Post-Harvest Profile of Green Gram

Directorate of Marketing and Inspection
Ministry of Agriculture and Farmers Welfare, GOI

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1.0 Introduction

1.1 Origin

Green gram or mung is one of the important pulse crops in India after chickpea and pigeonpea. Green gram has been cultivated in India since ancient times. It is believed that green gram is native to India and Central Asia, and since prehistoric times green gram has been grown in these regions. It is widely cultivated throughout many countries across Asia, Australia, Africa and the U.S.A recently.

1.2 Importance

Green gram is a protein-rich food legume. It contains about 25 per cent protein, which is almost three times that of cereals. It is a source of protein for the vegetarian population of the country. It is consumed in the form of split pulse (husked and dehusked) and whole pulse, which is an essential supplement to the cereal-based vegetarian diet. The moong dal *khichdi* is recommended to ill or aged people as it is easily digestible. *Roti* with *moong dal* and *moong dal* with *chawal* is an essential ingredient in the average Indian diet. The biological value improves greatly when wheat or rice is combined with green gram because of the complementary relationship of the essential amino acids. It is particularly rich in leucine, phenylalanine, lysine, valine, isoleucine, etc. Its nutritional value increases tremendously with sprouting, and mungbean sprouts are now becoming increasingly popular across the globe as a breakfast cereal and a snack. In addition to being an important source of human food and animal feed, green gram also plays a vital role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. It is a drought-resistant crop, suitable for dryland farming and predominantly used as an intercrop with other crops.

The nutritional value of green gram is given below.

Table 1: Nutritional value per 100 g of green gram (dal)

Calorific value (cal./ 100g)	Crude protein (%)	Fat (%)	Carbohydrate (%)	Ca (mg/ 100g)	Fe (mg/ 100g)	P (mg/ 100g)	Vitamin (mg/100g)		
							B1	B2	Niacine
334	24.0	1.3	56.6	140	8.4	280	0.47	0.39	2.0

Source: Pulse Crops, by B.Baldev, S.Ramanujam and H.K.Jain, 1989: PP. 563.

Green gram [*Vigna radiata*] belongs to the family *Leguminosae*. It is a small herbaceous annual plant growing to a height of 30 to 120 centimetres with a slight tendency to twine in the upper branches. The central stems are more or less erect, while the side branches are semi-erect. The leaves are 5-10 cm long, trifoliate, with long petioles. The stems and leaves are covered with short hairs, generally shorter than those in blackgram. The leaves are alternate, compound, mostly trifoliate and hairy. Stipules are broad. Flowers are in an axillary or terminal raceme, peduncle up to 13-15 cm. in length with clusters of 10 to 20 flowers. The calyx comprises five sepals, three large and free, two small and fused. Corolla is yellow in colour. The flower is typically papilionaceous having one standard, two wings, two keels, diadelphous androecieum and a monocarpellary gynoecium. The pods are linear, sometimes curved, round and slender with short pubescence. The number of seeds per pod

ranges from 10-15. The seeds are oblong, green or olive green in colour, sometimes yellow, brown or blackish. The seeds are small and nearly globular. The colour of the seed is usually green, but yellow-brown or purple-brown seeds also occur. The colour of cotyledons is light yellow. The crop is self-pollinated.

1.3 Area production

In India, green gram is one of the most widely cultivated pulse crops grown during kharif, spring and summer seasons. Besides, it is also cultivated in special niches such as rabi-rice fallows. It was grown over an area of 5.15 million hectares with a production of 3.09 million tonnes during 2020-21 (4th advance estimates). The area, production and yield of green gram in India for the last eight years are given in Table 2. The area, production and yield levels have increased considerably during this period. The area under green gram in India increased from 3.38 million hectares during 2013-14 to 5.15 million hectares during 2020-21 while the production increased from 1.61 million tonnes to 3.09 million tonnes and yield levels increased from 475 kg/hectare to 599 kg/hectare during the same period thereby inparting an overall growth of 106% to this crop in last ten years.

Table 2: Area, production and yield of green gram in India

	Area ('000 Hectares)			Production ('000 Tonnes)			Yield (Kg./Hectare)		
State/ UT	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Rajasthan	2466.8	2326.5	2553.1	1222.2	1303.3	1407.2	495	560	551
Madhya Pradesh	291.0	334.2	544.0	280.3	247.8	641.6	963	741	1179
Maharashtra	481.1	386.8	401.0	203.8	150.8	207.3	424	390	517
Karnataka	421.0	382.3	453.0	142.6	141.1	181.9	339	369	402
Gujarat	86.8	134.9	154.7	49.1	104.1	110.1	566	772	712
Bihar	169.6	165.7	166.4	118.5	110.1	93.1	698	664	560
Andhra Pradesh	121.0	107.0	105.0	84.7	86.5	81.1	700	808	772
Uttar Pradesh	92.0	93.0	86.0	55.7	53.0	61.0	605	570	709
Tamil Nadu	170.3	171.9	160.6	76.8	76.5	58.9	451	445	367
Odisha	216.7	240.1	235.4	70.8	80.7	57.9	327	336	246
Others	238.6	238.1	271.0	150.9	155.0	185.2	633	651	683
All India	4755.0	4580.5	5130.2	2455.4	2508.9	3085.4	516	548	601

Source: Directorate of Economics & Statistics, DAC&FW

2.0 Production Scenario

2.1 Major producing countries in the world

India is the largest producer, consumer, importer and processor of green gram in the world. Besides India, it is widely cultivated throughout Asia, including Myanmar, Pakistan, Bangladesh, Sri Lanka, Thailand, Laos, Cambodia, Vietnam, Indonesia, Malaysia, South China, and Formosa. In Africa and U.S.A., comparatively, it has been recently introduced. It is fast spreading to many other countries of the world.

2.2 Major producing states in India

Rajasthan is the largest producer of green gram, accounting nearly for 45 per cent of the total production, followed by Madhya Pradesh (19 %), Maharashtra (7 %), Karnataka (6 %), and Bihar (4 %) (2020-21 4th AE). The per cent share of major green gram producing states during 2020-21 is depicted in Figure 1.

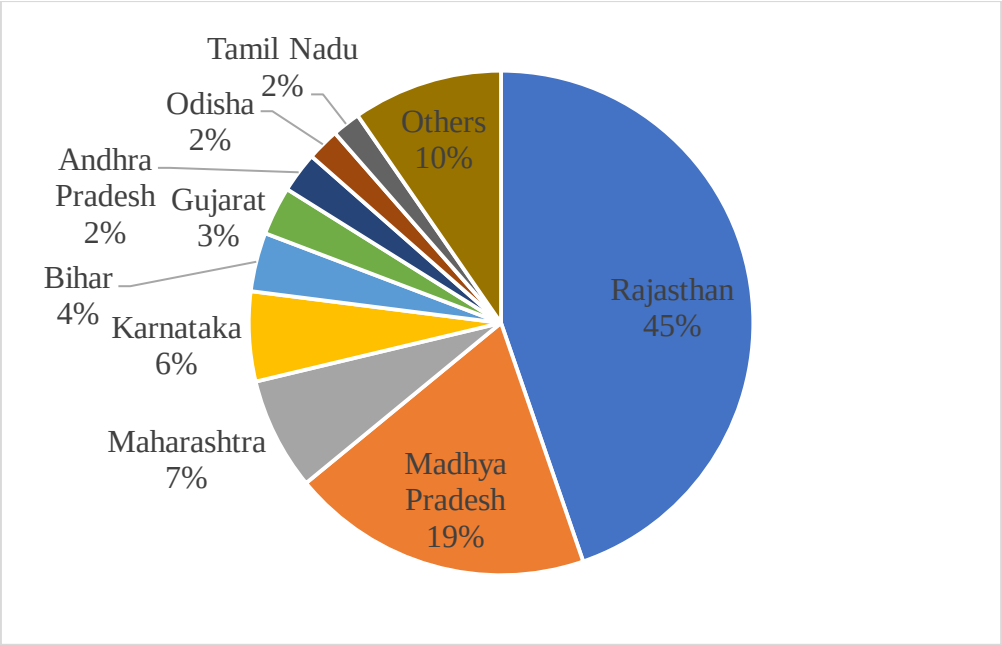


Figure 1: Major Green gram producing states during 2020-21 (4th Advance Estimates) (Percent to all India production of green gram)

In the case of area, the share of Rajasthan was 48 per cent, followed by Madhya Pradesh (10 %), Karnataka (9 %) and Maharashtra (8%) during 2020-21. Area shares of major green gram growing states during 2020-21 is depicted in Figure 2.

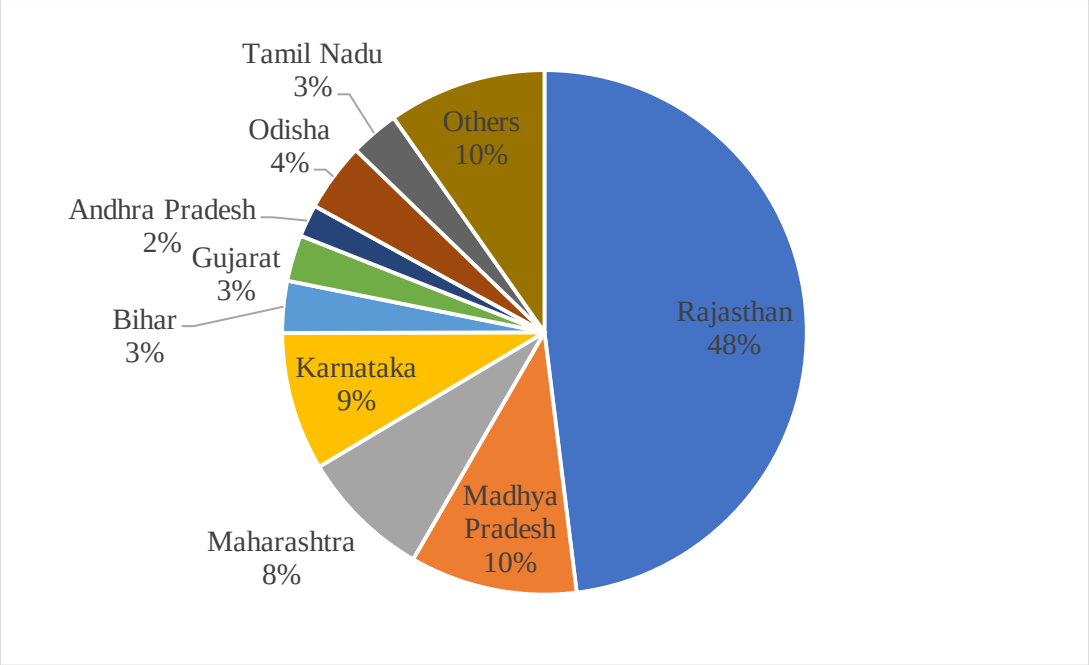


Figure 2: Area share of major green gram growing states during 2020-21 (4th Advance Estimates) (Percent to all India area under green gram)

2.3 State-wise major commercial varieties

A large number of region and season-specific varieties have been developed in green gram in India. While the top ten varieties constitute more than 80 per cent of the breeder seed indent in the country, other varieties cover about 20 per cent. The list of the recommended varieties of green gram for different seasons, which are currently in the active seed chain, is given in Table 4 below.

Table 4: Varieties of green gram in active seed chain recommended for different states and seasons

State	Recommended variety
***Kharif* season**	
Andhra Pradesh	PKV AKM 4, OUM 11-5 (Kamadeva), COGG 912, IPM 2-14
Assam	Pusa 0672, Pusa 1371
Bihar	IPM 02-3, MH 2-15 (Satya), PKV AKM 4, Pusa 9531, IPM 99-125 (Meha)
Chhattisgarh	PKV AKM 4, Pusa 9531
Gujarat	GM 4, IPM 02-3, PKV AKM 4, Pusa 9531
Haryana	IPM 02-3, MH 2-15 (Satya), MH 318
Himachal Pradesh	KM 2241 (Shweta), Pant Mung 6, Pusa 0672, Pusa 1371
Jammu & Kashmir	IPM 02-3, KM 2241 (Shweta), Pant Mung 6, Pusa 0672, Pusa 1371
Jharkhand	IPM 02-3, MH 2-15 (Satya), PKV AKM 4, Pusa 9531
Karnataka	COGG 912, DGGV 2, OUM 11-5 (Kamadeva), PKV AKM 4

Madhya Pradesh	PKV AKM 4, Pusa 9531, IPM 02-3
Maharashtra	PKV AKM 4, Pusa 9531
Meghalaya	KM 2241 (Shweta), Pant Mung 6, Pusa 0672, Pusa 1371
Odisha	COGG 912, OUM 11-5 (Kamadeva), PKV AKM 4
Punjab	IPM 02-3, MH 2-15 (Satya), ML 2056
Rajasthan	IPM 02-3, MH 2-15 (Satya), MSJ 118 (Keshvanand Mung 2), RMG 492, RMG 975 (Keshvanand Mung 1)
Tamil Nadu	Co(Gg) 8, COGG 912, OUM 11-5 (Kamadeva), PKV AKM 4, VBN(Gg) 2
Telangana	COGG 912, OUM 11-5 (Kamadeva), PKV AKM 4
Uttar Pradesh	IPM 02-3, IPM 2K14-9 (Varsha), IPM 302-2 (Kanika), KM 2195, MH 2-15 (Satya), PKV AKM 4, Pusa 9531, Varsha (IPM 2K14-9)
Uttarakhand	MH 2-15 (Satya)
West Bengal	IPM 02-3, MH 2-15 (Satya), PKV AKM 4, Pusa 9531
Spring/Summer Season	
Andhra Pradesh	IPM 2-14, IPM 205-7 (Virat)
Assam	HUM 12 (Malviya Janchetna), HUM 16, IPM 99-125 (Meha), SML 1115, IPM 512-1 (Soorya)
Bihar	HUM 12 (Malviya Janchetna), HUM 16, IPM 99-125 (Meha), IPM 205-7 (Virat), IPM 512-1 (Soorya)
Chhattisgarh	IPM 205-7 (Virat), IPM 410-3 (Shikha)
Gujarat	IPM 02-3, IPM 205-7 (Virat), IPM 410-3 (Shikha)
Haryana	IPM 02-3, IPM 205-7 (Virat), IPM 410-3 (Shikha), MH 318, MH 421, Pusa Vishal
Jharkhand	HUM 12 (Malviya Janchetna), HUM 16, IPM 99-125 (Meha), IPM 205-7 (Virat)
Karnataka	IPM 2-14, IPM 205-7 (Virat)
Madhya Pradesh	IPM 205-7 (Virat), IPM 410-3 (Shikha)
Maharashtra	IPM 410-3 (Shikha)
NCR region	IPM 205-7 (Virat), IPM 410-3 (Shikha), Pusa 1431, Pusa Vishal
Odisha	IPM 2-14
Punjab	IPM 02-3, IPM 205-7 (Virat), IPM 410-3 (Shikha), MH 421, Pusa Vishal, SML 668, SML 832
Rajasthan	IPM 02-3, IPM 205-7 (Virat), IPM 410-3 (Shikha), MH 421, Pusa Vishal, RMG 492

Tamil Nadu	IPM 2-14, IPM 205-7 (Virat)
Telangana	IPM 2-14
Uttar Pradesh	HUM 12 (Malviya Janchetna), HUM 16, IPM 02-3 IPM 99-125 (Meha), IPM 205-7 (Virat), IPM 302-2 (Kanika), IPM 410-3 (Shikha), MH 421, Pant Mung 5, Pusa Vishal, Kanika, Vasudha (IPM 312-20), Heera (IPM 409-4)
Uttarakhand	HUM 16, IPM 02-3, IPM 205-7 (Virat), IPM 302-2 (Kanika), IPM 410-3 (Shikha), MH 421, Pant Mung 5, Pusa Vishal
West Bengal	HUM 12 (Malviya Janchetna), HUM 16, IPM 99-125 (Meha), IPM 512-1 (Soorya)
Rabi/Rice fallow	
Andhra Pradesh	IPM 2-14, TM 96-2, LGG 460, LGG 407, LGG 410
Karnataka	IPM 2-14
Odisha	IPM 2-14, OBGG 52
Tamil Nadu	IPM 2-14, VBN(Gg) 2
Telangana	IPM 2-14

3.0 Post-harvest Management

3.1 Post-harvest Losses

Due emphasis is needed to reduce qualitative as well as quantitative losses of pulses, especially in green gram, during the post-harvest operations. It has been estimated that nearly 6.60 per cent of the production is lost during the post-harvest period in the case of green gram. Total loss in farm operations was 5.37 per cent which was mainly contributed by harvesting and threshing operations. The estimated monetary value of harvest and post-harvest losses in pulses was Rs. 2,453 crores at 2014 prices.

