	**Small Farmers Agribusiness Consortium (SFAC)**	Trade Division, Department of Agriculture and Cooperation, Min of Agri(GOI), New Delhi and Small Farmers Agri-business Consortium (SFAC), New Delhi	? To promote the growth of agriculture and agro industry. ? To promote organizations having domestic and export marketing chains. ? To facilitate the establishment of integrated producers' organizations with forward and backward linkages. ? To organize primary producers in suitable groups to achieve the objective of consortium ? To revive /strengthen local institutions as the instrument of agricultural development. ? To organize various services through public, private and cooperative sector.

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8.2 Institutional credit facilities:

Agricultural credit is disbursed in the form of short term, medium term, long term loans through multi agency network consisting of –

- Commercial Banks (CBs)
- Regional Rural Banks (RRBs)
- Co-operatives

The types of institutional credit facilities which are available for marketing / post harvest operations of agro commodities including rapeseed-mustard are given in the Table no.- XXVI.

Table no.- XXVI
Types of credit facilities

Name of scheme	Eligibility	Facility
1. Produce Marketing Loan Scheme	All the categories of farmers i.e., small / marginal / others are eligible.	This type of loan is given upto 1 lakh against pledge /hypothecation of agricultural produce (including warehouse receipts) for a period not exceeding 6 months.
2. Kishan Credit Card Scheme	All types of agricultural clients having good track record for last two years are eligible.	Kissan credit card is valid for 3 years through which the barrower / farmer can meet his production and other contingency needs by using easy convenient withdrawal slips.The minimum credit limit is Rs.3000/- and based on operational land holding, cropping pattern and scale of finance.
3. Crop Loan	All categories of farmers i.e, Small/Marginal and others are eligible	Provides financial assistance to meet cultivation expenditure for various crops including mustard -rapeseed.
4. Agricultural Term Loans	All categories of farmers and agricultural labourers are eligible for this loan provided they should possess the necessary experience in this activity.	It is provided to the activities ie., land development, minor irrigation, farm mechanization, horticulture, dairying, etc.
5. Self-help Groups (SHGs) Linkage Credit Programme	S.H.Gs are the self managed homogeneous groups of economically backward people who promote savings among themselves and can pool their agricultural activities.	Self -help groups are supplemented by bank credit when these groups gain experience.
6.National Agricultural Insurance Scheme (NAIS)	**On compulsory basis:** All farmers producing notified crops and availing seasonal agricultural operations (SAO) loans from financial institutions ie., loanee farmers. **On Voluntary basis:** All other farmers (Non-loanee farmers) producing notified crops .	Provides insurance coverage and financial support to the farmers in case of failure of any notified crop due to any natural calamities, pests and diseases. It also encourages the farmers to adopt progressive farming high value inputs and high agricultural technology. Besides, it helps to stabilize the farm income during disaster years.

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8.3 Organisations / agencies providing marketing services:

The names of Govt., Semi-Govt. and State Govt. organisations who provide and assist marketing services like procurement, grading, storage, and processing in the field of oilseeds including mustard – rapeseed are given in Table no -XXVII.

Table no.- XXVII

S.No	Organisation and it's website	Services provided
1.	**Directorate of Marketing and Inspection (DMI), Head Office, CGO Complex N.H.IV. Faridabad –121 001.** **Website: www.agmarknet.nic.in**	? To promote grading of agricultural produce under the Agricultural Produce(Grading & Marking) Act,1937. ? To facilitate the construction of rural godowns. ? To render advice on statutory regulation, development and management of agricultural markets by states/U.Ts. ? Marketing research, surveys and planning ? To train personnel in agricultural marketing
2.	**National Cooperative Development Corporation (NCDC), Head Office, 4, Siri Institutional Area, Opp. Asiad Village, August Kranti Marg, New Delhi-110016** **Website: www. ncdc.nic.in.**	? To promote, strengthen and develop the institution of farmers' cooperatives for increasing production, processing, marketing, storage, export, import of agro commodities and certain other notified commodities. Besides it also promotes the collection, processing, marketing, storage, and export of minor forest produce on the basis of cooperative principles.
3.	**Central Warehousing Corporation (CWC),H.O., 4/1, Siri Institutional Area, Opp. Asiad Village, August Kranti Marg, New Delhi-110016** **Website: www.fieo.com/cwc**	? Building up of scientific warehouses for agro commodities . ? Setting up of warehousing infrastructure in conjunction with railways. ? Assisting farmers to avail loan facility from the banks against pledge of warehouse receipt for stored agro-commodities in CWC warehouse.
4.	**Director General of Foreign Trade(DGFT),Udyog Bhawan, New Delhi.** **Website: www. nic.in/eximpol**	? Allotment of Import Export Code (IEC) No. to the exporter of agro commodities.
5.	**National Agricultural Cooperative Marketing Federation of India Ltd.(NAFED) Head Office, 1, Siddarth Enclave, Ashram Chowk, Ring Road, New Delhi.** **Website: www.nafed-India.com**	? Nodal agency of Govt. for procurement of oilseeds and pulses under Price Support Scheme. (PSS). ? Procurement of other agro commodities like oil palm under Market Intervention Scheme (MIS) ? Recognised as Export Trading House for exporting agro commodities. ? To coordinate and promote the marketing and trading activities of its affiliated cooperative organizations. ? To promote inter-state and international trade of agricultural commodities.

