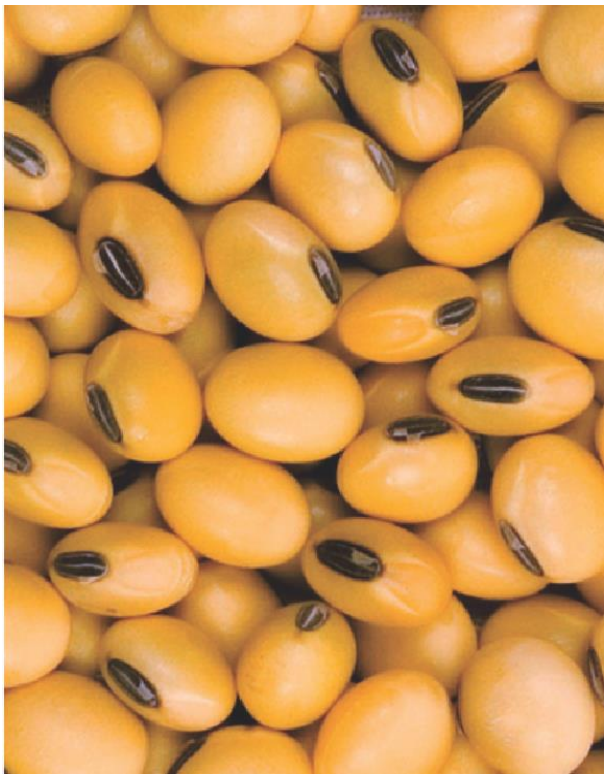
Post-Harvest Profile of Soybean



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

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1. INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is one of the most valuable crops in the world not only as an oilseed crop and feed for livestock and aquaculture but also as a good source of protein for the human diet and as a biofuel feedstock. It has established itself as a leading oilseeds crop and is of vital importance to the agricultural and edible oil economy of India. Before the introduction of yellow soybean germplasm, black soybean was under cultivation for ages under different names (*Kalitur, Bhat, Bhatmash, Ramkulthi, Kalikulthi, etc.*) in the foothills of Himalayas. It was traditionally one of the food crops, particularly in North-Eastern India. Among major agricultural commodities, soybean has a prominent place as the world's most important oilseed legume, which contributes about 28% to the global vegetable oil production, more than two-thirds of the world's protein concentrate for livestock feeding and is also a valuable ingredient in formulated feeds for poultry and fish.

Due to its unique chemical composition (20% oil and 40% protein), the crop has the potential to mitigate protein-energy malnutrition in India, in particular, and developing world in general. Besides, several nutraceuticals and functional compounds such as isoflavones, tocopherol and lecithin make it an ideal health food. It is sometimes referred to as a *miracle crop* or *golden bean*, because soybean is a major source of protein in South East Asia, Africa, the United States of America and in many other countries.

Soybean represents the best protein source available for improving the nutritional value of traditional diets of some developing countries, especially for the rural populace. Furthermore, the crop has revolutionized the rural economy by raising the living standards of soybean farmers (Paroda, 1999, Dupare *et al*., 2009; Sharma *et al*., 2016).

1.1 Importance:

- Soybeans are unique among crop plants in that they supply protein equal in quality to that of animal sources. Most of the world's soybeans are processed or crushed into soybean meal and oil.
- Soybean is an important source of food, protein, and oil.
- Owing to its amino acid composition, the protein of soybean is called a complete protein. Soybean also contains carbohydrates, vitamins and minerals.
- Crop adaptability to diverse agro-climatic conditions
- Significant role in preventing and treating chronic diseases such as heart ailments, osteoporosis, cancer, kidney ailments and menopausal syndromes.
- Scope for manufacturing numerous processed food products.

1.2 Origin:

Soybean is reported to be originated from China. The cultivation and use of soybean could be traced back to the beginning of China's agricultural age. It has also been reported that the Indian continent is the secondary center for the domestication of the crop after China (Hymowitz, 1990; Singh and Hymotwiz, 1999). In India, Soybean was introduced from China in the tenth century AD through the Himalayan routes. Soybean has been traditionally grown on a small scale in Himachal Pradesh, the Kumaon Hills of Uttar Pradesh (now Uttaranchal), eastern Bengal, the Khasi Hills, Manipur, the Naga Hills, and parts of central India covering Madhya Pradesh (Agarwal, et al, 2013).