Table 4: Harvest and post-harvest losses of green gram at national level

Stages	Losses (%)
Total loss in farm operations	4.00
Total loss in storage	1.40
Overall Total loss	**5.40**

Source: Report on harvest and post-harvest losses of major crops, CIPHET, Ludhiana 2015

The post-harvest losses of green gram can be minimized in the process of threshing, winnowing, storage, processing, handling and transportation.

- **Threshing and Winnowing:** It has been reported that about 1.60 per cent losses occurred during threshing, and 0.30 per cent in winnowing. To reduce these losses, threshing and winnowing operations must be completed within a short period through improved equipment on a *pucca* platform.

- **Transport Losses:** During transportation, it has been observed that 0.20 per cent losses occurred in transporting the produce from the field to storage. Efficient and quick transportation supported by good packaging material is necessary to reduce the losses.

- **Processing:** Green gram is consumed as whole (sprouts), splited cotyledons (with or without husk) as dal. Dehsuking and splitting takes place abrasive emery rollers, which cause scouring losses and result into lesser dal recovery than the theoretical or potential dal recovery. Due to the use of traditional pre-milling treatments and abrasive milling methods, milling losses can be as high as 5-10%. To reduce the milling losses and increase the output, improved dal milling methods and machineries should be adopted.

- **Storage:** Due to improper and inefficient storage methods, about 1.40 per cent loss is estimated during storage. Quantitative losses mainly result from spoilage, breakage of produce, infestation by insects, rodents or birds. Improved scientific storage facilities should be adopted to reduce the losses considerably.

Following preventive measures should be adopted to avoid post-harvest losses:

- Harvest at the proper stage of maturity to reduce losses.

- Use proper method of harvesting.
- Adopt modern mechanical methods to avoid the losses in threshing and winnowing.
- Use improved technique of processing.
- Adopt cleaning and grading for remunerative prices *inter-alia* to avoid financial loss.
- Use good packaging materials for storage and in transport, i.e. B-Twill Jute bags or HDPE bags.
- Adopt proper technique in storage.
- Apply pest control measures during storage.
- Proper handling, i.e. (loading and unloading) of Green gram with good transportation facilities at farm and market-level reduces losses.
- Avoid the use of hooks.

3.2 Harvesting care

During harvesting, proper care should be taken to minimize quantitative and qualitative losses.

The following care should be taken during harvesting:

- Harvesting should be done at proper maturity (when about 75% pods mature and turn black) to reduce shattering loss and ensure optimum grain quality and consumer acceptance.
- Harvesting before the maturity of the crop usually results in lower yields, a higher proportion of immature seeds, poor grain quality and more chances of infestation during storage.
- Delay in the harvesting of green gram results in shattering of pods and other losses caused by birds, rats, insects etc.
- The best time to harvest the crop, when a large share, i.e., 75-80 per cent, of the pods are fully matured.
- Avoid harvesting during adverse weather conditions, i.e., rains and overcast weather.
- Use the right kind of harvesting equipment (sickle).
- Avoid pest infestation prior to harvesting.
- The harvested bundles should be kept in one direction in order to ascertain efficient threshing.
- Keep the harvested bundles for drying in the field after cutting on the threshing floor, if weather permits.
- The harvested produce should be stacked in a dry, clean place in a cubical way to facilitate circulation of the air around.
- Rogue out the admixtures prior to harvesting.
- Keep the harvested green gram separately from one variety to another to get the true to type variety (grains).

3.3 Grading

Grading and marking agricultural produce as per accepted quality standards helps farmers, marketing functionaries, processors, traders and consumers to obtain quality products. Classification of produce imparts the following benefits:

3.3.1 Benefits of grading

- It enables the farmer to get a higher price of the produce.
- It facilitates competitive marketing.
- It widens the marketing process as buying and selling can take place between two parties at distant places by quoting standard grades.
- It reduces the cost of marketing and minimises storage losses.
- It facilitates in maintaining the quality of the produce.
- It helps the consumers to get standard quality of produce at reasonable prices.
- It facilitates futures trading and, thus leads to price stabilisation

The sale is generally made based on visual inspection of available samples and with local commercial names in the market. Buyers offer prices on the visual examination of a whole lot considering the quality factors like size of the grains, colour of the grains, moisture content, refraction and admixture with other varieties. In order to ensure the remunerative price to the farmers and gain the confidence of consumers, the green gram should be graded systematically.

3.4 Grade Specifications

Agricultural Produce (Pulses Grading and Marking) Rules, 2019

Initially, the Agricultural Produce (Grading and Marking) Act, 1937 was enacted to maintain the quality of agricultural produce in India. According to this Act, specifications have been drawn up for green gram for various quality factors. The grade standards specified for green gram whole, split and split (dehusked), drawn by the Directorate of Marketing and Inspection, are given below:

A) Grade designation and quality of green gram (whole)

1. Mature seeds of green gram (whole) shall be dried
2. Minimum requirements:
   i) Green gram (whole) shall be-
      a) sweet, sound, clean, wholesome and free from admixture of unwholesome substances
      b) uniform in size, shape and colour
      c) free from rodent hair and excreta, moulds, living and dead insects, insect fragments, harmful bacteria, fungal infestation, mould growth, webs, parasite, larvae and mites
      d) free from obnoxious smell, discolouration and all other impurities except to the extent as indicated in this schedule
      e) free from added colouring matter, admixture of deleterious substances
      f) free from toxic or noxious seeds such as Crotalaria (*Crotalaria* spps.), Corn cockle (*Agrostemma githago* Linn.), Castor bean (*Ricinus communis* Linn.), Jimson weed (*Datura stramonium*), and other seeds that are commonly recognised as harmful to health
      g) free from abnormal taste, flavour and odour.
   ii) It shall comply with the restrictions in regard to the limits for metallic contaminants, crop contaminants, naturally occurring toxic substances,

insecticides and pesticides residue, microbial requirements and other food safety requirements as specified under the Food Safety and Standards (Contaminants, Toxins and Residue) Regulation, 2011 and the Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011 made under the Food Safety and Standards Act,2006 (34 of 2006) for domestic trade.

iii) It shall comply with the residual limits of heavy metals, pesticides and other food safety requirements as laid down by the Codex Alimentarius Commission, or requirement of importing countries for exports.

3. Criteria for grade designation: The criteria for grade designation for the Green gram (whole) shall be as under:

Grade designation	Maximum limit of tolerance (percent by weight)					Weevilled grains (% by count) (Maximum)
	Moisture	Foreign matter		Other edible grains	Damaged grains	
		Organic	Inorganic			
Special	11.0	0.10	0.05	0.2	0.5	Absent
Standard	12.0	0.30	0.10	0.5	2.0	3.0
General	14.0	0.75	0.25	4.0	5.0	6.0

Note:- In foreign matter the impurities of animal origin shall not be more than 0.10 percent by weight provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 9.00 percent by weight.

B) Grade designation and quality of green gram (split without husk)

1. Moong split (without husk) shall be dried split seeds of pulse *Vigna radiata* Linn. Wilczek
2. Minimum requirements:
   (i) **Green gram (split without husk)** shall be -
   a) sweet, sound, clean, wholesome and free from admixture of unwholesome substances
   b) without husk , split, uniform in size, shape and colour;
   c) free from rodent hair and excreta, moulds, living and dead insects, insect fragments, harmful bacteria, fungal infestation, mould growth, webs, parasite, larvae and mites;
   d) free from obnoxious smell, discolouration and all other impurities except to the extent as indicated in this schedule;
   e) free from added colouring matter, admixture of deleterious substances;
   f) free from toxic or noxious seeds such as Crotalaria (*Crotalaria* spp.), Corn cockle (*Agrostemma githago* Linn.), Castor bean (*Ricinus communis* Linn.), Jimson weed (*Datura stramonium*), and other seeds that are commonly recognised as harmful to health; and
   g) free from abnormal taste, flavour and odour.
   (ii) It shall comply with the restrictions in regard to the limits for metallic contaminants, crop contaminants, naturally occurring toxic substances, insecticides and pesticides residue, microbial requirements and other food safety requirements as specified under the Food Safety and Standards (Contaminants, Toxins and Residue) Regulation, 2011 and the Food Safety and Standards (Food

Products Standards and Food Additives) Regulation, 2011 made under the Food Safety and Standards Act,2006 (34 of 2006) for domestic trade

(iii) It shall comply with the residual limits of heavy metals, pesticides and other food safety requirements as laid down by the Codex Alimentarius Commission, or importing countries requirement for exports.

3. Criteria for grade designation.-The criteria for grade designation green gram (split without husk) shall be as under:

Grade designation	Maximum limit of tolerance (percent by weight)						Weevilled grains (% by count) (Maximum)
	Moisture	Foreign matter		Other edible grains	Damaged grains	Broken and fragmented grains	
		Organic	Inorganic				
Special	11.0	0.10	0.05	0.2	0.5	0.5	Absent
Standard	12.0	0.30	0.10	0.5	1.0	1.0	1.0
General	14.0	0.75	0.25	4.0	5.0	2.0	3.0

Note: In foreign matter, the impurities of animal origin shall not be more than 0.10 percent by weight provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 8.00 percent by weight.

C) Grade designation and quality of green gram (split with husk)

1. Green gram (split with husk) shall be dried split seeds of the pulse *Vigna radiata* Linn. Wilczek.
2. Minimum requirements:
   (i) Green gram (split with husk) shall be:
      a) sweet, sound, clean, wholesome and free from admixture of unwholesome substances
      b) with husk, split, uniform in size, shape and colour
      c) free from rodent hair and excreta, moulds, living and dead insects, insect fragments, harmful bacteria, fungal infestation, mould growth, webs, parasite, larvae and mites
      d) free from obnoxious smell, discolouration and all other impurities except to the extent as indicated in this schedule
      e) free from added colouring matter, admixture of deleterious substances
      f) free from toxic or noxious seeds such as Crotalaria (Crotalaria spp.), Corn cockle (*Agrostemma githago* Linn.), Castor bean (*Ricinus communis* Linn.), Jimson weed (*Datura stramonium*), and other seeds that are commonly recognized as harmful to health
      g) free from abnormal taste, flavour and odour.
   (ii) It shall comply with the restrictions in regard to the limits for metallic contaminants, crop contaminants, naturally occurring toxic substances, insecticides and pesticides residue, microbial requirements and other food safety requirements as specified under the Food Safety and Standards (Contaminants, Toxins and Residue) Regulation, 2011 and the Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011 made under the Food Safety and Standards Act,2006 (34 of 2006) for domestic trade.

(iii) It shall comply with the residual limits of heavy metals, pesticides and other food safety requirements as laid down by the Codex Alimentarius Commission, or importing countries requirement for exports.

3. Criteria for grade designation: The criteria for grade designation for green gram (split with husk) shall be as under:

Grade designation	Maximum limit of tolerance (percent by weight)						Weevilled grains (percent by count) (Maximum)
	Moisture	Foreign matter		Other edible grains	Damaged grains	Broken & fragmented grains	
		Organic	Inorganic				
Special	11.0	0.10	0.05	0.2	0.5	1.0	Absent
Standard	12.0	0.30	0.10	0.5	1.0	2.0	1.0
General	14.0	0.75	0.25	4.0	5.0	3.0	3.0

Note: In foreign matter, the impurities of animal origin shall not be more than 0.10 percent by weight provided that the total of foreign matter, other edible grains and damaged grains shall not exceed eight percent by weight.

For detailed Grade specifications, please refer to Agricultural Produce (Pulses Grading and Marking) Rules, 2019 (https://dmi.gov.in/Documents/Pulses_GM_rules_2019.pdf).

Grade specifications under FSSAI

MOONG WHOLE:

Moong whole shall consist of seeds of green gram (Phaseolous aurues Roxb., Phaseolus radiatus Roxb.) It shall be sound, dry, sweet, wholesome and free from admixture of unwholesome substances. It shall also conform to the following standards, namely:—

(i) Moisture- Not more than 14 per cent by weight (obtained by heating the pulverized grains at 130oC-133oC for two hours).
(ii) Foreign matter — Not more than 1 per cent. by weight of which not (Extraneous matter) more than 0.25 per cent. by weight shall be mineral matter and not more than 0.10 per cent. by weight shall be impurities of animal origin.
(iii) Other edible grains - Not more than 4 per cent by weight.
(iv) Damaged grains- Not more than 5 per cent by weight.
(v) Weevilled grains- Not more than 6 per cent by count.
(vi) Uric acid- Not more than 100 mg. per kg.
(vii) Aflatoxin Not more than 30 micrograms per kilogram.

Provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 9 per cent by weight.

SPLIT PULSE (DAL) MOONG:

Dal Moong shall consist of split seeds of green grams (Phaseolus aureus Roxb, Phaseolus raditus). It shall be sound, clean, sweet, wholesome and free from unwholesome. It shall also conform to the following standards, namely:—

(i) Moisture- Not more than 14 per cent by weight (obtained by heating the pulverized grains at 130oC-133oC for two hours).
(ii) Foreign matter - Not more than 1 per cent. by weight of which not (Extraneous matter) more than 0.25 per cent. by weight shall be mineral matter and not more than 0.10 per cent. By weight shall be impurities of animal origin.
(iii) Other edible grains - Not more than 4 per cent by weight.
(iv) Damaged grains- Not more than 5 per cent by weight.
(v) Weevilled grains- Not more than 3 per cent by count.
(vi) Uric acid- Not more than 100 mg. per kg.
(vii) Aflatoxin Not more than 30 micrograms per kilogram.

Provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 8 per cent by weight.

Grade specifications of followed by Food Corporation of India (FCI) and National Agricultural Cooperative Federation (NAFED):

NAFED is the nodal agency of Government of India for procuring green gram in different states under the Price Support Scheme (PSS). The concerned State Co-operative Marketing Federations are the procuring agents for NAFED. Organization has prescribed only one grade, i.e., Fair Average Quality (FAQ) for procurement of pulses including Green gram under the Price Support Scheme. All the purchases under the PSS by NAFED are made in accordance with the prescribed grades/specifications Fair Average Quality (FAQ) which are given below:

- Pulses shall have reasonably uniform size, shape and colour.
- Pulses shall be sweet, clean, wholesome and free from moulds, weevils, obnoxious smell, discoloration, admixture of deleterious substances (including added colouring matter) and all other impurity except to the extent indicated in the schedule.

S.No.	Special characteristics	Maximum limits of tolerance (% by weight per qtl.) for FAQ
1.	Foreign matter	2% by weight (of which not more than 0.25% by weight shall be mineral matter and not more than 0.1% by weight shall be impurities of animal origin)
2.	Admixture	3.0% by weight
3.	Other edible grain	1% by weight
4.	Damaged grains /Slightly damaged / Touched (including insect damage)	3.0% by weight
5.	Broken/ Split/Unhusked	3 % by weight
6.	Immature and shrivelled pulses	3% by weight
7.	Weevilled pulses	3% by count
8.	Moisture	12

1. Foreign matters include dust, stones, lumps of earth, chaff husks stem, straw or any other impurity including non-edible seeds.
2. Admixture means any pulse other than the principal pulses.

3. Damaged pulses are those that are internally damaged or discoloured to such an extent that the damage or discolouration materially affects the quality of the pulses.
4. Slightly damaged pulses are those pulses that are superficially damaged or discoloured such damage or discolouration not materially affecting the quality of the pulses.
5. Immature & shrivelled pulses are those that are not properly developed.
6. Weevilled pulses are those pulses that are partially or wholly bored or eaten by weevil or other grain insects.