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6.	**The Rajasthan State Cooperative Oilseeds Growers Federation Ltd. Nehru Sahkar Bhavan Bhavani Singh Road, Jaipur**	? Procurement of oilseeds like mustard under the guidelines of NDDB.
7.	**State Marketing Boards at State Capitals.**	? Regulation management and development of marketing in concerned state. ? To implement different schemes on agricultural marketing. ? To co-ordinate functioning of all market committees. ? Grading of agricultural produce. ? Publicity of matters related to regulated marketing of agro produce.
8.	**Technology Mission on Oilseeds, Pulses & Maize (TMOP&M), Govt. of India, Janpath, New Delhi**	? To pursue a mission-mode approach by forming a consortium of various departments and agencies like National Dairy Development Board, National Co-operative Development Corporation, National Agricultural Co-operative Marketing Federation, Deptt. of Civil Supplies, Khadi & Village Industries Commission, National Oilseeds & Vegetable Oils Development Board to facilitate the task of handling specialised focus on price support, storage, processing and marketing. ? Facilitating oilseed farmers and other beneficiaries to avail following benefits: ➢ Direct purchase ➢Timely declaration of price. ➢Efficient Procurement by designated agencies. ➢Expansion of marketing/storage/processing facilities. ➢Fair prices to the consumer.
9.	**Agricultural Produce Market Committees(APMCs) at different regulated markets of different states.**	? For better marketing of agricultural produce like oilseeds, the APMC complexes provide the following facilities: ➢Providing covered common auction hall, open common auction platform to facilitate the display and sale of agricultural produce. ➢Facilitates drying of produce. ➢Providing grading, weighing and storage facilities of produce, brought to APMC complexes.

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9.0 PROCESSING AND UTILISATION

9.1 Processing: The following methods are adopted for mustard-rapeseed processing:


Ghani/kolhu

◆ **Bullock driven ghanis/ Kolhu:** It consist of a mortar and a wooden pestle where the pestle isrotate by a bullock going around in a circle and the oilseeds are placed in mortar. There are different types of ghanis. Large quantities of oilseeds are crushed by ghanis in mustard-rapeseed producing states due to consumer preferences towards ghani processed oil. The demand for different types of mustard-rapeseed oils mainly influenced by it's quality, characteristics colour and flavour.

Crushing time - 2-5 hours.
Yield of oil - 30-32 percent.

◆ **Rotary mill:** It is a power driven ghani which is made of cost iron and in this process both the mortar and pestle of cast iron and in this process both the mortar and pestle revolves. There are different types of rotary mills.

Crushing time - 40-60minutes.
Yield of oil - 30-35 per cent .

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◆ **Expeller**


Expeller

It is used there where there is not much demand for pungent oil. The cleaned seed is subjected to roll in 3 or 5 high rollers and fed into steam jacketed through which it is heated to 75-80 degree centigrade temperature and with necessary moisture. The oil is expelled by pressure exerted by the warms against the walls and narrow end of expeller of the chamber. Subsequently, it falls through perforated aparture and collected through filter press.

Crushing capacity -200kgs/hour.
Yield of oil -35-38 per cent .

➔As reported , the Technology Mission on Oilseeds, Pulses and Maize, Department of Agriculture & Co-operation, New Delhi is implementing a programme for 1 TPD modern expeller as well as 6TPD expeller for mustard-rapeseed oil as a replacement of traditional ghanis to get maximum recovery of oil with it's full pungency. The expellers are not costly in relation to the cost benefit ratio. Because, they give good quality pungent oil with higher oil recovery in less time and save the labour cost also.