Table 1. Proximate Composition of Soybeans and Their Structural Parts

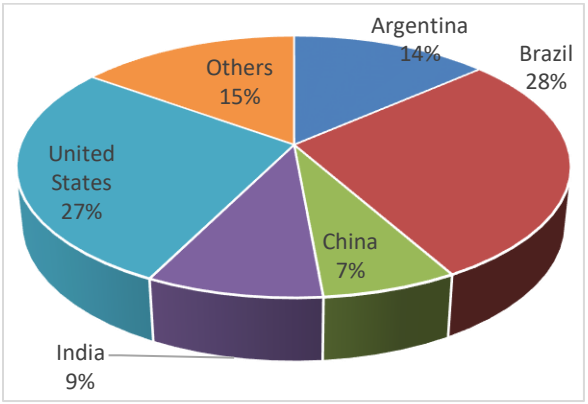
Part	% in whole seed	Chemical Composition Percentage in (% dry matter)			
		Protein	Lipid	Carbohydrate	Ash
Hull	8	9	1	86	4.3
Hypocotyl axis	2	41	10	43	4.4
Cotyledons	90	43	23	29	5.0
Whole seeds	100	40	20	35	5.0

Source: Wolf and Cowan (1975)

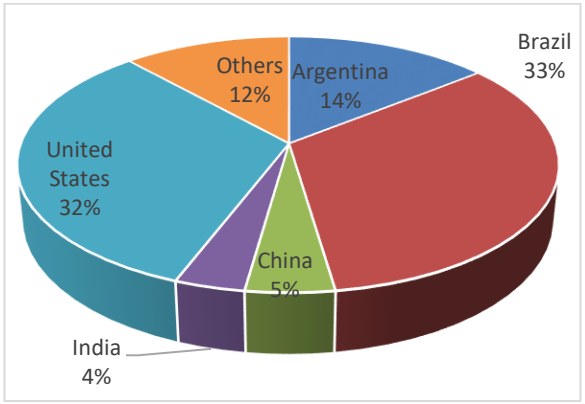
2. PRODUCTION

The area and production of soybean increased tremendously in the world and major producing countries. World area under soybean cultivation was 23.82 million ha (m ha) in 1961-62 which increased to 123.55 m ha in 2017-18, increased with the compound annual growth rate of 2.97 per cent. Global soybean production has increased from 26.88 million tonnes (m t) in 1961-62 to 352.64 m t in 2017-18 with an annual growth rate of 4.46 per cent. Average soybean productivity has increased from 1129 kg/ha in 1961-62 to 2854 kg/ha in 2017-18 with an annual growth rate of 1.45 per cent.

2.1 Major producing countries in the world



A. World soybean area share



B. World soybean producing countries

Figure 2. Major soybean producing countries

Five major soybean producing countries namely USA, Brazil, Argentina, China, and India contribute to about 85% of the area and 88% of global soybean production. The Brazil has overtaken USA and is the largest producer of soybean accounting for about 33% of global production of soybean followed by USA (32%) and Argentina (14%). The big three producers contribute to about 69% of the area under soybean in the world and 79% of production. India ranks fourth in terms of area under soybean and fifth in soybean production globally.

Table 2. World soybean: area by region and major producing countries

Countries	2016/17	2017/18	2018/19	2019/20	2020/21*	2021/22*
Area (million ha)						
Argentina	19.50	17.34	16.32	16.58	16.60	16.60
Brazil	33.18	33.96	34.78	35.88	38.53	40.07
China	7.09	8.25	8.42	8.43	9.88	9.20
India	11.18	11.18	10.33	11.13	12.81	12.50
USA	33.47	36.24	35.45	30.35	33.31	35.09
World	96.39	114.73	117.91	114.27	135.98	141.75
Production (million tonnes)						
Argentina	58.80	54.97	37.79	55.26	44.00	49.00
Brazil	96.39	114.73	117.91	114.27	135.98	141.75
China	12.79	15.29	15.97	15.73	19.60	18.40
India	13.16	13.16	10.93	13.27	12.90	13.20
USA	116.93	120.06	120.51	96.79	112.55	118.08
World	335.90	359.53	344.64	333.67	361.94	380.57