Source:

i) http://fci.gov.in/app/webroot/upload/Procurement%20of%20moong%20under%20PSFS%20for%20KMS%202016-17.pdf
ii) Action Plan and Operational arrangements for Procurement of Oilseeds and Pulses under Price Support Scheme in Kharif Season 2003, NAFED, New Delhi.

Specifications under Prevention of Food Adulteration Act (PFA): (Permissible limits)

S. No.	Parameters	Green gram (Whole)	Green gram (Split)
1.	Foreign Matter	1% (Mineral Matter 0.25%, Impurities of animal origin 0.10%)	1% (Mineral Matter 0.25%, Impurities of animal origin 0.10%)
2.	Admixture	4%	4%
3.	Damaged Pulses	5%	5%
4.	Weevilled grains	5% by count	3% by count
5.	Uric acid	100 mg/kg	100 mg/kg
6.	Aflatoxin	30 µg/kg	30 µg/kg
7.	Moisture	14%	14%

a) For whole grains, total of foreign matter, other edible grains and damaged grains shall not exceed 9 per cent by weight.
b) For split dal, total of foreign matter, other edible grains and damaged grains shall not exceed 8 per cent by weight.

Source: The Prevention of Food Adulteration Act, 1954 along with The Prevention of Food Adulteration Rules, 1955 as amended by The Prevention of Food Adulteration (Tenth Amendment) Rules, 2002 together with Commodity Index.

3.5 Adulterants and Toxins

3.5.1 Adulterants

Normally adulteration/contamination in agricultural produce occurs either intentionally for financial gain or incidentally due to carelessness and lack of proper hygienic condition of processing, packing, storing, transportation and marketing. The adulterants cause different foodborne diseases. In green gram dal, the following adulterants are commonly found:

- **Khesari dal**: Khesari dal (*Lathyrus sativus*) is often mixed in green gram dal as an adulterant. Khesari dal contains a toxic substance known as Beta-oxylyl amino alanine (BOAA). It is a neurotoxin amino acid and water-soluble. When *khesari* dal is consumed in large quantities (regularly) for a long period, it causes neuro- paralysis of the lower limbs known as Lathyrism. The method

of control is the detoxification of toxic substance through a simple household procedure, i.e. the toxin can be easily removed by soaking the dal in boiling water and discarding the water before cooking.

- **Metanil Yellow**: It is used in colouring green gram dal to get an attractive deep yellow colour. Metanil Yellow is a non-permitted coal tar dye commonly known as 'Kishori Rang', which is toxic and banned. It causes cancer. Food grade colours are available in the market, but traders use metanil yellow, as it is cheap.
- **Lead Chromate**: This is also used to colour green gram dal. It is one of the most toxic salts of lead. It can cause anaemia, paralysis, mental retardation and brain damage in children and abortion in pregnant women. This may cause irreparable damage to the human body system when eaten at regular intervals for a long period.

Adulteration is normally detected through laboratory tests. However, certain simple screening tests for the detection of adulterants are given below:

Table 6: Adulterants used in green gram dals (split) and their detection tests

Adulterants	Detection Test
1. *Khesari* dal (Botanical Name- *Lathyrus sativus*)	Add 50 ml. of diluted HCl acid to a small quantity of dal and keep on simmering water for about 15 minutes. Development of pink colour indicates the presence of khesari dal.
2. Metanil Yellow	Add concentrated HCl to small quantity of dal in a little amount of water. Immediate development of pink colour indicates the presence of metanil yellow and similar colour dyes.
3. Lead Chromate	Shake 5 grams of Green gram dal with 5 ml. of water and a few drops of HCl. Pink colour indicates presence of lead chromate.

Source: Central Agmark Laboratory, Directorate of Marketing and Inspection, Nagpur

3.5.2 Toxins

Toxins are the natural toxic substances present in some food materials, which may cause serious illness.

- **Aflatoxin:** Aflatoxin contamination is the most common occurrence in agricultural produce/food. Aflatoxin is one type of mycotoxins containing toxic substances, which are produced by moulds or fungi. Aflatoxins contamination may occur in pulses in the field itself, in farm storage and after processing, whenever environmental conditions i.e. high moisture/humidity and temperature, are favourable for the growth of fungi. Aflatoxins are produced by fungi, namely *Aspergillus flavus*, *Aspergillus ochraceus* and *Aspergillus parasiticus*. The aflatoxigenic Aspergilli is generally regarded as storage fungi.

The ingestion of aflatoxin suppresses the growth, productivity and immunity of human beings. Aflatoxins are carcinogenic, mutagenic and cause liver damage etc.

- **Prevention and control of Aflatoxins:**
    - Store the green gram after drying up to a safe moisture level, i.e. within the prescribed range.
    - Prevent the growth of aflatoxin by proper drying of grains.
    - Use proper and scientific storage.
    - Prevent insect infestation by chemicals to avoid mould formation.
    - Separate the infected grains from sound grains to avoid aflatoxin contamination.

3.6 Grading at Producers' Level under Agmark

There is an increasing recognition of the fact that producers need to be assisted in grading their produce before sale so that farmers may get a better price. For securing adequate returns to the producer/seller, the scheme of "Grading at Producers' Level" was introduced in 1962-63 by the Directorate of Marketing and Inspection. The main objective of this scheme is to subject the produce to simple test and assign a grade before it is offered for sale. After grading, the producers get prices commensurate with the quality of the produce.

3.6.1 Benefits:

1. Grading of the produce at producers' level enable farmers to get a higher price for their produce as well as it helps the consumers to get standard quality produce at a fair price.
2. Grading not only facilitates the dissemination of prices and market information but also assist the machinery of distribution at all stages.

Grading of green gram at producers level in the year 2017-18

S. No.	Year	Quantity (M.T.)	Value (Rs. Lakhs)
1	2017-18	5188.80	1421.33
2	2018-19	1806.10	971.98
3	2019-20	2783.60	1563.52

Source: Data provided by DMI

3.7 Packaging

Packaging is an important function for every produce, and so is in the marketing of green gram. It is a practice to protect the produce from any damage during storage, transportation and other marketing aspects. It is required at every stage of marketing, from the producer to the consumer. At present time, packaging plays an important role in the marketing of produce. The good packaging of green gram facilitates convenience in transportation and storage and attracts consumers to buy and pay a premium price. The packaging reduces the marketing cost and protects the quality.

3.7.1 Packaging materials

The following packaging materials are used in the packaging of green gram:

1) Jute bags: Gunny bags made up of jute are widely used by farmers and traders. As per NAFED, packing of Green gram should be made in New B Twill (Jute) gunny bags in 100 kg net.
2) HDPE/pp bags: These bags are also used for packaging green gram.
3) Polythene These are the jute bags blended with synthetics impregnated Jute bags.
4) Poly pouches: In recent years, green gram is packed in polypouches with attractive label and brand name. Generally, these are available in 1 kg., 2 kg. and 5 kg. pack size.
5) Cloth bags: Cloth bags are also used in packing green gram.

The good packaging material must possess the following qualities:

- It must protect quality and quantity.
- It must prevent spoilage during transit and storage.
- It must tell information about quality, variety, date of packing, weight and price etc.
- It must be convenient in handling operations.
- It must be convenient to stack.
- It must be cheap, clean and attractive.
- It must be biodegradable.
- It must be free from adverse chemicals.
- It should be useful after the first use.

3.7.2 Method of packing

- Pulses shall be packed in gunny bags/jute bags, poly woven bags, poly pouches, cloth bags or other suitable packages which shall be clean, sound, and free from insect, fungal infestation, and the packing material shall be as permitted under the Prevention of food adulteration rules, 1955.
- Pulses shall be packed in containers, which safeguard the hygienic, nutritional and organoleptic qualities of the products.
- The containers, including packaging material, shall be made of substances, which are safe and suitable for their intended use. They should not impart any toxic substance or undesirable odour or flavour to the product.
- The net weight of the Pulses in a package shall be as per the provision prescribed under the packaged commodities rules, 1977.
- Each package shall contain Pulses of the same type and of the same grade designation.
- Each package shall be securely closed and sealed, and marked.

3.8 Transportation

The transportation of green gram is mainly done by head loads, bullock or camel cart, tractor-trolleys, trucks, railways and ships depending upon the availability of transportation

means, the quantity of the produce and the stage of marketing. The most common means of transportation used are given in Table 7.

Table 7: Means of transportation used at different stages of marketing

Stage of Marketing	Agencies	Means of Transport Used
From threshing floor to the village market or primary market.	Farmers	By head load, pack animal, bullock or camel cart and tractor-trolley.
From primary market to secondary wholesale market and miller	Traders / Millers	By trucks, railways.
From wholesale markets and miller to retailer	Millers / Retailers	By trucks, railways, tractor trolley, mini trucks
From retailer to consumer	Consumers	By hand, bicycle, rickshaw.
For Export and Import	Exporters and Importers	By railways and ship

3.8.1 Availability of cheaper and convenient modes of Transport:

There are different modes of transport used in green gram transportation. Road and rail transport is normally used for internal markets, however, for export and import mainly Sea transport is used. The most common modes of transportation are

- **Road Transportation**: Road transport is the most predominant mode of transport used in the movement of green gram right from the producing fields to the ultimate consumer. The following means of road transport are used in different parts of the country to transport Green gram: a) Head Load b) Pack Animals c) Bullock cart d) Tractors Trolley e) Trucks
- **Railways:** Railway is one of the most important means of transportation of green gram. The railway is cheaper than road transport, and it is more suitable for long-distance, as well as for large quantities. The tariff charges for the transport of green gram depends on distance, quantity etc. Railway transportation requires more handling costs as it requires loading and unloading charges and local transportation costs.
- **Water Transport**: It is the oldest and cheapest mode of transport. It includes river, canal and sea transport. But only a few consignments of green gram are transported through internal waterways. The export and import of green gram are mainly done by sea transport. This transport system is slow but cheap and suitable for carrying a large quantity of green gram.

3.8.2 Selection of Mode of Transportation:

The following points should be considered for the selection of mode of transportation:

- The mode of transportation should be cheaper among available alternatives.

- It should be convenient during the loading and unloading of green gram.
- It must protect green gram during transportation from adverse weather conditions.
- It should be safe from pilferage etc.
- It must deliver green gram to the consignee in a stipulated period as price changes every day.
- It should be easily available, particularly during the post-harvest period.
- Distances should be considered.

3.9 Storage

The storage is an important aspect of post-harvest technology because green gram is seasonally produced (mainly during kharif season) but consumed throughout the year. Therefore, the supply of green gram has to be maintained by proper storage throughout the year. Storage protects the quality of grains from deterioration and helps in the stabilization of prices by regularising demand and supply. The storage losses caused by insects, rodents and microorganisms are more as compared to transportation, handling, processing. Lack of storage facilities at the village level forces the farmer to sell their produce, at a low price, immediately after harvest. It is essential that during storage, green gram should remain in good condition and not undergo any deterioration due to fungal and insect infection or attack by rodents.

3.9.1 Requirements for safe storage:

The following requirements should be fulfilled for the safe storage of green gram:

- **Selection of site (location):**

The storage structure should be located on a raised well-drained place. It should be easily accessible. The storage structure should be protected from humidity, excessive heat, direct sunrays, insect and rodents. Storage go-down should be constructed on a well-built platform at the height of not less than 1 foot from ground level to prevent dampness.

- **Selection of storage structure:**

The storage structure should be selected according to the quantity of green gram to be stored.

- **Cleaning of storage structures:**

The storage structures should be properly cleaned before storing green gram. There should be no leftover grains, cracks, holes and crevices in the structure, which may be a harbour of insects. Before storage, the storage structure should be fumigated.

- **Cleaning and Drying**

Before storage, the green gram should be properly cleaned and dried. Grains should be free from foreign matters and excessive moisture to avoid quality deterioration and pest attacks.

- **Cleaning of bags:**

As far as possible, new gunny bags should be used. The old gunny bags should be properly cleaned, dried and fumigated before use.

- **Separate storage of new and old stock:**

To check infestation and maintain the hygienic condition of the godown, the new and old stock should be stored separately.

- **Cleaning of vehicles:**

The vehicles used for transporting Green gram should be properly cleaned with phenyl.

- **Use of dunnage:**

Dunnage should be used before stacking bags to avoid the absorption of moisture from the floor. Bags should be kept on wooden crates or bamboo mats, preferably along with a cover of polythene sheet.

- **Proper aeration:**

There should be proper aeration during clear weather conditions, but care should be taken to avoid aeration during the rainy season.

- **Regular inspection:**

Regular inspection of stored green gram should be carried out to check infestation. It is necessary to maintain the proper health and hygiene of the stock.

3.10 Major storage pests and control measures

Post-harvest protection of pulses assumes greater importance in the overall crop protection system. All the efforts put in while raising the crop would go in vain if adequate measures are not adopted during storage. The produce is to be essentially stored for a longer or shorter duration, either for consumption or as seed for sowing during the next cropping season.

The various factors responsible for the deterioration of grains and seeds stored, which can be broadly classified under two categories:

1. Biotic factors	**2. Abiotic factors**
Insect	Moisture content
Rodents	Relative humidity
Birds	Temperature
Fungi	
Mites	
Bacteria	

Under varying combinations of biotic and abiotic factors, the grains and seeds get deteriorated, resulting in insect infestation, loss in weight, quality, germination, discolouration of the commodity, odour, unacceptability in the trade, and finally leading to huge monetary losses. A number of pests damage the produce during storage. These pests

cause both quantitative and qualitative losses. Pests of green gram also damage seed viability and nutritive value of the produce. The infestation of these pests depends on various factors like moisture content of the grain, relative humidity, temperature, storage structures, storage period, processing, unhygienic condition, fumigation frequency, etc. The major stored grain pests of green gram and their control measures are given below:

Name of pests	Figure of pest	Nature of damage	Control measures
1. Pulse beetle *Callosobruchus sps.*	 **Beetle**	i. The larvae bore into grains and feed the entire content of the grain, leaving behind the shell (seed coat). ii. Adults make circular holes in the seed iii. Often these insects begin their infestation when the pods are in the ripening stage in the field and are subsequently carried into storage after harvest along with the grains.	Two types of treatments are followed to manage infestation **A) Prophylactic treatment (preventive):** Use following insecticides to prevent infestation in go-down and stock of pulses: **1.Malathion (50 % EC):** Mix 1 litre in 100 litre of water. Use 3 litre prepared solution per100 m^2 area. Spray at every 15 days interval. **2.DDVP (76 % EC):** Mix 1 litre in 150 litre of water. Use 3 litre prepared solution per100 m^2 area. Do not spray on stock. Spray on walls and floors of the go-down as and when required or once in a month. **3.Deltamethrin (2.5% WP):** Mix 1 kg in 25 litre of water. Use 3 litre prepared solution per 100 m^2 area. Spray on gunny bags after 3 months interval.
2.Khapra beetle *Trogoderma granarium (Everts)*	 **Beetle**  **Larvae**	i. Larvae are one of the most serious stored grain pests, but the beetle itself does not damage.	

3. Dried bean weevil *Acanthoscelides obtectus (Say)*		i. Infestation is induced in the field on a ripening crop when pods are split open. ii. Larvae feed on the seed by boring. iii. It is reported to attack common bean under temperate conditions	**B) Curative treatment:** Use following fumigants to control pulses infested stock/godown. **1.Alluminium phosphide:** For stack fumigation, use 3 tablets/tonne and put polythene cover on infested stock. For go-down fumigation, use 120 to 140 tablets/100 m^3 volume and keep go-down structure airtight and closed for 7 days. **Rat cage:** Different types of rat cages are available in the market. Caught rats can be killed by dipping into water.
5.Confused flour beetle *Tribolium confusum J.du V.*		i. Beetle and larvae both feed on broken and damaged grains produced by milling and handling or attacking damaged grains of other insects.	
6. Rodents		ii. Rodents eat whole grains and split pulses. iii. They also cause mechanical damage to gunny bags and other storage structures by punctures, which results spilling of grains. iv. Rodents spill more grains than they consume. v. Rodents also contaminate pulses by hair, urine and faeces, which deteriorate the quality and cause many diseases, like cholera, food poisoning, ringworm etc.	