◆ **Hydraulic press:** It is rarely used for processing of mustard-rapeseed due to it's high cost and complicated operations.

◆ **Solvent Extraction Process:** It is the modern method of extracting oil from seeds. The basic techniques is to dissolve oil in a volatile solvent (N-Hexane) and then to distil he extract recovering solvent and oil separately.

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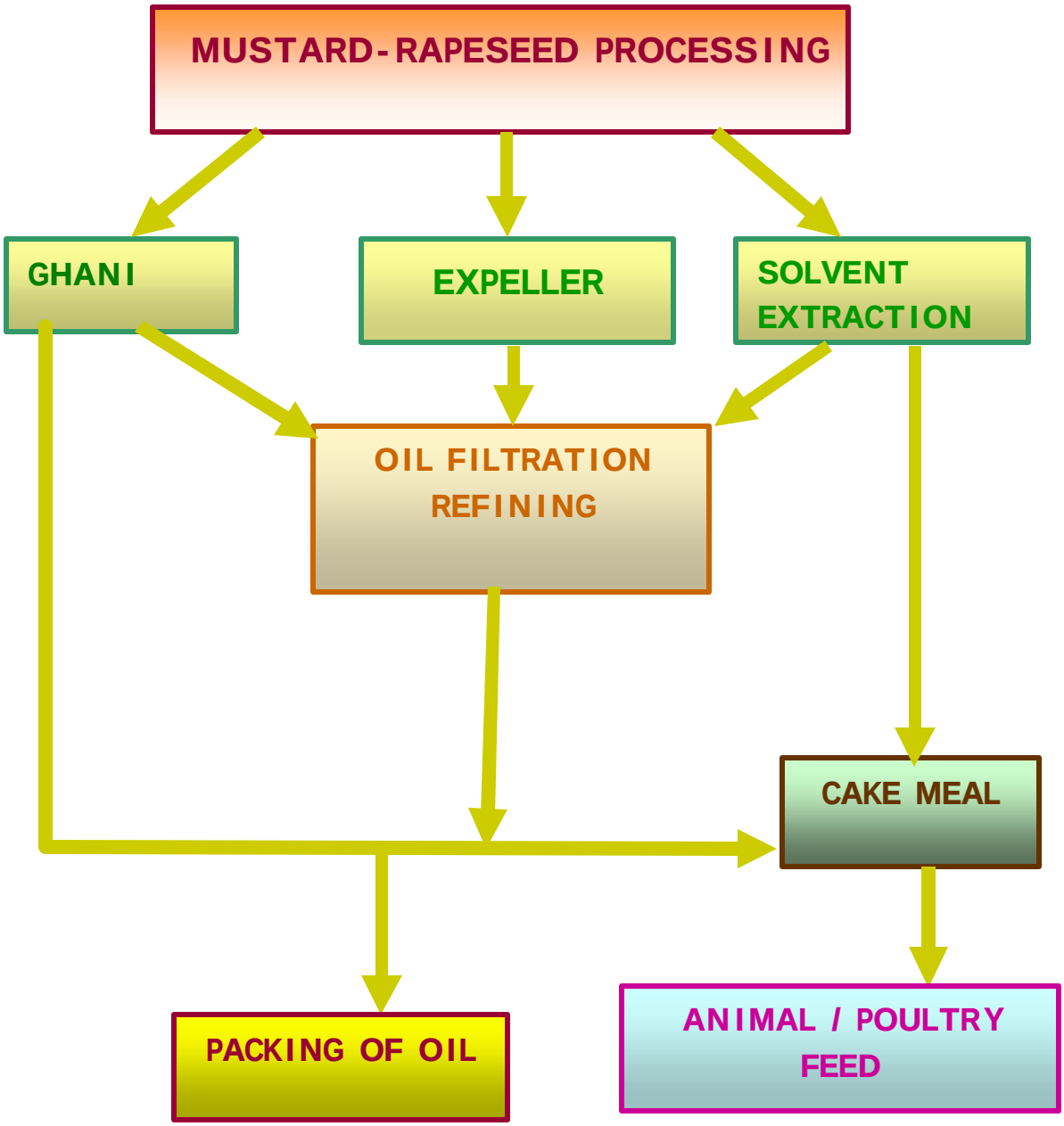
Processing of mustard-rapeseed:



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9.2 Uses:

Mustard - rapeseed is useful in various ways as follows:

Use as edible oil: The seed contains 30 – 46 per cent oil and yields one of the most important oil in India .It is very popular edible oil in northern and eastern India. Two types of mustard oil are popular in India i.e., the kacchi ghani type and refined mustard oil. The Kacchi Ghani type is preferred by most of the consumers due to it's characteristic colour and pungency. The refined oil is preferred by health conscious people.