Source: FAO Statistics and AMIS-FAO. * Estimates

2.2 Major producing states of India

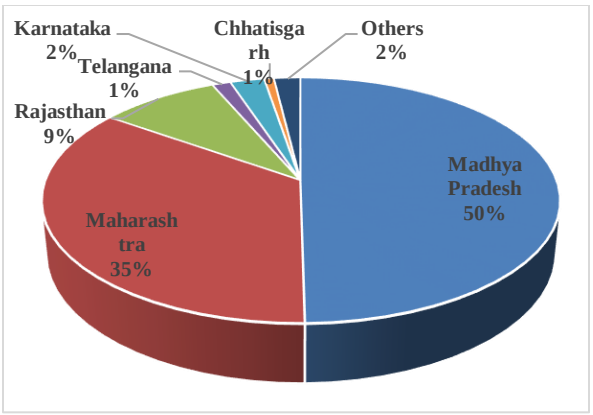
Madhya Pradesh, Maharashtra and Rajasthan states together contributes to about 93% of the area and production of soybean in India, however, the cultivation of soybean is fast expanding in the states of Telangana, Karnataka and Gujarat. Madhya Pradesh is a leading producer of soybean with about 54% of the country's total soybean production (Table 3 and Figure 2), hence known as 'Soy State'.

Table 3. Area and production of soybean in major producing states

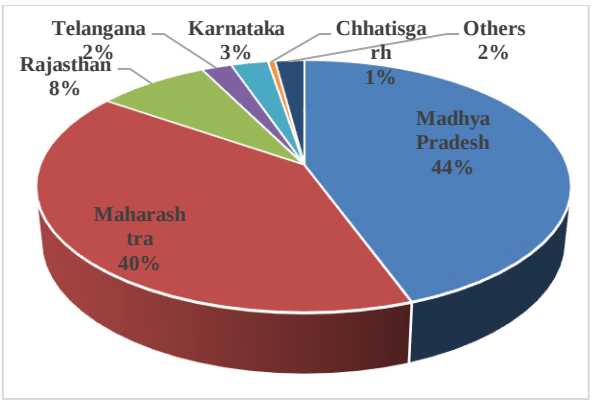
(Area in million hectares and Production in million tonnes)

	2017-18		2018-19		2019-20		2020-21	
State	Area	Prod	Area	Prod	Area	Prod	Area	Prod
MP	5.01	5.32	5.42	6.67	6.19	4.89	6.50	4.61
Maharashtra	3.69	3.80	4.08	4.61	4.12	4.83	4.36	6.20
Rajasthan	0.89	1.07	0.93	1.17	1.12	0.52	1.13	1.09
Telangana	0.15	0.25	0.15	0.23	0.17	0.31	0.16	0.24
Karnataka	0.28	0.25	0.25	0.26	0.32	0.38	0.31	0.38
Chhatisgarh	0.10	0.05	0.09	0.07	0.07	0.08	0.07	0.05
Others	0.21	0.19	0.21	0.26	0.2	0.22	0.28	0.33
India	10.33	10.93	11.13	13.27	12.19	11.23	12.81	12.90

Source: DES, MoA&FW,



A. Share of major states in soybean area



B. Major soybean producing states

Figure 2. Major soybean producing states in India

2.3 Zone-wise soybean varieties released

Soybean R&D system developed and released high yielding soybean varieties with desired characteristics suitable for cultivation in different zones.

Table 4. Soybean varieties suitable for different zones in India (last 15 years)