3.10.1 Insect Pest Management

A) Use of Chemicals

This is one of the important components of Insect Pest Management in grain and seed storage but warrants judicious use. In view of the problem of residue and health hazards involvement, the use of chemicals for direct mixing with the grain meant for consumption is not advised. The use is restricted to prophylactic treatment or mixing in the case of seeds. The use of BHC 5% or pyrethrum 0.06% dust @ 25 gm/m^2 area has been in practice for the treatment of the surface area of the stacks with the repeated application after an interval of 3 weeks as prophylactic treatment. A spray of BHC wettable powder, pyrethrum E.C. with an

interval of 3 weeks for repeat performance may be carried, the details of which are as follows:

BHC WP (50%)	3L/100 m^2	area Dilution 1:25
Pyrethrum (2.5 E.C.)	3L/100 m^2	area Dilution 1:300
Malathion (50 E.C.)	3L/100 m^2	area Dilution 1:300

For the preservation of seeds, malathion which has low mammalian toxicity, can effectively check insect infestation when applied @ 10 ppm. However, organophosphates viz. fenitrothion, pirimiphos methyl, bromophos, idofenfos, etrimphos may be used as seed protectants.

The most recent in use is the treatment of bags with deltamethrin W.P. (2.5%) @ 30 mg/m^2 surface area. It has been found to be a very promising prophylactic treatment. The problem of the development of resistance in insects to some of the insecticides due to indiscriminate use has forced us to search for alternative eco-friendly measures of grain protection.

B) Fumigation

For the control of insects and pests, the process of fumigation continues to play an important role in the protection of stored grains and seeds and is considered to be one of the most efficient methods. A fumigant may be defined as "A chemical which at required temperature and pressure can exist in a gaseous state in sufficient concentration to be lethal to a given pest organism". In the strict sense of the definition, a fumigant acts in gaseous form. It is generally felt that fumigation is resorted to when insect infestation has taken place, but the fact is that it also acts as a preventive device to get rid of the infestation in the empty go-down or storage structure prior to loading. Utmost care is needed while selecting a fumigant for use against stored seeds. The following points need to be given due consideration:

- The chemical may remain an undesirable residue.
- A physiologically active compound may impair the viability of seeds.
- Effect of repeated fumigation on the viability of seeds.

C) Altered/ Modified Atmosphere

Inert gases like carbon dioxide, nitrogen, carbon monoxide could be used. This method of grain protection with atmospheric conditions unfavourable for insect development is not new and has been used in the past without knowing how it works in underground pits in the soil. Purging air-tight containers with carbon dioxide increased to 70 per cent or above or reducing oxygen below two per cent is practised for disinfestation of stored grains. However, the process of altering the atmosphere has its limitations.

D) Use of Plant Products

In search of a safe, biodegradable substitute for chemical insecticides, a large number of plant products with antifeedant and deterrent or repellent quality have been used with promising results. The practise of adding a small quality of vegetable oil or mineral oil to grains of legumes to protect them from insects is common. Vegetable oils obtained from groundnut, mustard, rape, soybean, cottonseed, neem, palm, sesame, safflower, rice bran, etc., have been found effective. The treatment of oil results in the prevention of egg-laying, reduced fecundity, adult mortality, reduction in egg hatching, interference with larval development and finally reduces adult progeny. Mixing of local plants viz. neem kernel powder, custard apple seed powder, crushed dried fruits of black pepper has been found to be effective.

E) Good Storage Practices

The post-harvest system is a true example of insect pest management where one single method of protection will not suffice for the purpose of achieving the desired goal. There is a strong need to combine various processes. Insect pest management in the storage of grains can be divided into two heads. A) Preventive measures. 2). Curative measures.

1) Preventive Measures

- **Drying of Grains**

The moisture content of less than 9 per cent has been found to be safe and does not permit insects to breed. The grains may be dried to the desired moisture content by exposing them to solar radiation in thin layers on a cemented floor, or solar absorbance bed developed at Indian Agriculture Research Institute, New Delhi. Mechanical drier provided with hot air blowing process could also dry the grains on a larger scale.

- **Maintenance of Hygiene**

Dirt, rubbish, webbing or refuse material of the previous leftover grain should be swept from the store. Cracks and crevices, holes in the wall, floor or ceiling should be scrapped off and replaced by a new one. Rat holes should be closed, and stores be whitewashed. Turn inside out and expose to sun or fumigate if old bags are being reused to avoid any insect presence.

- **Use of Improved Storage Structures**

Properly dried grains should be stored in improved storage structures where ecological conditions viz. temperature, moisture, oxygen and carbon dioxide can be manipulated to suit the safe storage conditions.

- **Prophylactic Treatment**

Disinfestation of the go-down should be carried with chemical spray, dust or fumigation. Surface treatment of the bags with suitable persistent insecticide needs to be done. Seeds can be mixed with insecticide and fungicides.

- **Curative Measures**

It is advisable to treat the seeds with insecticide if the insect infestation has taken place for lapses, and in case of grains meant for consumption, be exposed to sun or fumigated with an appropriate fumigant.

3.11 Storage Structures

Some common structures are:

- Mud bins or Kothi: Cylindrical in shape and are made up of clay mixture with straw and cow dung or mud and bricks.
- Metal Drums: Cylindrical in shape and are made up of iron sheets.
- Thekka: Rectangular in shape and are made up of gunny or, cotton wound around wooden support.
- Gunny Bags: Gunny bags are made up of jute.

3.11.1 Improved storage structures:

The Government of India has made efforts to promote improved storage facilities at the farm level and launched a programme to impart scientific knowledge to farmers regarding the storage of grains known as the Save Food Grain Campaign. Indian scientists and agriculturists have designed and fabricated improved storage bins for the use of farmers, which are moisture-resistant and rodent-proof.

- **Improved bins:**
  - Pusa Kothi
  - Nanda bins
  - Hapur Kothi
  - PAU bins
  - PKV bins
  - Chittore stone bins etc.
- Warehouse: Warehouse is a scientific storage structure constructed and used by different organisations like CWC, SWC, NAFED etc.
- CAP Storage (cover and plinth): It is an economical way of storage on a large scale.
- Silos: Silos are used for the storage of food grains. Silos are made from bricks, concrete and metallic materials with automatic loading and unloading equipment.

3.12 Storage Facilities

Storage of the green gram is performed at different levels, i.e. at Producers' level, at Rural level, at Mandi level, at CWC and SWC level and at Co-operative level.

i) At Producer's Level:

Producers store green gram in various types of traditional and improved structures. Generally, these storage structures are used for a short period. Different organizations/institutions have developed improved structures for the storage of green gram with varying capacities and shape like Hapur Kothi, Pusa Kothi, Nanda bins, PKV bins.

These are usually constructed on a raised platform or plinth constructed of plastered mud brickwork, stone slabs or wooden planks. Some producers also store green gram in jute gunny bags or gunny bags lined with polythene stacked in the living room.

ii) At Rural Level:

Considering the importance of rural storage in the marketing of agricultural produce, the Directorate of Marketing and Inspection initiated a Rural Go-down Scheme, in collaboration with NABARD and NCDC, to construct scientific storage go-down with allied facilities in rural areas and to establish a network of rural godowns in the States and Union Territories.

Increased requirement of rural storage has been necessitated on account of the increase in the production of food grain and its continuing increasing trend.

iii) At Mandi level:

Most of the States and Union Territories have enacted Agricultural Produce Market (Regulation) Act. The reduction of loss of produce was aimed in the scheme of the regulated market. The regulated markets developed modern market yards with necessary infrastructural facilities. The APMCs have constructed auction platforms for protecting the produce from rains and dampness. Go-downs have been constructed so that the agricultural produce brought into the market should be stored safely by market committees. The produce is auctioned, weighed in the presence of the producer/seller at the time of keeping the produce in the go-down after grading and a receipt is issued indicating the quality and weight of produce to be stored. The receipt is issued by the licensed general commission agents or brokers, depending upon the case. The CWC, SWC and Co-operative societies have also constructed go-down in the market yards.

In most secondary and terminal regulated markets, central and state warehousing corporations also provide scientific storage facilities at prescribed storage charges and issue warehousing receipts against pledge of produce, which is a negotiable document for obtaining finance from the Scheduled Banks.

iv) CWC & SWC level:

a) Central Warehousing Corporation (CWC):

CWC was established in 1957. It is one of the biggest public warehouse operators in the country. CWC is operating 422 warehouses across India with a storage capacity of 10.1 million tonnes.

Warehousing activities of CWC include foodgrain warehouses, among other activities. Along with storage and handling, CWC also offers services in the area of clearing & forwarding, handling &transportation, procurement & distribution, disinfestation services, fumigation services and other ancillary activities. Further, CWC also provides consultancy services/ training for the construction of warehousing infrastructure to different agencies (http://cewacor.nic.in/index.php).

State-wise storage capacity with CWCs as on 31.03.2021

State	Region	Warehouses	Total Capacity (MT)
Andhra Pradesh	Hyderabad	26	837890
Arunachal Pradesh	Guwahati	1	3340
A&N Island UT	Chennai	1	2700
Assam	Guwahati	12	109007
Bihar	Patna	16	167095
Chandigarh UT	Chandigarh	1	12217
Chhatisgarh	Bhopal	10	232750
Delhi	Delhi	8	144442
Goa	Mumbai	2	36396
Gujarat	Ahmedabad	24	725604
Haryana	Chandigarh	26	745052
Himachal Pradesh	Chandigarh	3	8850
Jharkhand	Patna	5	77696
Karnataka	Bangaluru	24	478058
Kerala	Kochi	11	169460
Madhya Pradesh	Bhopal	25	684026
Maharashtra	Mumbai	25	616828
Maharashtra	Mumbai (CFS, IRT, logistic)	5	731773
Manipur	Guwahati	2	7140
Nagaland	Guwahati	1	13000
Odisha	Patna	23	395443
Puducherry UT	Chennai	1	7350
Punjab	Chandigarh	25	899668
Rajasthan	Jaipur	30	798068
Tamil Nadu	Chennai	24	690794
Telangana	Hyderabad	17	1941598
Tripura	Guwahati	2	25403
Uttar Pradesh	Delhi	8	235880
Uttar Pradesh	Lucknow	36	861093
Uttarakhand	Lucknow	7	77617
West Bengal	Kolkata	23	695294
Total		422	12454422

Source: Annual Report, 2020-21, Central Warehousing Corporation, New Delhi.

b) State Warehousing Corporation (SWCs):

Different states have set up their own warehouses in the country. The areas of operation of the SWC are district places of the state. The total share capital of the state warehousing corporations is contributed equally by the Central Warehousing Corporation and the concerned State Government.

State-wise storage capacity with SWCs as on 31.03.2021

State	No. of Centres	Capacity in Lakh MT
Andhra Pradesh	149	15.72
Assam	42	2.03
Bihar	63	8.39
Chhatisgarh	135	19.69
Gujarat	45	4.56
Haryana	111	19.15
Karnataka	154	18.05
Kerala	55	2.45

Madhya Pradesh WLC	276	171.49
Maharashtra	204	21.33
Meghalaya	6	0.18
Odisha	69	5.35
Punjab	120	55.74
Rajasthan	93	14.74
Tamil Nadu	60	7.77
Telangana	311	23.88
Uttar Pradesh	157	39.61
Uttarakhand	13	1.31
West Bengal	140	7.68
Total	2203	439.12

Source: Annual Report, 2020-21, Central Warehousing Corporation, New Delhi.

v) Co-operative storage:

Cooperative storage facilities are provided to the producer at cheaper rates, which reduces the storage cost. These cooperatives also provide pledge loans against the produce, and storage is more systematic and scientific than traditional storage. Financial assistance and subsidies are provided by Government organisations/banks to build cooperative storage. To meet the increasing need for storage capacity, the National Cooperative Development Corporation (NCDC) encourages the construction of storage facilities by cooperatives, particularly at rural and market levels.

State-wise storage capacity with Cooperatives as on 31.03.2021

State	Rural level (No.)	Market level (No.)	Capacity in MT
Andhra Pradesh	4013	899	728304
Arunachal Pradesh	5	7	3250
Assam	770	265	299550
Bihar	2455	496	557600
Chhattisgarh	80	121	351550
Gujarat	1868	456	731410
Haryana	1490	457	1315789
Himachal Pradesh	1644	210	205815
J&K	133	45	23200
Jharkhand	139	4	14292
Karnataka	5223	966	1194921
Kerala	2142	145	362025
Madhya Pradesh	5497	1121	1528495
Maharashtra	3864	1528	2323090
Manipur	158	18	26130
Meghalaya	90	59	35500
Mizoram	124	9	14286
Nagaland	116	14	16400
Odisha	1951	595	486780
Punjab	3887	830	1987690
Rajasthan	4793	396	575820

Tamil Nadu	4759	411	983728
Telangana	5	0	6030
Tripura	186	19	24185
UTs	0	5	10900
Uttar Pradesh	9300	797	2107190
Uttarakhand	60	42	88800
West Bengal	2837	473	485360
NAFED	0	9	40200
NCCF	0	1	10000
Total	57590	10398	16538290

Source: Annual Report 2020-21, NCDC, New Delhi.

3.13 Pledge Finance System

The farmers are often compelled to sell their produce immediately after harvest when the prices are low. Micro-level studies indicate that distress sales by small farmers account for about 50% of the marketable surplus. To avoid such distress sales, the Government of India promoted Pledge Finance Scheme through a network of rural godowns and a negotiable warehouse receipt system. Through this scheme, small and marginal farmers can get immediate financial support to meet their requirements and retain the produce till they get a remunerative price. According to the RBI guidelines, loan/advances up to 75 per cent of the value of the produce stored in the go-down can be advanced to farmers against pledge/hypothecation of agricultural produce (including warehouse receipts) subject to a ceiling of Rs. 5 lakh per borrower.

Such loan is given for a period of 6 months, which can be extended up to 12 months based on financing banks commercial judgement. The commercial banks/co-operative banks/RRBs provide credit to the farmers for the produce stored in the go-down under this scheme. The banking institutions accept the go-down receipts on its being duly endorsed and delivered to the bank for pledge loan against hypothecation of produce as per RBI guidelines. Farmers are given the freedom to take back their produce once the pledge loan is repaid. The facility of pledge finance is extended to all farmers, whether they are the borrowing members of Primary Agricultural Credit Societies (PACS) or not, and the District Central Cooperative Banks (DCCBs) can directly finance individual farmers on the strength of the pledge.

3.13.1 Benefits of Pledge finance scheme

- This increases the retention capacity of the small farmers, which consequently also enable the farmers to avoid distress sale.
- This minimises the farmer's dependency on the commission agents as the pledge finance provide financial support to them immediately after the harvest period.
- Participation of the farmers, irrespective of their landholding size, increases the arrivals in the market yard throughout the year.
- This gives a sense of security to the farmers even if their produce is not sold out in the market yard immediately.

4.0 Marketing Practices and Constraints

4.1 Assembling (Major Assembling Markets)

Assembling is an important marketing function. Assembling includes the operation of collecting green gram produce from different villages to a central place, i.e. primary market and secondary market for its further movement to the dal millers or the consumers.

Some major assembling markets of different states are given in Table 8.