Mustard oil

Use as spices: Mustard is used in India as well as in European countries like France, Italy as versatile spice for culinary preparation of fish, meat, vegetables etc., There are indications that mustard as spices has been noticed in European as well as Indian literatures since ancient age.

Use as fertilizer : While used as fertiliser it is beneficial to increase productivity in sugarcane, berseem, papaya ,tea plantations, orchids and planktons in pond.

Use as a medium of preservation: In India, mustard oil is widely used as medium of preservation for preparation of pickles, chutney and other preparations

Use as seed meal: The rapeseed meal is rich in protein and low in glucosinolate content, hence it has a high demand as ingredient for cattle feed and poultry feed in India. It is in highly demanded by the feed millers and exported to various foreign and Mediterranean countries. The seed meal is an important source of export earnings.

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Medicinal application: The oil obtained from mustard seeds has antifungal properties, hence beneficial for body massage for control of skin diseases. For healing joint pains and rheumatic disease, the oil is also used by mixing with garlic and turmeric. It strengthens the gums if taken with salt and alum. It is also noticed that sleeping on mustard seeds gives the bio-energetic healing massage effect. Moreover, it is used to relieve back-ache, muscle pain, anxiety, depression and insomnia.

Industrial application: The erucic acid present in the oil has immense industrial applications. 'High Erucic Acid Rapeseed' (HEAR) oil is the non-edible variety of rapeseed oil which is used for industrial purposes because the erucic acid has various industrial applications from lubricants to paper, textile and plastic industry. The global market for low erucic acid rapeseed oil is increasing day by day.

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10.0 DO'S & DON'TS

Do's	Don'ts
✓ Harvest the crop, when the leaves have almost completely dropped off the plants and the pods turn yellow.	✗ To harvest a crop when the leaves are not completely dropped off the plants and the pods not turned into yellow colour.
✓ After harvesting, threshing and winnowing the seeds of mustard-rapeseed collected should be bagged and stored in a dry place.	✗ To store seeds of mustard-rapeseed in hot, humid/damped condition after harvesting, threshing and winnowing.
✓ Clean and grade the seeds of mustard-rapeseed at producer's level before sale. For it's quality assessment, always try to follow the AGMARK Grade Specifications.	✗ To sell the produce without cleaning and grading at producers' level, assess the quality of the produce only through visual inspection and not by recognised grade standards.
✓ While grading for export, try to follow ISO Specifications (International standard) for mustard-rapeseed .	✗ To export the produce without grading as per international grade standards.
✓ While packing, the oilseeds should be packed in clean, hygienic bags of a material, which does not affect the seed and prevent it from absorbing moisture.	✗ To pack the oilseeds in a material which can't protect it from moisture.
✓ For holding, store the produce in nearest godowns of Central Warehousing Corporation (CWC) or other agencies from where the facilities of pledge finance schemes can be availed.	✗ To store the produce in unscientific godowns of traders/commission agents.
✓ Avail benefit of centrally sponsored GRAMIN BHANDARAN YOJANA scheme for construction of rural godowns at the doorstep of farmers.	✗ To store the produce in unscientific places in a haphazard manner.
✓ To get better price of produce, sell it to the co-operative society, nearest procurement center of National Agricultural Co-opt Marketing Federation (NAFED)/ other agencies or at regulated markets.	✗ To sell the produce to local traders or itinerant merchants at low prices.

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✓ To ensure better marketing of the produce, avail benefit of contract farming with any agency.	✗ To produce oilseeds without assessing and assuring it's market demand for that year.
✓ Get the market information on mustard regularly from newspaper, T,V, concerned APMC offices, websites of different organizations namely Agmarknet .	✗ Marketing oilseeds without collecting/verifying any marketing information.
✓ Avail the system of future trading to avoid price risk arising due to wide fluctuation in commodity prices.	✗ To sell the produce at fluctuating prices or in glut situation.
✓ Avail the procedure of phytosanitary measure for export.	✗ To export without any phyto-sanitary measure.

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