Variety	Year of notification	Area of adaptability	Maturity days	Yield (q/ha)	Oil (%)
MAUS-81	161(E), 04/02/2004	Central Zone	93-97	32.78	20.53
TAMS-38	122(E), 02/02/2005	Maharashtra Vidarbha region	95	21.65	
PUSA 9712 (DS 9712)	1566(E), 05/11/2005	North Plain Zone	116	22-25	17.9
CO(SOY)3	599(E), 25/04/2006	Tamil Nadu	85-90	14	
Phule Kalyani (DS-228)	1572(E), 20/09/2006	Maharashtra	95-100	23.53	17.25
PUSA -9814 (DS-9814)	1572(E), 20/09/2006	North Plain Zone	125	19-22	
CO(SOY) 7	01/01/2007	TN	85-90	13-14	
Pratap Soya-2 (RKS-18)	122(E), 06/02/2007	Southern & North Eastern Zone	91	23.34	18.20
TAMS 98-21	122(E), 06/02/2007	Maharashtra	95-100	22-26	18.6
Jawahar Soybean 95-60(JS 95-60)	1178(E), 20/07/2007	Madhya Pradesh	82-88	18-20	18.21
SL 525	1178(E), 20/07/2007	Northern Plain Zone	121	23.03	
RAUS-5(Pratap Soya-1)	1703(E), 05/10/2007	North Eastern Zone	96-104	30-35	19.2-20.6
Swarna Vasundhra	1714(E), 18/07/2008	Jharkhand			
Jawahar Soybean 97-52 (JS 97-52)	2458(E), 16/10/2008	Central Zone and North Eastern Zone	100	25-30	20.21
Pant Soybean-1347(PS-1347)	2458(E), 16/10/2008	North Plain Zone	123	31	20
SL-688	2458(E), 16/10/2008	North Plain Zone	125	25	
VL Soya 59	2458(E), 16/10/2008	North Hill Zone	135	26	
VL Soya 63	2458(E), 16/10/2008	North Hill Zone	130	27	
DSB-1	449(E), 11/02/2009	Karnataka	90-95	20-25	
Pant Soybean-1225 (PS-1225)	449(E), 11/02/2009	Tarai and Bhabar Region of UP and Uttarakhand	125	30-32	18
VL Soya-65	211(E), 29/01/2010	Uttarakhand	121	15.42	

MAUS 158	2137(E), 31/08/2010	Marathwada region of Maharashtra	93-98	22.60	21.10
RKS-24	283(E), 07/02/2011	Rajasthan	95-98	30-35	21
SK744	456(E), 16/03/2012	Punjab	139	18.42	31
Pant Soybean - 19 (PS 1368)	952 E, 10/04/2013	Uttarakhand	117-125	21.21	
Pratap Soya 45 (RKS 45)	2817 (E), 19/09/2013	Rajasthan	95-98	30-35	21
JS 20-29	1146 (E). 24/04/2014	Central zone	93-96	21.25	20.90
MAUS-2 (Pooja)	1146 (E). 24/04/2014				
Raj Vijay Soybean 2001-4 (RVS 2001-4)	1146 (E). 24/04/2014	Madhya Pradesh	94	25	
DSB – 21	1919 (E), 30/07/2014 1228 (E), 07/05/2015	Karnataka	90-95	25-30	18.2
JS 20-34	1146 (E). 28/01/2015	Central zone	86-88	20.52	20.3
NRC 86 (Ahilya 6)	268 (E), 28/01/2015	Central zone	95-97	21.28	19.8
KDS 344 (Phule Agrani)	268 (E), 28/01/2015	Southern Zone	94	25.55	16.8
PUSA 12 (DS 12-13)	1228(E), 07/05/2015	Punjab, Haryana, Delhi, UK, Bihar, UP	124-131	22.86	
JS 20-69	2238 (E), 29/06/2016	Madhya Pradesh	93-95	18.52	
MACS-1281	2238, 07/06/2016	Southern Zone	96	25.19	
VL Soya 77	3540 (E), 22.11.2016	Uttarakhand hills	112-127	19.70	
VL Bhat 201	3540 (E), 22.11.2016	Uttarakhand hills	117	16.42	
RKS-113	, 18/08/2016	Assam, WB, Jharkhand, CG, NE State			
Raj Soya-24 (RVS 2002-4)	1007, 30/03/2017	MP, Maharashtra, Rajasthan, UP	96	19.05	

Source: ICAR-Indian Institute of Soybean Research, Indore.