Table 8: Major assembling markets of different states

Sl. No	Name of State	Name of Dist.	Location / Place of Regulated Markets	Whether Primary / Sub- Market	Distance from District H.Q. (km)
1	Andhra Pradesh	East Godawari	Kakinada	Primary	0
			Kothapeta	Primary	65
			Ambuje Peta	Primary	60
			Rajanmundri	Primary	70
			Bikkavole	Primary	30
			Mulkipuram	Primary	90
			Tinu	Primary	80
		Prakasam	Ongole	Primary	0
			Addaniki	Primary	40
			Markapur	Primary	90
			Kambam	Primary	115
			Kondepi	Primary	30
			Santanutllapady	Primary	20
2	Telangana	Nalgonda	Nalgonda	Primary	0
			Miryalguda	Primary	60
			Suryapet	Primary	60
			Bhoungir	Primary	75
			Makrekal	Primary	30
			Thirumalgiri	Primary	70
			Valigonda	Primary	50
			Choutuppal	Primary	50
			MOtnkur	Primary	70
		Medak	Sadashiupet	Primary	18
			Zaheerubad	Primary	60
			Jogipet	Primary	30
		Karimnagar	Karim Nagar	Primary	0
			Jogityal	Primary	50
			Dharmavaram	Primary	40
			Gangadhara	Primary	25
			Choppadandi	Primary	18
3	Gujarat	Banaskantha	Palanpur	Principal	3

			Deera	Principal	25
			Chunera	Principal	50
			Panthuwada	Principal	70
			Bhabhur	Principal	88
			Thura	Principal	80
			Tharal	Principal	81
		Mensena	Mensena	Principal	2
			Kadi	Principal	60
			Vadnagar	Principal	35
			Vigapur	Principal	45
			Visanagar	Principal	30
		Kutchh (H.Z. Bhuj)	Bhuj	Principal	5
			Mandavi	Principal	50
			Anjar	Principal	34
			Bachan	Principal	64
			Rapar	Principal	84
			Mundra	Principal	52
5	Karnataka	Bangalore (U)	Bangalore	Terminal	0
		Mysore	Mysore	Primary	0
		Gulbarga	Gulbarga	Primary	0
			Sedam	Primary	55
			Yadgir	Primary	72
		Bidar	Bidar	Primary	0
			Bhulki	Primary	40
		Raichur	Raichur	Primary	0
		Dharwad	Dharwad	Primary	0
			Hubli	Primary	20
		Gadag	Gadag	Primary	0
			Laxmeshwar	Primary	36

6	Maharashtra	Parbhani	Parbhani	Primary	0
			Gangakhed	Primary	45
			Jintur	Primary	45
			Manwat	Primary	40
			Purna	Primary	42
			Selu	Primary	48
			Pathuri	Primary	48
			Palamr	Primary	60
7	Orissa	Anugul	Anugul	Principal	0
		Balangir	Balangir	Principal	0
		Cuttack	Kendupatana	Principal	33
		Jagatsingpur	Jagatsingpur	Principal	0
		Jajpur	Jajpur	Principal	0
		Kalahandi	Junagarh	Principal	26
			Bhawanipatha	Principal	0
			Kesinga	Principal	35
		Khurda	Balugoan	Principal	65
		Mayurbhanj	Baripada	Principal	0
		Sundarfarh	Sargipalli	Principal	18
8	Rajasthan	Nagaur	Nagaur	Primary	N.A.
			Merta city	Primary	N.A.
			Kucneman city	Primary	N.A.
		Tonk	Malpura	Primary	N.A.
		Ajmer	Kekri	Primary	N.A.
		Jodhpur	Jodhpur	Primary	N.A.
9	Tamil Nadu	Salem	APMC Salem	Primary	0
			APMC Authur	Primary	60
		Namakkal	APMC Namakkal	Primary	0
		Virudhunagar	APMC Virudhunagar	Primary	0
		Tuti corin	APMC Tuticorin	Primary	0
			APMC Kovilpatti	Primary	60
		Coimbatorer	APMC Coimbatorer	Primary	0

		Thanjavur	APMC Tanjavur	Primary	0
		Erode	APMC Erode	Primary	0
10	Uttar Pradesh	Miruit	Miruit	Primary	10
		Ghaziabad	Ghaziabad	Primary	16
		Mainpuri	Mainpuri	Primary	3
		Hathras	Hathras	Primary	5
		Barilly	Barilly	Primary	10
		Moradabad	Moradabad	Primary	8
		Kanpur Nagar	Kanpur	Primary	15
		Allahabad	Allahabad	Primary	15
		Laliptur	Laliptur	Primary	5
		Varanashi	Varanashi	Primary	5
		Lakhow	Lakhow	Primary	8
		Saharanpur	Saharanpur	Primary	10
11	West Bengal	Madinapur West	Kharagpur	Primary	14
		Madinapur	Contai	Principal Market	50
		24 Pargana South	Barbipur	Sub- Market	30
			Jaya Nagar	Sub-Market	40
		Burdwan	Asansale	Principal Market	90
		Purulia	Purulia	Principal Market	3
		Nadra	Bellanadhani	Principal Market	33
			Karimpur	Principal Market	90
		Malda	Samuc	Principal Market	60
		Birbhun	Suithana	Sub-Market	40
		Coochbehar	Coochbehar	Principal Market	2
		Darjiling	Darjiling	Principal Market	2.5

Source: Previous commodity profile report

4.2 Trends in prices and arrivals

The disposal of green gram commences shortly after threshing since the producers require funds for the purpose of discharging their various financial obligations. The trends in prices, arrivals and minimum support prices have been depicted in Figure 3.

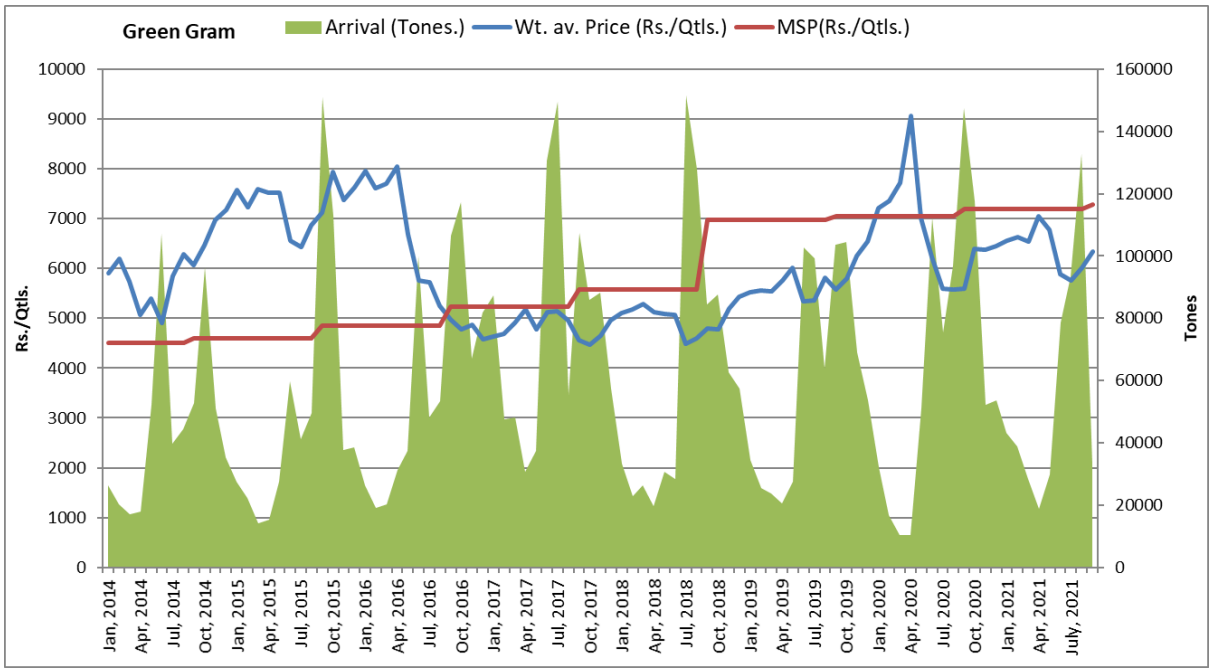


Figure 3: Arrivals, weighted average price and MSP of green gram in India

Arrivals of green gram

State	Sept 2018 to Aug 2019		Sept 2019 to Aug 2020		Sept 2020 to Aug 2021	
	Arrivals (Tonnes)	Weighted Avg. Modal Price (Rs./Qtl.)	Arrivals (Tonnes)	Weighted Avg. Modal Price (Rs./Qtl.)	Arrivals (Tonnes)	Weighted Avg. Modal Price (Rs./Qtl.)
Madhya Pradesh	230088	5225	294474	5772	309749	5919
Rajasthan	155701	5144	156384	6011	161516	6463
Karnataka	122535	5233	117266	6135	205559	5937
Maharashtra	61817	4993	63931	6123	66888	6259
Uttar Pradesh	58134	5064	34915	6569	43433	6435
Gujarat	8691	5643	26759	6426	26220	6162
West Bengal	16290	7284	14801	8781	13124	10512
Assam	20307	7155	11865	7564		
Telangana	8770	4846	11579	5325	11044	4615
Kerala	2775	7642	2290	9522	2234	10589
All India	689805	5308	736806	6094	840764	6081

Source: Data provided by DMI.

4.3 Despatches, Distribution and Inter-state movements

Pulses including green gram were mostly despatched to the markets within the state or to the markets of the adjoining states with the exception of Bengal gram which is sent to other states also. Assembling and distribution of the agricultural produce are interlinked. The assembling deals with the movement of the Green gram from the farm to the assembling centre, while the distribution deals with its further movement to the consumer.

Following agencies are involved in the distribution of green gram in whole and or split husked form at various stages:

Producers	Commission Agents or, *Arhatias*
Village Traders Miller	Representative of Dal
Itinerant Traders organisations	Co-operative
Wholesale merchants organisations	Government
Retailers	

4.4 Export and Import

Table 9: Important statistics on green gram in India

Year	2018-19	2019-20	2020-21
Production (million tonnes)	2.46	2.51	3.09 (4th Advance Estimates)
MSP(Rs./Qtl.)	6975	7050	7196
Procurement (tonnes)	407309	306960	166051
Import (lakh tonnes)	0.84	0.69	0.82
Export (thousand tonnes)	11.31	13.34	13.06

Source: Commodity Profile for Pulses and DACFW

4.4.1 Export

During 2021-22, India exported 27.65 thousand tonnes of green gram to other countries. The important overseas markets for export of green gram from India were China, USA, Nepal, Canada, UK, etc.

Table 10: India's export of green gram

Country / Region	Values in Rs. Lacs		Quantity in tons	
	2020-2021	2021-2022	2020-2021	2021-2022
CHINA P RP		9,453.71		12,276.67
U S A	3,681.92	4,108.49	3,169.91	3,586.24
NEPAL	1,708.53	2,968.95	2,345.97	3,736.67

CANADA	1,257.10	2,392.04	1,289.42	2,506.63
U K	2,328.01	1,512.89	2,287.36	1,595.31
NETHERLAND	307.8	724.98	466.61	653.87
QATAR	473.51	569.83	532.31	669.39
U ARAB EMTS	267.06	534.49	251.47	665.99
SINGAPORE	225.76	259.9	206.81	227.96
Total	12,588.86	24,269.73	13061.82	27649.96

Source: Department of Commerce; HS Code 07133190

4.4.2 Import

During 2021-22, India imported 1.96 lakh tonnes of green gram from other countries. The value of import of green gram by India during 2020-21 was Rs. 128,280 lakh.

Table 11: India's import of green gram

Country / Region	Values in Rs. Lacs		Quntity in tons	
	2020-2021	2021-2022	2020-2021	2021-2022
MOZAMBIQUE	12,227.44	38,481.06	19,863.00	61,892.05
MYANMAR	713.57	21,320.31	923	31,725.58
TANZANIA REP	9,440.24	18,890.87	14,491.89	32,011.04
AFGHANISTAN		16,743.77		21,074.19
BRAZIL	6,734.33	9,517.90	9,216.33	14,563.54
ARGENTINA	329.55	5,011.71	439.77	7,902.32
KENYA	17,158.87	4,204.28	24,154.65	6,010.22
U ARAB EMTS	2,371.25	4,188.64	3,181.00	6,630.65
SOUTH AFRICA	1,677.15	4,155.33	2,009.26	5,196.37
AUSTRALIA	2,523.78	1,380.03	2,585.35	1,614.32
Total	56,483.52	128,280.24	81842.36	195557.1

Source: Department of Commerce; HS Code 07133190

4.5 Sanitary and Phyto-Sanitary requirements

The agreement on Sanitary and Phyto-sanitary (SPS) measures is a part of the GATT Agreement, 1994, for export and import trade. The aim of the agreement is to prevent the risk of the introduction of new pests and diseases in the new regions, i.e. importing countries. The main purpose of the agreement is to protect human health, animal health, and the phyto-sanitary situation of all member countries and protect the members from arbitrary or unjustifiable discrimination due to different Sanitary and Phyto-sanitary standards.

When SPS Required:

The SPS agreement applies to all Sanitary and Phyto-sanitary measures, which may directly or indirectly affect international trade. Sanitary measures deal with human or animal health, and Phyto-sanitary measures are related to plant health. SPS measures are applied in four situations for the protection of human, animal or plant health:

- Risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease causing organisms.
- Risks coming from additives, contaminants, toning or disease-causing organisms in foods, beverages or feedstuffs.
- Risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment, or spread of pests.
- Prevention or limitation of damage caused by the entry, establishment or spread of pests.

The SPS standards commonly applied by Governments as they affect imports are:

- Import Bans (Total/partial) are generally applied when there is a significant rate risk about a hazard.
- Technical specification (Process standards/Technical standards) are the most widely applied measures and permit import subject to compliance with pre-determined specification.
- Information Requirements (Labelling Requirements/Control on Voluntary claims) permit imports, provided they are appropriately labelled.

4.5.1 Procedure for issue of SPS certificate for export:

In order to make plant materials free from quarantine and other injurious pests to conform with the prevailing phyto-sanitary regulations of the importing country, the exporter needs to give a suitable disinfestation/disinfection treatment without affecting the viability for sowing/edibility of the plants/seeds.

For plant materials (seed, meal, extraction, etc.) meant for export, the Government of India has authorised some Private Pest Control Operators (PCO) who have the expertise, men and materials for treating the export agricultural cargo / produce. The exporter has to apply to the officer in charge (Plant Protection and Quarantine Authority, Department of Agriculture and Cooperation) for a phyto-sanitary certificate (PSC) in a prescribed application for at least 7 to 10 days in advance of the export. Before submitting the application for the issue of PSC, it should be ensured that the cargo is treated properly by the licensed PCO.

4.6 Export Procedures

The exporter should keep in mind the following laid down procedure during the export of green gram from India: -

- Registration with RBI. (Apply in the prescribed form (CNX) to obtain code number. This code number is to be quoted on all export papers).
- Importer-Exporter code (IE code) number is to be obtained from the Director General of Foreign Trade (DGFT).
- Register with Agricultural and Processed Food Products Export Development Authority (APEDA) to obtain registration cum membership certificate. This is required to obtain permissible benefits from the Government.

- Exporter can now procure their export orders.
- Quality of the produce is to be assessed by the inspecting agency and a certificate is issued to this effect.
- Produce is now shifted to port.
- Obtain marine insurance cover from any Insurance Company.
- Contact the Clearing and Forwarding (C&F) agent for sorting the produce in godowns and to get the shipping bill for allowing shipment by the Custom Authority.
- Shipping Bill is submitted by C & F agent to custom house for verification and verified shipping bill is given to the shed superintendent to obtain carting order for export.
- The C&F agent presents shipping bill to preventive officer for loading into ship.
- After loading into ship, a mate's receipt is issued by captain of ship to the superintendent of the port, who calculates port charges and collect the same from the C&F agent.
- After the payments, C&F agent takes mate's receipt and requests port authority to prepare bill of loading to the respective exporter.
- Then C&F agent sends the bill of loading to the respective exporter.
- After receiving the documents, exporter obtains a certificate of origin from chamber of commerce, stating that the produce is of Indian origin.
- Importer is informed by exporter regarding date of shipment, name of vessel, bill of loading, customer's invoice, packing list etc.
- Exporter submits all documents to his bank for verification and bank verifies the papers against original letter of credit.
- After verification, bank sends documents to foreign importer to enable him to take delivery of produce.
- After receiving papers, importer makes payment through bank and sends the GR form to RBI, an evidence of realisation of export proceeds.
- Exporter now applies for various benefits from duty drawback schemes.