2.4 Soybean Price Movement

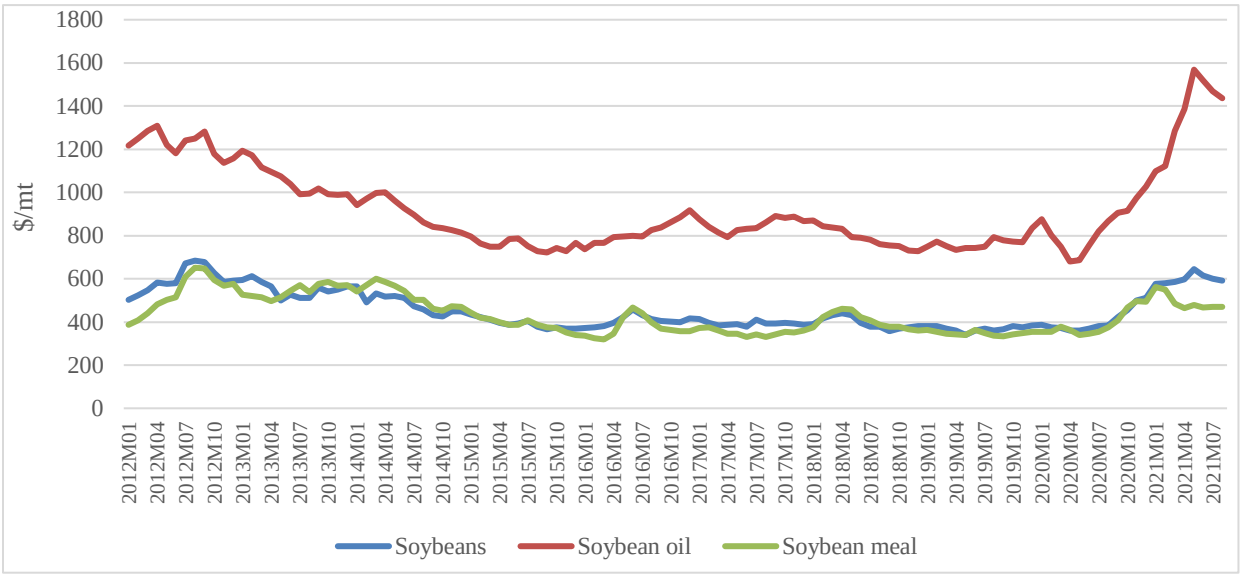


Figure 3. International price movement of soybean and products (Data source: World Bank Pink Sheet)

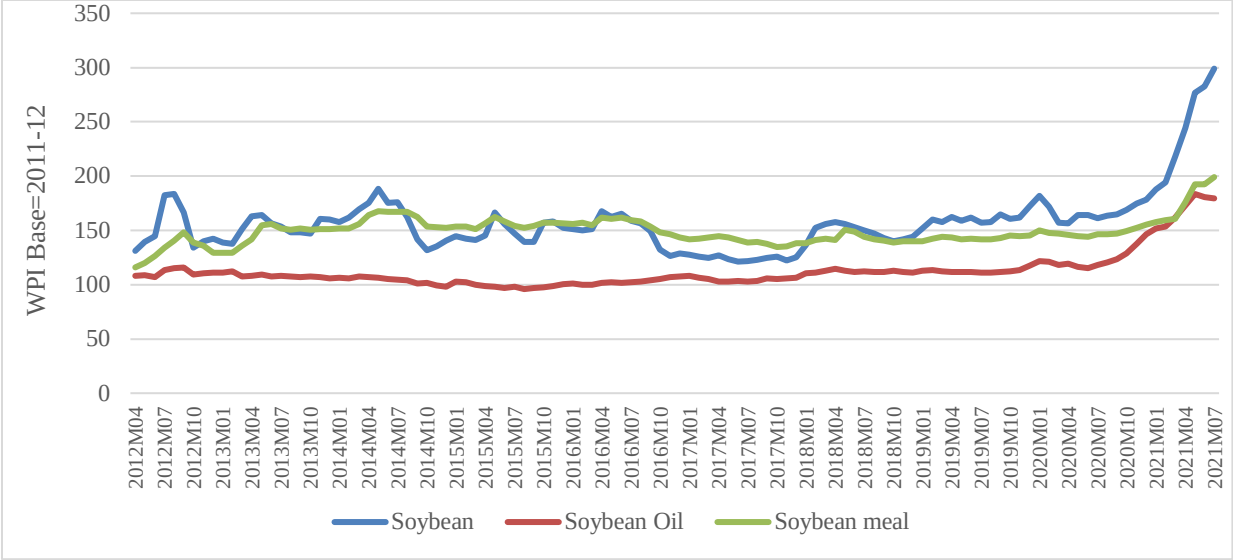
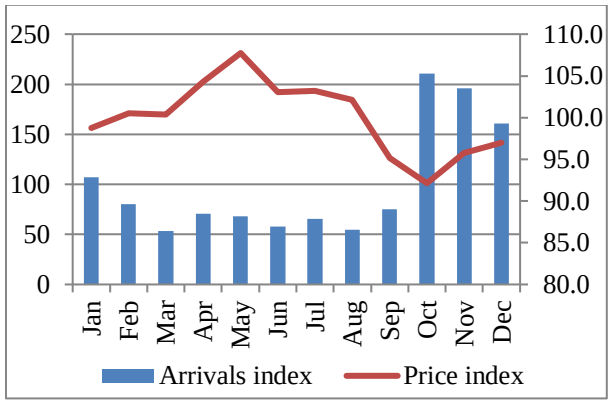
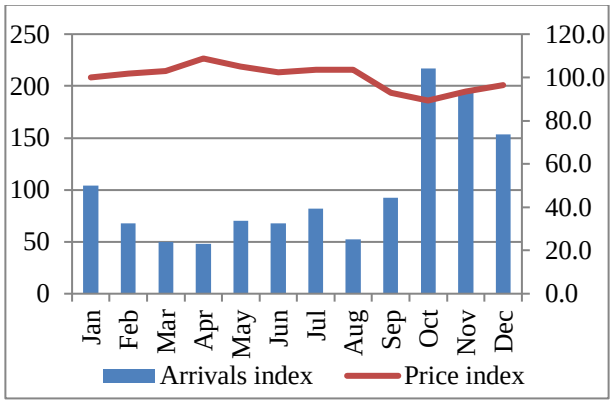