4.7 Marketing Constraints

The following are the main marketing constraints in green gram:

- **Distress sale:**

Due to the financial crisis, farmers are forced to sell their produce just after harvesting. During this period, farmers get lower prices due to glut in the market. The producers cannot withhold or store their produce for some period to get more prices since the farmers have to meet the urgent requirement of money.

- **Unstable price:**

Generally, the price of green gram goes down or prevails low in the early post-harvest period due to more arrivals in the market and later on, prices go up. Due to unstable price levels, the farmers get a lower price in the market.

- **Lack of Marketing Information:**

Due to lack of information regarding arrivals and prices prevailing in other markets, producers market the Green gram in the village and nearby market at a lower price, which can be avoided.

- **Adoption of Standards:**

Farmers usually do not grade their produce; as a result, they do not get remunerative prices in the market.

- **Inadequate storage facilities at rural stage:**

Due to inadequate storage facilities at the rural stage, farmers lose a substantial quantity of their produce by way of driage, spoilage, rodents etc. Farmers are also forced to sell their produce just after harvest due to a lack of storage facilities. So rural godowns are a must to avoid the sale immediately after the harvest so as to enable to get more prices to producers.

- **Transportation facilities at producers' level:**

Due to inadequate transportation facilities at the village level, producers sell their green gram to traders directly from their farm or in the village, which offers them a lower price than prevailing prices in the markets.

- **Training to producer:**

The training to producers regarding the marketing of their produce is required. It improves their skill for better marketing of their produce.

- **Infrastructure facilities:**

Due to inadequate infrastructure facilities at producers, traders and market levels, the marketing of green gram is affected adversely.

- **Malpractices of markets:**

There are many malpractices prevailing in markets like excess weighment, delay in payment, a large quantity of samples from the produce, different kinds of arbitrary deductions for religious and charitable purposes from producers, high commission charges, delay in weighing, loading, unloading and weighing charges from producers.

- **Superfluous middlemen**:

A long chain of middlemen reduces the share of the consumer's price received by the actual cultivator/producer.

4.8 eNam

National Agriculture Market (eNAM) is an all India electronic trading portal which connects the existing APMC mandis to create a unified single national market for agricultural commodities.

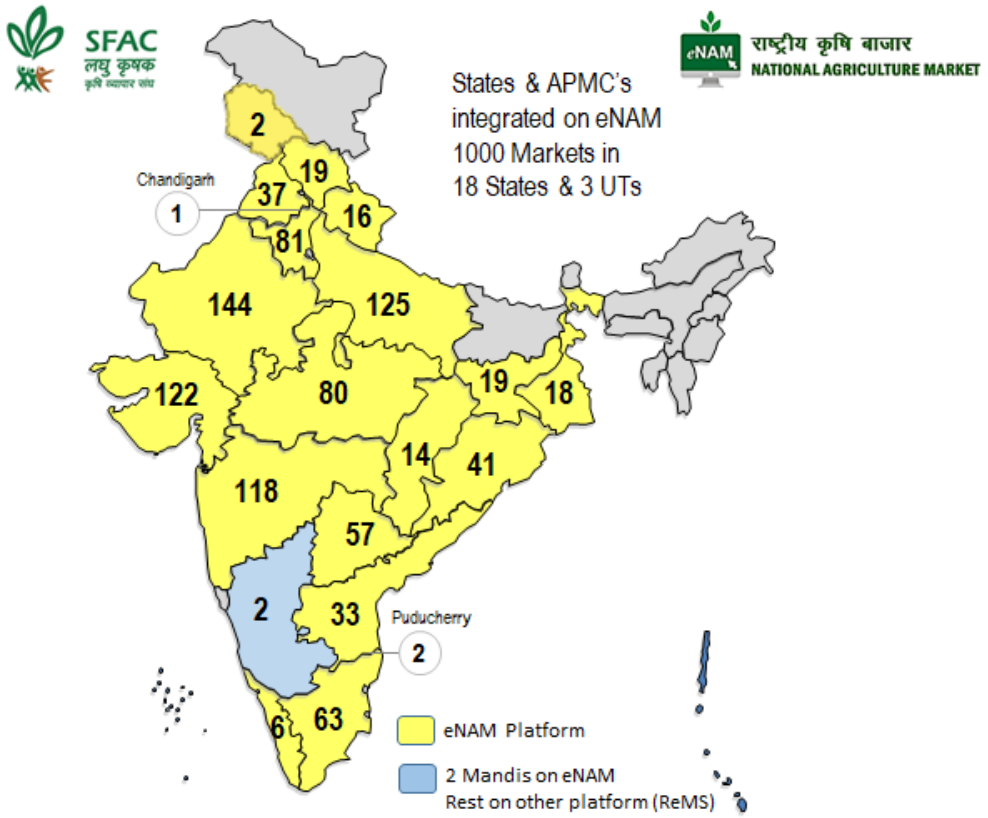
The lead agency for implementing eNAM under the aegis of Ministry of Agriculture and Farmers' Welfare, Government of India is Small Farmers Agribusiness Consortium (SFAC).

4.8.1 Vision of eNam

The vision of eNam is to promote uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.

4.8.2 Mission of eNam

The mission of eNam is integration of APMCs across the country through a common online market platform to facilitate pan-India trade in agriculture commodities, providing better price discovery through transparent auction process based on quality of produce along with timely online payment.



Source: eNam (https://www.enam.gov.in/web/)
For more, refer https://www.enam.gov.in/web/.

5.0 Marketing Channels, Costs and Margins

5.1 Marketing Channels

The following are the important marketing channels that exist in the marketing of green gram.

A) Private Marketing Channel:

This is a traditional channel and the most common marketing channel in India. The main private marketing channels for green gram are as under:

i) Producer → Dal Miller → Consumer

ii) Producer → Village Trader → Dal Miller → Wholesaler → Retailer → Consumer

iii) Producer → Dal Miller → Retailer → Consumer

iv) Producer → Wholesaler → Dal Miller → Retailer → Consumer

v) Producer → Wholesaler → Dal Miller → Wholesaler → Retailer → Consumer

vi) Producer → Wholesaler → Retailer → Consumer (For whole green gram)

vii) Producer → Commission Agent → Dal Miller → Wholesaler → Retailer → Consumer

B) Institutional Marketing Channel:

Some institutions have been entrusted with marketing activities of green gram like NAFED. NAFED is the nodal agency for procuring green gram through providing minimum support prices to the farmers for their produce. The main institutional marketing channels for green gram are as under:

Producer → Procuring Agency → Dal Miller → Consumer

Producer → Procuring Agency → Dal Miller → Wholesaler → Retailer → Consumer

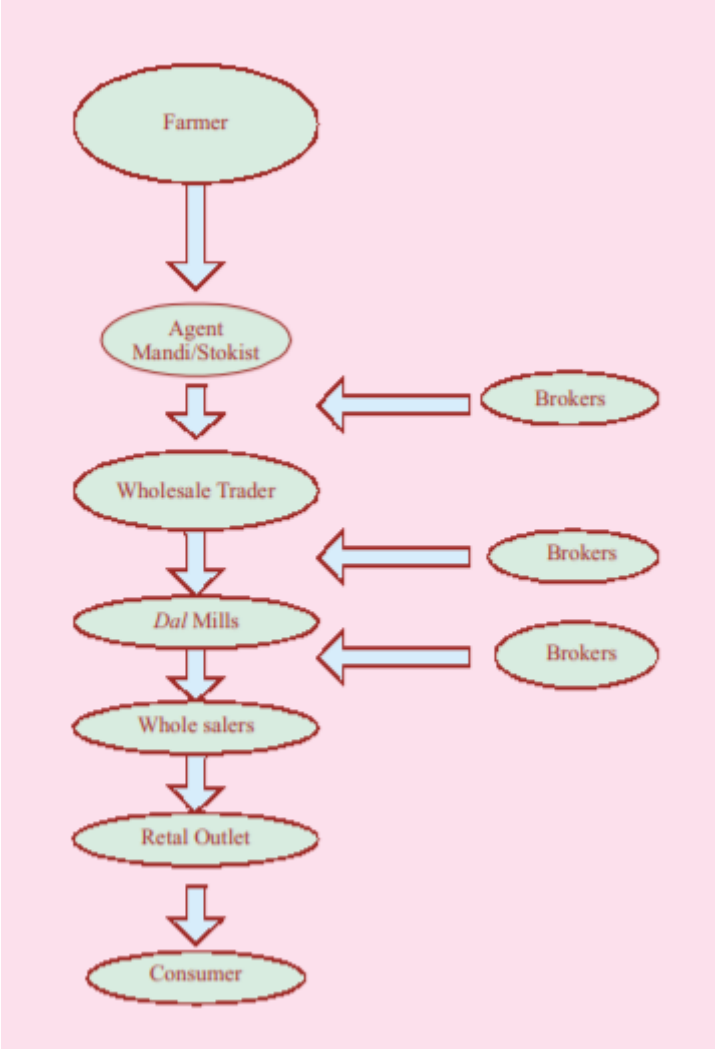
Producer → Procuring Agency → Dal Miller → Retailer → Consumer

Criteria for selection of channels:

The following criteria should be considered while selecting a marketing channel:

- The channel, which ensures a higher share to producers and provides lower prices to consumers, is considered the most efficient channel.
- Selection should be for a shorter channel having lower market cost.
- Avoid the longer channel having more intermediaries causing higher market cost and lower producer's share.
- Select the channel which distributes the produce appropriately at least expense and secures the desired volume of disposal.

Marketing channels are depicted below.



Source: Post Harvest Management of Pulses, IIPR, Kanpur

5.2 Marketing Costs and Margins

5.2.1 Marketing costs

Marketing costs refer to the expenses incurred in the flow of goods and services from the producer to the final consumers.

The marketing costs normally include:

- handling and assembling charges at local levels
- transport and storage costs
- handling charges by wholesaler and retailer
- expenses on secondary services such as financing, risk-taking and market intelligence; and
- profit margins taken out by different agencies.

5.2.2 Marketing margins

Margin refers to the difference between the price paid and received by a particular marketing agency or by a combination of marketing agencies in the marketing system as a whole.

Total marketing margin includes cost involved in moving Bengal gram from producer to consumer and profits of various market functionaries involved in the process.

The absolute value of the total marketing margin varies from market to market, channel to channel and time to time.

- Market fee: It is charged either on the basis of weight or on the basis of the value of the produce. It is usually collected from the buyers. The market fee differs from state to state and market to market.
- Commission: The charges are usually made in cash and vary from market to market. It is paid to the commission agents and may be payable either by the seller or by the buyer or sometimes by both buyer and seller.
- Taxes: Different taxes are charged in different markets, such as toll tax, terminal tax, sales tax, octroi etc. These taxes differ from market to market in the same state and also from state to state. These taxes are usually payable by the seller.
- Miscellaneous charges: Those include handling, weighing, loading, unloading, cleaning, charity contribution in cash and kind etc. These charges may be payable either by the seller or by the buyer.

6.0 Marketing Information and Extension

6.1 Marketing Information

Marketing information is a key function to make efficient marketing decisions, regulate the competitive marketing processes and restrict the monopoly or profiteering individuals in the market. It is needed by producers in planning the production and marketing of their produce and is equally required by other market participants. Farmers need to be fully familiarized with different areas of agricultural marketing in order to improve price realization. Marketing information is important at all the stages of marketing, right from farm level to ultimate consumption level and simultaneously for all the participants in these stages, i.e. producers, traders (millers), consumers, etc. It is the key to achieve both operational and pricing efficiency in the marketing system.

6.2 Marketing Extension:

Marketing extension is a vital factor in enlightening the farmers about proper marketing of their produce and removal of their marketing problems. It envisages educating the farmers, traders and consumers for bringing desired changes in their knowledge, skills, attitude and behaviour. In the present global agricultural scenario, the farmers need to be educated to accept modern market-oriented farming by taking care of productivity, quality and market demand. Farmers need to reorient their cropping pattern as per the market demand. The farmers should keep pace with fast-changing technology, economic reforms, consumer awareness and new export-import policies for agricultural commodities.

An effective marketing extension service is the need of the hour. This has assumed even greater importance in the light of the fast-changing business environment as a result of the liberalization of the economy under the WTO Agreement. The marketing extension functionaries should disseminate the complete, accurate and latest market information to the grass-root level in areas such as market-driven production programme, post-harvest management, availability of marketing finance, facilities for grading, packaging, storage, transportation, online market information system, marketing channels, contract farming, direct marketing, alternative markets including forward and future markets etc.

6.2.1 Benefits of Marketing Information and Extension:

Marketing information and extension is important for all the concerned participants of agricultural marketing.

- Producers: In the present situation, an effective market information and extension service facilitates decision making about when, where and how to market Green gram.
- Consumers: With the help of market information and extension, producers will produce green gram according to consumer preferences for fetching remunerative price.
- Traders: Market information and extension foster true competition among the market players. It helps them to decide on purchase, sale and storage of green gram by

knowing the trend of arrivals, demands, consuming centres, grading, packaging, stock position etc., in the markets.

- Government: Market information plays a vital role in formulating appropriate agricultural policies about procurement, export and import, minimum support price.

6.2.2 Sources of Marketing Information:

In our country, there are a number of sources/institutions that are directly or indirectly disseminating marketing information and providing extension services as summarised:

Sources / Institutions	Activities for Marketing Information and Extension
1.Directorate of Marketing and Inspection (DMI), NH-IV, CGO Complex, Faridabad. Website: http://agmarknet.gov.in/	• Provides information through nationwide Marketing Information Network (Agmark net portal). • Marketing extension through training to Consumers, Producers, Graders, etc. • Marketing Research and Survey. • Publication of reports, pamphlets, leaflets, Agricultural Marketing journals, Agmark Grade standards etc.
2. Agricultural Produce Market Committee (APMC)	• Provides market information on arrivals, prevailing prices, despatches etc. • Provides market information of adjoining / other market committees. • Arranges training, tours / exhibitions etc.
3. Directorate General of Commercial Intelligence and Statistics (DGCIS), Kolkata http://dgciskol.gov.in/	• Collection, compilation and dissemination of marketing related data i.e. export-import data, inter state movement of foods grains etc.
4. State Agricultural Marketing Boards at different state capital	• Provide marketing related information to co-ordinate all the market committees in the state. • Arrange seminars, workshops and exhibitions on subject related to agricultural marketing. • Provide training facilities to producer, traders and employees of the Boards.
5.Directorate of Economics and Statistics, New Delhi. http://agricoop.nic.in/	• Compilation of agricultural data on area, production and yield for development and planning. • Dissemination of market intelligence through publication and Internet.
6.Central Warehousing Corporation (CWC) 4/1 Siri Institutional Area, Opp. Siri fort, New Delhi-	Farmers Extension Service Scheme (FESS) was launched by CWC in the year 1978-79 with the following objectives : i) To educate farmers about the benefit of scientific storage and use of public warehouses.

110016 http://cewacor.nic.in/index.php	ii) To impart training to the farmers on the techniques of scientific storage and preservation of food grains. iii) To assist farmers in getting loans from the banks against pledge of warehouse receipt. iv) Demonstration of spraying and fumigation methods to control insects.
7.Federation of Indian Export Organisations (FIEO) Niryat Bhawan, Rao Tula Ram Marg, Opp. Army Hospital Research & Referral, New Delhi-110 057 www.fieo.org	• Provide information to its members about latestdevelopments of export and import. • Organise seminars, workshops, presentation, tours,buyer-seller meets, sponsoring participation in international trade fair, exhibitions and providing advisoryservices with specialized divisions. • Provide information about market developmentassistance schemes. • Provide useful information on India's export and importwith diverse database.
8.Different websites on Agricultural Marketing Information	https://enam.gov.in/web/ http://agmarknet.gov.in/ http://agricoop.nic.in/ www.fieo.org http://cewacor.nic.in/index.php https://www.ncdc.in/index.jsp https://apeda.gov.in/apedawebsite/ http://www.fmc.gov.in/index.aspx https://icar.org.in/ http://www.fao.org/home/en/ http://dpd.gov.in/ https://www.agricultureinformation.com/forums/ http://www.agriwatch.com/ http://www.kisan.net/ http://www.nafed-india.com/ https://www.indiaagronet.com/ http://www.commodityindia.com/

7.0 Alternative Systems of Marketing

7.1 Direct Marketing

Direct marketing is an innovative concept, which involves the marketing of produce, i.e. green gram by the farmer directly to the consumer/miller without any middlemen. Direct marketing enables producers and millers, and other bulk buyers to economize on transportation costs and improve price realization. It also provides an incentive to large scale marketing companies, i.e. millers and exporters, to purchase directly from producing areas. Direct marketing by farmers to the consumers has been experimented in the country through *Apni Mandis* in Punjab and Haryana. The concept with certain improvements has been popularised in Andhra Pradesh through *Rythu Bazars*. At present, these markets are being run at the expense of the state exchequer as a promotional measure to encourage marketing by small and marginal producers without the help of the middlemen. In these markets, mainly fruits and vegetables are marketed along with other commodities at present.