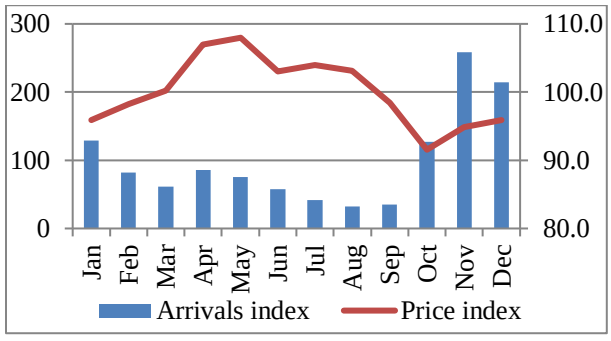
Figure 4. Wholesale price index of soybean and products (Data source: Office of the Economic Advisor, Ministry of Commerce and Industry, GOI)



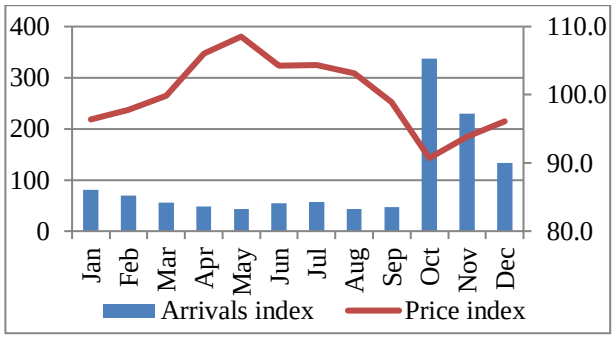
Dewas Mandi



Indore Mandi



Latur Mandi



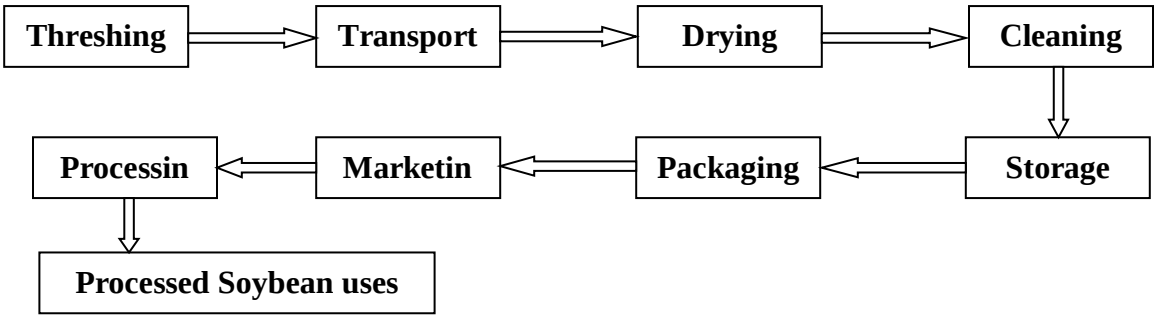
Kota Mandi

Figure 5. Monthly index of arrivals and prices of soybean in major markets (Data source: AGMARKNET)