7.1.1 Benefits:

- Direct marketing helps in better marketing of the produce.
- It increases the profit of the producer.
- It minimizes marketing costs.
- It encourages the distribution efficiency of the marketing system.
- It promotes employment to the producer.
- Direct marketing satisfies the consumer.
- It provides better marketing techniques to producers.
- It encourages direct contact between producers and consumers.
- It encourages the farmers to take up retail sales of their produce.

7.2 Contract Marketing

Contract farming is a mutual linkage between agri-business farms and farmers which emphasize on competitiveness in terms of quality but also optimizes production. It is effective for management and assures markets with mutually agreed prices are the basic component of contract farming. Contract Marketing is a system of marketing where a selected crop is grown for marketing by farmers under a ‘buy back’ agreement with an agency (entrepreneur or trader or processor or manufacturer). In the wake of economic liberalization, it has gained momentum as the national and multinational companies enter into contracts for the marketing of agricultural produce. They also provide technical guidance, capital, input supply to contracted farmers. Contract Marketing ensures continuous supply of quality produce at a mutually contracted price to contracting agencies, as well as ensures timely marketing of the produce. Contract Marketing is beneficial to both parties, i.e. farmers and the contracting agency.

7.2.1 Advantages to farmers: -

- Price stability ensuring the fair return of produce
- Assured marketing outlet and no involvement of middlemen.

- Prompt and assured payments
- Technical advice in the field of production till harvesting
- Fair trade practices
- Credit facility
- Crop insurance
- Exposure to new technology and best practices

7.2.2 Advantages to contracting Agency:

- Assured supply of produce (raw materials)
- Control on need-based production/post-harvest handling
- Control on quality of produce
- Stability in price as per mutually agreed contract terms and conditions
- Opportunities to acquire and introduce desired varieties of crop
- Help in meeting specific customer needs/choice
- Better control on logistics
- Strengthen producer/buyer relationship

7.3 Co-operative Marketing

The co-operative societies sell members' produce directly in the market, which fetches the remunerative price. Co-operative societies market the member's produce collectively and secure advantages of economy of scale to its members.

Co-operative marketing provides the following services:

- Procurement and disposal of farm produce
- Processing of produce
- Grading
- Packing
- Storage
- Transport
- Credit
- Fair trade practices
- Protect against marketing malpractices

National Co-operative Development Corporation was set up under an Act of Indian Parliament on 13 March 1963 for strengthening and promoting agricultural marketing through co-operative societies.

The co-operative marketing societies consists 3-tier structure: -

- Primary Marketing Society (PMS) at the village level.
- State Co-operative Marketing Federation (SCMF) at the state level.
- National Agricultural Co-operative Marketing Federation of India Limited (NAFED) at the national level.

7.3.1 Benefits:

- Remunerative price to producers
- Reduction in cost of marketing
- Reduction in commission charges
- Effective use of infrastructure
- Credit facilities
- Timely transportation service
- Reduces malpractices
- Marketing Information
- Supply of agricultural inputs
- Collective processing

7.4 Forward and Future Markets

Forward trading means an agreement or a contract between seller and purchaser for a certain kind and quantity of a commodity for making a delivery at a specified future time, at contracted price. It is a type of trading, which provide protection against the price fluctuations of agricultural produce. Producers, traders and millers utilize future contracts to transfer the price risk. Presently, future markets in the country are regulated through the Forward Contracts (Regulation) Act, 1952. The Forward Markets Commission (FMC) performs the functions of advisory, monitoring, supervision and regulation in future and forward trading. Forward trading transactions are performed through exchanges owned by the associations registered under the Act. These exchanges operate independently under the guidelines issued by the FMC.

Green gram is currently not allowed under forward trading.

8.0 Institutional Facilities

8.1 Marketing Schemes of Government/Public Sector Organisations

Name of the scheme/Implementing Organisation(s)	Facilities provided /Objectives/Salient features
1. Integrated Scheme for Agricultural Marketing (ISAM) The Marketing Division in the Department of Agriculture is the overall in charge of policy formulation for the agricultural marketing sector. The Directorate of Marketing & Inspection (DMI) an attached office of the Department will implement the three sub schemes viz. Agricultural Marketing Infrastructure (AMI), Marketing Research and Information Network (MRIN) and Strengthening of Agmark Grading Facilities (SAGF); Small Farmers Agribusiness Consortium (SFAC), an autonomous organisation will implement the sub scheme ofAgri-Business Development (ABD) through Venture Capital Assistance (VCA) and Project Development Facility (PDF) and Chaudhary Charan Singh National Institute of Agriculture Marketing (NIAM), also an autonomous organisation under the Department will provide training, research and consultancy to stakeholders in the agri marketing sector. For more details, please refer https://dmi.gov.in/Schemeisam.aspx	The objective of this "Integrated Scheme for Agricultural Marketing (ISAM) are as follows: Promotion of agricultural marketing through 1. Creation of marketing and agribusiness infrastructure including storage 2. Incentivize agricultural market reforms 3. Provide market linkages to farmers 4. Provide access to agricultural market information 5. Support quality certification of agriculture commodities. The ISAM will have the following five sub schemes :- (i) Agricultural Marketing Infrastructure (AMI) [the existing schemes of Grameen Bhandaran Yojana (GBY) and Development/ Strengthening of Agricultural Marketing Infrastructure, Grading and Standardization (AMIGS) will be merged as AMI] (ii) Marketing Research and Information Network (MRIN) (iii) Strengthening of Agmark Grading Facilities (SAGF), (iv) Agri-Business Development (ABD) through Venture Capital Assistance (VCA) and Project Development Facility (PDF) and (v) Choudhary Charan Singh National Institute of Agriculture Marketing (NIAM).
2. Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA) Ministry of Agriculture & Farmers Welfare	Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA) to ensure Minimum Support Price (MSP) to farmers of notified pulses qualifying Fair Average Quality (FAQ) norms. PM-AASHA is an umbrella scheme comprising of Price Support Scheme (PSS), Price Deficiency Payment Scheme (PDPS) and Private Procurement & Stockist Scheme (PPSS). These schemes are implemented at the request of the State Governments / Union Territories. PSS is

	implemented for procurement of pulses at MSP. The National Agricultural Cooperative Federation of India Ltd. (NAFED) is the Central Nodal agency of Government of India for procurement of Pulses at Minimum Support Price (MSP), in every crop season.
3. Price Stabilisation Fund (PSF) Ministry of Consumer Affairs, Food & Public Distribution Department of Consumer Affairs, Krishi Bhawan, New Delhi Fore more details, please refer to https://consumeraffairs.nic.in/	To begin with, interventions would be supported for onions, potatoes and pulses only. However, other commodities may be added later. Objectives: • To promote direct purchase from farmers /farmers' association at farm gate/Mandi. • To maintain a strategic buffer stock that would discourage hoarding and unscrupulous speculation. • To protect consumers by supplying such commodities at reasonable prices through calibrated release of stock. It has been decided to create a corpus of Rs. 500 cr. for providing interest free advance towards working capital to eligible proposals from State Government/Union Territories (UTs) and Central Agencies/Central PSUs/Cooperative organizations as decided by respective Ministries, to enable 3 procurement of perishable agri-horticulture produce.

Source: http://agricoop.gov.in/programmesandschemes/agricultural-marketing
http://agricoop.gov.in/programmesandschemes/credit

Procurement of green gram under Price Support Scheme (PSS) and Price Stabilization Fund (PSF) have been given below.

Table 12: Procurement of green gram under Price Support Scheme (PSS)

Year	Support Price for FAQ (Rs./quintal)	Quantity Procured (tonnes)	Value (Rs. Lakh)	Major States of Procurement
2016-17	5225	9,497	4,962	Karnataka and Maharashtra
2017-18	5225 (Rabi) and 5575 (Kharif)	4,07,309	2,23,141	Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Telanagana
2018-19	5575 (Rabi) and 6975 (Kharif)	3,06,960	2,13,506	Andhra Pradesh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Telangana
2019-20	6975 (Rabi) and 7050 (Kharif)	1,66,051	1,16,871	Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Telangana
2020-21*	6975 (Rabi) and 7196 (Kharif)	20,842	14,894	Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Telangana

Source: Department of Agriculture Cooperation & Farmers Welfare

* As on 04.03.2021

Table 13: Procurement of green gram (Domestic) under Price Stabilization Fund (PSF)

Quantity in tonnes

Value in Rs. Crore

Year	FCI		NAFED		SFAC		Total		Major States of Procurement
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
2016-17	64737	338	120594	630	24506	128	209837	1096	Rajasthan, Madhya Pradesh, Telangana, Karnataka, Maharashtra, Haryana and Andhra Pradesh
2017-18	-	-	-	-	-	-	-	-	-
2018-19*	-	-	-	-	-	-	-	-	-

Source: Department of Agriculture Cooperation & Farmers Welfare

*No procurement has been undertaken since kharif marketing season 2017-18 under PSF and requirement towards re-building suitable buffer under PSF would be met from transfer of pulses from PSS stock to PSF buffer. Around 15.64 lakh MTs pulses procured under PSS have been transferred to PSF.

8.2 Institutional Credit Facilities

Government fixes agriculture credit disbursement targets for the banking sector every year, and banks have consistently surpassed these targets. The flow of institutional credit to the agriculture sector is shown in Table 14.

Scheduled commercial banks contributed the major share (76 per cent) in agricultural credit. Co-operative banks and RRBs also play major roles in extending agricultural credit with an average share of 12 per cent each during the last five years.

Table 14: Flow of Institutional Credit to Agriculture Sector

(Rs crore)

Agency	2016-17	2017-18	2018-19	2019-20	2020-21 (P)	Average share (%)
Co-operative Banks	142758	150321	152340	157367	120522	12
RRBs	123216	141216	149667	165326	138337	12
Commercial Banks	799781	871080	954823	1070036	789905	76
Total	**1065755**	**1162617**	**1256830**	**1392729**	**1048764**	**100**

Source: Department of Agriculture, Cooperation & Farmers Welfare

P: Provisional (as on 31-12-2020)

8.2.1 Short Term and Medium Term Loans:

Name of scheme	Eligibility	Objective/Facilities
1.Crop Loan	All categories of farmers–small/marginal and others	• To meet cultivation expenses for various crops as short term loan. • This loan is extended in the form of direct finance to farmers
2.Produce Marketing Loan (PML)	All categories of farmers small/marginal and others	• This loan is given to help farmers to store produce on their own to avoid distress sale. • This loan also facilitates immediate renewal of crop loans for next crop.
3. Kisan Credit Card Scheme https://www.rbi.org.in/Scripts/BS_ViewMasCirculardet	Farmers - individual/joint borrowers who are owner cultivators; Tenant farmers, oral lessees & share	The Kisan Credit Card scheme aims at providing adequate and timely credit support from the banking system under a single window with flexible and simplified procedure to the

ails.aspx?id=11034	croppers; Self Help Groups (SHGs) or Joint Liability Groups (JLGs) of farmers including tenant farmers, share croppers etc.	farmers for their cultivation and other needs as indicated below: To meet the short term credit requirements for cultivation of crops; Post-harvest expenses; Produce marketing loan; Consumption requirements of farmer household; Working capital for maintenance of farm assets and activities allied to agriculture; Investment credit requirement for agriculture and allied activities.
4."Pradhan Mantri Fasal Bima Yojana (PMFBY)" and "Restructured Weather Based Crop Insurance Scheme (RWBCIS)"	Scheme is available to all farmers – loanee and nonloanee both irrespective of the size of their holding.	With insurance, farmers would be able to manage risk in agriculture production in a better way and will succeed in Stabilizing the farm income. Further, it will increase coverage in north eastern region enabling farmers of NER to manage their agricultural risk in a better way. Allocation of business to Insurance Companies to be done for three years (Both PMFBY/RWBCIS). Option shall be given to States/UTs to choose Scale of Finance or district level Value of Notional Average Yield (NAY) i.e. NAY* Minimum Support Price (MSP) as Sum Insured for any district crop combination (Both PMFBY/RWBCIS). Farm gate price will be considered for the other crops for which MSP is not declared.

Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) is a Central sector scheme with 100% funding from the Government of India. Under the scheme, income support of

Rs.6000/- per year is provided to all farmer families across the country in three equal instalments of Rs.2000/- each every four months. The entire responsibility of identification of beneficiary farmer families rests with the State / UT Governments. The fund is directly transferred to the bank accounts of the beneficiaries (https://www.pmkisan.gov.in/).

8.2.2 Long Term Loans:

Name of scheme	Eligibility	Objective/Facilities
Agricultural Term Loan	All categories of farmers–small/marginal and others	• The banks extend this loan to farmers to create assets facilitating crop production/income generation. • Activities covered under this scheme are land development, minor irrigation, farm mechanization, plantation and horticulture, dairying, poultry, sericulture, dry land, waste land development schemes, etc. • This loan is offered in the form of direct finance to farmers with a repayment span not less than 3 years and not exceeding 15 years.