3. POST-HARVEST MANAGEMENT

Agricultural production is seasonal and exposed to the natural environment, but post-production operations play an important role in farmers' price realization and providing stability in the food supply chain. Losses in food crops occur during harvesting, threshing, drying, storage, transportation, processing and marketing. Post-harvest management is the technology handling of agricultural produce after harvest to prolong the shelf life, freshness and an attractive appearance. Nearly, 9-10 % of grains are wasted due to faulty post-harvest management during harvesting, threshing, packaging, storage, and transportation, etc. Proper scientific post-harvest management can minimize these losses. Like postharvest management, the proper pre-harvest steps such as the use of proper harvesting tools and assessment of the maturity stage also improve the shelf life of the grains and reduce the post-harvest losses to a great extent.

Figure 6. Post-harvest management of Soybean



3.1 Harvest and post-harvest losses

Grain losses occur during handling and processing at different harvest and post-harvest operations right from the farm to plate. Losses during harvesting operations depend on the time of harvesting, weather conditions and varieties. Pod shattering losses were higher in some varieties, although most of the varieties are now pod-shattering resistant. During storage at farmer's level, spoilage and losses may occur due to mishandling, use of very old and damaged gunny bags and rodents. During the transport of soybean from the farmhouse to the assembling markets and from assembling markets to the secondary markets or consuming centers, losses occur on account of pilferage, leakage of gunny bags and rough handling. The extent of harvest and post-harvest losses are presented in Table 5.

Table 5. Harvest and post-harvest losses of soybean in major producing states (in kg/qt)

Operations	Losses (%)	**Storage channels**	Losses (%)
Harvesting	5.45	Farm	0.12
Collection	1.17	Godown	0.14
Threshing	1.45	Wholesaler	0.34
Winnowing/ cleaning	0.52	Retailer	0.15
Drying	0.07	Processing unit	0.25

Packaging	0.16		
Transportation	0.14		
Total in farm operations	**8.95**	**Total loss in Storage**	**1.00**
Overall total loss			**9.96**

Source: Jha *et al*, (2015).

3.2 Harvesting care

The soybean crop reaches at harvestable maturity when the pods have lost their green colour and attained the mature pod colour characteristic of the variety and seed has become hard. The crop should be promptly harvested at this stage to avoid pod shattering and field deterioration. The time of harvesting of soybean depends on the variety (short or long duration) and time of sowing. Harvesting of *kharif* soybean starts from the end of September month, if sown timely. Generally, harvesting is completed in the month of October or early November month. Losses in the field also occur due to untimely harvest, poor agricultural operations, careless handling, natural calamities like heavy rainfall, hailstorm, birds, rodents, etc.

The following care should be taken while harvesting of soybean:

- Soybean should be harvested timely upon maturity when the seed moisture is 17-18% without delay to avoid shattering and prevent seed deterioration due to field weather.
- Harvesting before maturity means a low yield and also a higher proportion of immature seeds, poor quality and more chances of disease attack during the storage of grain.
- Delay in harvesting results in pod shattering and cracking of grains in the pods and exposure to insects, rodents, birds and pests attack.
- Avoid harvesting during wet weather conditions.
- Harvesting should be done by adopting the proper method.
- Protect the harvested grains from rain and excessive dew by covering.
- Keep the harvested grains separately for each variety, to get true to type variety seed.
- Dry harvested crop for 8-10 days on the threshing floor.
- Avoid direct sun drying and excessive drying, which leads to an increase in the breakage of the grains.
- Crop should be threshed upon proper drying and with maintaining proper speed of thresher.
- If the threshing is delayed, keep the harvested soybean in a dry and shady place, which facilitates the air circulation and prevents excessive heating.
- The cleaning/ processing should be carried out at seed moisture of 12-13%. An air screen cleaner is the most effective for soybean seed. The sieves' size may vary according to seed

size of different varieties. The recommended sieve size for processing is 8.0 mm round for top screen and 4.0 mm oblong for bottom screen.