8.3 Organisations/ Agencies Providing Marketing Services

Name of the Organisations / Agencies & Address	Services Provided
1.Directorate of Marketing and Inspection (DMI) NH-IV, CGO Complex, Faridabad. Website: http://agmarknet.gov.in/	• To integrate development of marketing of agricultural and allied produce in the country. • Promotion of standardization and grading of agricultural and allied produce. • Market development through Regulation, Planning and Designing of physical market. • Administration of Meat Food Products Order (1973). • Promotion of Cold Storage. • Liaison between the Central and State Governments through its regional offices and sub-offices spread all over the country.
2.Agricultural and Processed Food Products Export Development Authority (APEDA) NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016 https://apeda.gov.in/apedawebsite/	• Development of scheduled agriculture products related industries for export. • Provides financial assistance to these industries for conducting surveys, sensibility studies, reliefs and subsidy schemes. • Registration of scheduled product exporters on payment of such fees as may be prescribed. • Adapting standards and specification for the purpose of export of scheduled products. • Carrying out inspection of meat and meat products for ensuring the quality of such products. • Improving the packaging of the scheduled products. • Promotion of export oriented production and development of scheduled products. • Collection and publication of statistics for improving marketing of scheduled products. • Training in the various aspects of industries related to the scheduled products.
3. Agricultural Produce Market Committee	• Provides market information on arrivals, prevailing prices, despatches

(APMC)	etc. • Provides market information of adjoining / other market committees. • Arranges training, tours / exhibitions etc.
4. National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) Nafed House, Sidhartha Enclave, New Delhi – 110014 http://www.nafed-india.com/	• Central nodal agency of Government of India for procurement of pulses, millets and oilseeds under price support scheme. • It undertakes sale of pulses and oilseeds procured under PSS and import. • Provide storage facilities. • Consumer Marketing Division of NAFED serves the consumers through the network of its retail outlets (NAFED BAZAR) by providing consumer items of daily need. • Processing of pulses, fruits, etc for internal trade.
5. Central Warehousing Corporation (CWC) 4/1 Siri Institutional Area, Opp. Siri fort, New Delhi- 110016 http://cewacor.nic.in/index.php	• Provides scientific storage and handling facilities. • Offers consultancy services/ training for the construction of warehousing infrastructure to different agencies. • Import and export warehousing facilities. • Provides disinfestation services.
6. National Co-operative Development Corporation (NCDC) 4, Siri Institutional Area, New Delhi-110016 https://www.ncdc.in/	• Planning, Promoting and Financing Programmes for production, processing, marketing, storage, export and import of agricultural produce. • Financial support to Primary, Regional, State and National level marketing societies is provided towards i) Margin money and working capital finance to augment business operations of agricultural produce. ii) Strengthening the share capital base and iii) Purchase of transport vehicles.
7. Director General of Foreign Trade, (DGFT) Udyog Bhavan, New Delhi. https://dgft.gov.in/	• Provides guidelines / procedure of export and import of different commodities. • Allot import-export code number (IEC No) to the exporter of Agricultural

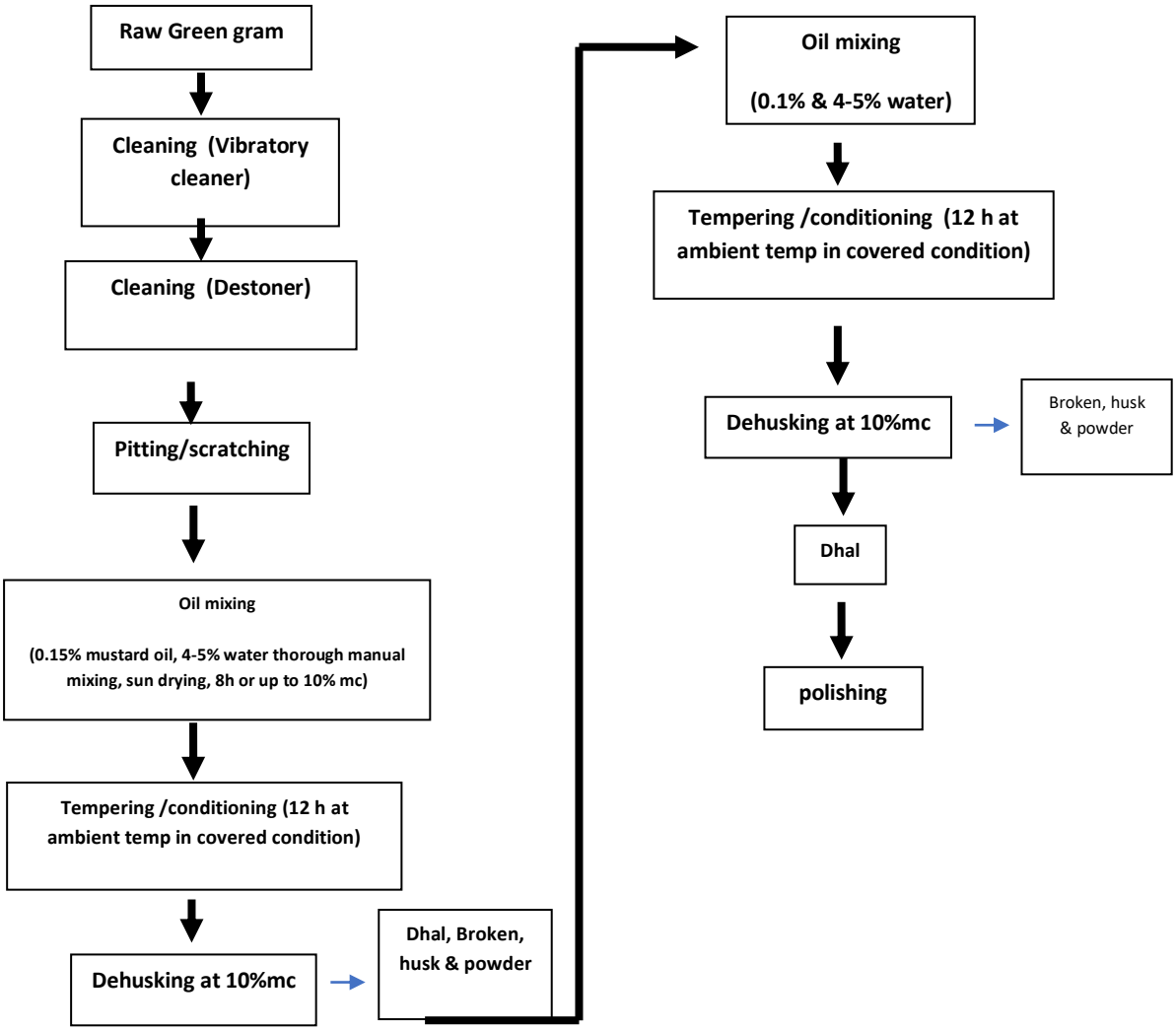
	commodities.
8. State Agricultural Marketing Boards at different state capital	• Implementation of the regulation of marketing in the state. • Provides infrastructural facilities for the marketing of notified agricultural produce. • Grading of agricultural produce in the markets. • To co-ordinate all the market committees for information services. • Provides aid to financially weak or needy market committees in the form of loans and grants. • To eliminate malpractices in the marketing system. • To arrange or organise seminars, workshops or exhibitions on subject relating to agricultural marketing.

9.0 Utilization

9.1 Processing

Processing is an important marketing function in the present-day marketing of Green gram. Processing converts the raw materials and bring the produce nearer to human consumption. It is concerned with value addition to the produce by changing its form. Pulses are generally converted into dal by decutilating and splitting the whole seed. Over 75% of the total legumes produced in the country are split into dal. Processing of green gram is generally known as dal milling or dehulling. Milling means the removal of the outer husk and splitting the grain into two equal halves. Dal milling is one of the major food processing industries in the country, next only to rice milling. The efficiency of conversion of grain to dal by traditional methods of milling is low, and the resultant product, especially that from the wet method, is inferior in cooking quality. The average dal yield varies from 68-75 per cent (theoretical value 85 per cent), i.e., a net loss of 10-17 per cent during the conversion of green gram into finished dal by traditional methods.

Process flowchart for milling of green gram:



Source: ICAR-CIPHET, Ludhiana

9.2 Uses

Green gram is used in many ways as human food, fodder and maintaining soil fertility. The main uses of green gram are as follows:

- Dal: Decorticated split cotyledon of whole seed is called dal. Green gram is consumed mainly as dal in India. Green gram dal is a staple food and is an important ingredient of the diet of Indian people. It is also consumed as dal in other South Asian countries, in Tanzania and Uganda in Africa.
- Whole Dry Seed: Whole dry seed is boiled and consumed in India, Eastern Africa, the West Indies and Indonesia. It is also consumed in Myanmar.
- Seed Purpose: Generally, farmers retain a part of their produce for seed purposes for sowing in next season.
- Animal Feed: The green leaves and tops of plants are used as animal feed in South Asia, Africa and Caribbean countries. The by-product of seed coats, broken bits and powder from dal mills form a valuable protein source for dairy animals. Cracked and shrivelled seeds are also used as animal feed. The husk of pods and leaves obtained during threshing constitute a valuable cattle feed.
- To Improve Soil Fertility: Rhizobium bacteria are present on the root nodules of green gram. The green gram crop fixes atmospheric nitrogen in symbiotic association with Rhizobium bacteria and maintains the soil fertility.
- Fuel Purpose: The dry stem of the plant and dry leaves are used as fuel for cooking by the poor population in rural India.

9.3 DO'S AND DON'TS

DO'S	DON'TS
✓ Harvest the green gram at the proper stage of maturity, i.e. harvest the crop when 75-80 per cent of the pods mature.	✘ Delay in harvesting results in shattering of pods. Harvest of green gram before the pods are fully mature may result in lower yields, a higher proportion of immature seeds, poor grain quality.
✓ Harvest during conducive weather condition.	✘ Harvest the crop during adverse weather condition (during rain and overcast weather).
✓ Threshing and winnowing on cemented (pucca) floor.	✘ Threshing and winnowing on kutcha floor leads to increase in post-harvest losses.
✓ Market the Green gram after AGMARK grading to get remunerative prices in the market.	✘ Marketing of Green gram without grading will fetch lower prices.
✓ Before marketing the produce, get the market information regularly from agmarknet.nic.in website, newspapers, T.V., radio, concerned APMC offices etc.	✘ Market produce without collecting /verifying marketing information.
✓ Store the green gram during the post-harvest period and sell it later when the prices are higher in the market.	✘ Sell green gram during the post-harvest period when the prices are low during this period due to glut.
✓ Use the proper and scientific method of storage.	✘ Use conventional and outdated methods of storage, which causes storage losses.
✓ Avail the benefit of government schemes for construction of rural go-downs and store Green gram to minimise losses.	✘ Store green gram at the unscientific place in a haphazard manner, which will result in qualitative and quantitative deterioration of green gram grains.
✓ Select the shortest and efficient marketing channel to get the highest share in marketing.	✘ Use the long marketing channel, which reduces the producer's share as well as more commission charges.
✓ Package properly to protect the quality and quantity of produce during transit and storage.	✘ Improper package causes more losses during transit and storage.
✓ Select the cheapest and convenient mode of transportation from the available alternatives.	✘ Use the mode of transport, which will cause losses and require a higher cost.

✓ Transportation of green gram should be done in bags to minimize grain losses.	✘ Transport Green gram in bulk, which causes more losses.
✓ Use effective, efficient and improved post-harvest technology and processing techniques to avoid post-harvest losses.	✘ Use traditional and conventional techniques in post-harvest operations and in processing which causes more quantitative and qualitative losses.
✓ Avail the facility of Price Support Scheme during glut situation.	✘ Sell green gram to local traders or itinerant merchants during glut situation.
✓ Avail the procedure of Sanitary and Phyto-sanitary measures during export.	✘ Export without any Sanitary and Phyto-sanitary measures and face rejection.
✓ To assure better marketing of the produce, avail benefit of contract farming.	✘ Produce Green gram without assessing and assuring its market demand for that year.

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Appendices

State-wise Progress of AMI (Storage Infrastructure) including Erstwhile GBY

Since inception w.e.f. 01.04.2001& up to 31.03.2022

S. No.	State	No. of projects	Storage Capacity (in MT)	Subsidy Released (Rs. Lakh)
1	Andhra Pradesh	1444	5816670	29303.71
2	Arunachal Pradesh	1	945	6.30
3	Assam	346	1067157	6659.78
4	Bihar	1089	715539	3018.15
5	Chhattisgarh	600	1953611	7372.00
6	Goa	1	299	0.94
7	Gujarat	11970	4964855	27995.05
8	Haryana	2284	6818374	38871.69
9	Himachal Pradesh	88	30826	180.77
10	Jammu & Kashmir	15	88027	709.79
11	Jharkhand	37	183708	814.92
12	Karnataka	4674	3941516	19387.07
13	Kerala	209	105903	539.55
14	Madhya Pradesh	4617	13749757	71724.49
15	Maharashtra	3698	7035176	29225.43
16	Meghalaya	16	21012	186.75
17	Mizoram	1	302	2.52
18	Nagaland	36	32814	354.38
19	Odisha	695	1019830	4191.55
20	Punjab	1761	6814459	23516.33
21	Rajasthan	1594	3123742	10585.51
22	Tamilnadu	1202	1436730	5205.06
23	Telangana	857	5023442	25292.72
24	Tripura	5	28764	296.61
25	Uttar Pradesh	1182	5600154	18074.01
26	Uttarakhand	291	786272	3467.72
27	West Bengal	2565	1619834	5093.98
Total		**41278**	**71979718**	**332076.78**

State-wise Progress of AMI (Other than storage infrastructure) including Erstwhile AMIGS SchemeSince inception w.e.f. 20.10.2004 & upto 31.03.2022

S. No.	State	No. of projects	Subsidy Released (Rs. Lakh)
1.	Andhra Pradesh	379	7102.90
2.	Assam	13	573.52
3.	Chhattisgarh	339	6688.92
4.	Delhi	1	30.41
5.	Goa	1	50.00
6.	Gujarat	8815	22844.76
7.	Haryana	7	137.70
8.	Himachal Pradesh	62	1640.18
9.	Jharkhand	1	0.00
10.	Karnataka	835	8975.19
11.	Kerala	372	6254.84
12.	Madhya Pradesh	1264	33761.78
13.	Maharashtra	1568	43965.50
14.	Manipur	17	0.00
15.	Mizoram	1	2.52
16.	Nagaland	72	1422.33
17.	Odisha	20	852.13
18.	Punjab	2074	26920.31
19.	Rajasthan	557	9853.39
20.	Sikkim	1	15.52
21.	Tamil Nadu	1811	5361.95
22.	Telangana	711	11489.05
23.	Uttar Pradesh	3	872.00
24.	Uttarakhand	7	1002.26
Total		**18931**	**189817.16**

Procurement of Moong under PSS and PSF

Year	PSS		PSF		Total	
	Qty. procured (tons)	Value Lakhs	Qty. procured (tons)	Value Lakhs	Qty. procured (tons)	Value Lakhs
2016-17	9496.7	4962.0	209837.3	1096.0	219334.0	6058.0
2017-18	407309.2	223140.7	0.0	0.0	407309.2	223140.7
2018-19	306960.3	213505.7	0.0	0.0	306960.3	213505.7
2019-20	166051.5	116871.1	0.0	0.0	166051.5	116871.1
2020-21	20842.1	14894.2	0.0	0.0	20842.1	14894.2
2021-22	229138.0	165484.0	100000.0	719.6	329138.0	166203.6

Source: Agricultural Statistics at a Glance 2021, DES, DA&FW, GOI

Details of mandis and traders registered on eNAM, in different States/UTs

State/ UT	*Mandies*	Traders	FPOs	Farmer	No. of Unified licenses issued by State
Andhra Pradesh	33	3483	177	1445806	3,483
Chandigarh	1	114	0	7106	0
Chhattisgarh	14	3126	22	135253	36
Gujarat	122	9444	110	869102	9,444
Haryana	81	14486	243	2725243	35
Himachal Pradesh	19	2015	56	124506	0
Jammu and Kashmir	2	237	4	957	0
Jharkhand	19	2315	120	247554	104
Karnataka	2	662	13	1455	662
Kerala	6	354	7	2792	35
Madhya Pradesh	80	22378	104	3007337	1,070
Maharashtra	118	21548	268	1217277	0
Odisha	41	7504	208	285380	7,504
Puducherry	2	181	2	13529	0
Punjab	37	2611	10	217427	1
Rajasthan	144	82924	189	1500993	82,924
Tamil Nadu	63	6375	108	312051	3,768
Telangana	57	5803	62	1823790	5,803
Uttar Pradesh	125	35157	271	3315390	90
Uttarakhand	16	4738	44	54329	4,738
West Bengal	18	3994	171	49819	33
Total	1000	229,449	2189	17,357,096	1,19,730

Source: https://enam.gov.in/

State wise progress of market reforms

State/ UT	Limiting regulation within APMC Yard	Separation of Powers between Dir(Mktg.) & MD, Mandi Board	Single unified trading license	Single Point levy of Market fee	Private Wholesale market	Direct marketing (Outside mandi)	Declaring warehouse, silos / cold storages, as deemed market	e-trading	Deregulation of marketing of F&V
Andhra Pradesh	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Arunachal Pradesh	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assam	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bihar	No APMC Act								
Chhattisgarh	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Goa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gujarat	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Haryana	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
HP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jharkhand	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Karnataka	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kerala	No APMC Act								
MP	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Mah.	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Manipur	No APMC Act								
Meghalaya	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mizoram	No	No	Yes	Yes	Yes	Yes	No	Yes	No
Nagaland	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Odisha	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Punjab	No	No	Yes	Yes	Yes	Yes	No	Yes	No
Rajasthan	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Sikkim	No	No	Yes	Yes	Yes	Yes	No	Yes	No
Tamil Nadu	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Telangana	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Tripura	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UP	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Uttarakhand	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
West Bengal	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Delhi	No	No	No	No	No	No	No	No	Yes
Chandigarh	No	No	Yes	Yes	Yes	Yes	No	Yes	No
Puducherry	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
J&K	No APMC Act								
Laddakh									
A&N Islands									
DNH									
Daman & Diu									
Lakshdeep									

Source: DMI (updated on 14.07.2020)