- Transport the grain in bags, which minimises the grain losses.
- Avoid too much post-harvest handling to minimise the grain losses.
- Pack the Soybean in sound B-Twill jute bags totally free from any contamination.

3.3 Post-harvest equipments

Following equipments/ machines for different post-harvest operations have been developed by ICAR-Central Institute of Agricultural Engineering, Bhopal.

Threshing

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	CIAE High Capacity Multicrop Thresher	Capacity: 8-10 Quintal/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal
2	CIAE Multicrop Thresher	Capacity: 2-3 Quintal/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

Cleaning/ Destoning

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	Pedal cum power operated grain cleaner	Capacity: 10-12 Quintal/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

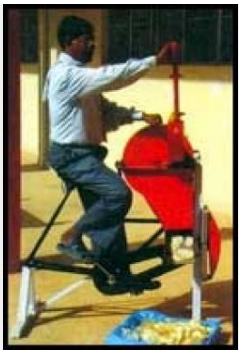
2	Grain flour separator	Capacity: 80-120 Kg/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal
3	Manual double screen cleaner	Capacity: 5-10 Kg/h, Manual		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

Blanching

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	Soybean Blanching Unit	Capacity: 20 Kg/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

Dehusking/ Dehulling

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	Motorised soybean dehuller	Capacity: 80 Kg/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

3	Manual soyabean dehuller	Capacity: 10-15 Kg/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

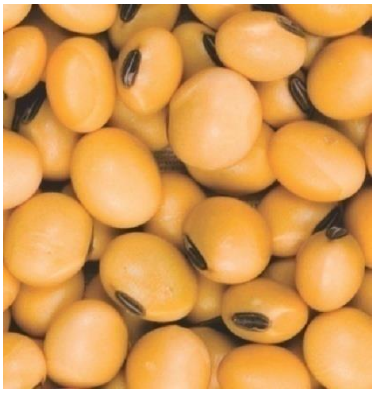
Processing/ Crushing

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	Soybean Processing Machinery for Tofu Making Machine	Capacity: 50 Kg/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal
2	Soy Milk Filtration Unit	Capacity: 60 Litre/h		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

Secondary Processing

#	Equipment	Specifications (Capacity)	Photograph	Manufacturer/Supplier
1	Soybean Flaking machine	Capacity: 20 kg /hour		Central Institute of Agricultural Engineering (C.I.A.E.), Bhopal

3.4 Grading



Grading is an important facilitating service in the marketing process of an agricultural commodity. It has been observed that uniform variety having bold grains fetches a higher price in the market. The traders, who purchase soybean negotiate the price based on its quality such as cleanliness, boldness, colour, moisture, shrinkage, admixture, etc.

Importance of grading

- Grading before sale enables farmers to get a higher price of the product and facilitate marketing.
- It widens the marketing process because buying and selling take place between two parties at distant places and reduces the cost of marketing and minimises storage and handling losses.
- It facilitates the keeping quality of the product and easy finance.
- In case of dispute, it facilitates settling the claims.
- It facilitates the future trading.

At the markets, mostly manual grading (by visual inspection) is followed. With the coverage of APMC under e-NAM, assaying facilities are being put in place. Farmers also increasingly realizing the importance of drying, cleaning and grading in better price realization for their farm produce.

3.4.1 Grade specifications

A) AGMARK specifications:

The AGMARK grade standards for Soybean notified under the Agricultural Produce (Grading and Marking) Act 1937 by the Central Government (Directorate of Marketing and Inspection) are given in Table 6.

Table 6. AGMARK Grade Standards for Soybean (Soybeans Grading and Marking Rules, 2012.)

Designation	Extran		Split cracked seed % by mass (Max)	Immature, shriveled and green seeds percent by mass (max.)	Damaged and Weevilled seeds percent by mass (max.)	Other edible seeds percent by mass (max.)	Moisture, percent by mass (max.)	Oil content, percent by mass on dry basis (Min.)	Colour of extracted oil on lovibond scale expressed as (Y+10R) in 1/16" cell
	Organic percent by mass (max.)	*Inorganic, percent by mass (max.)							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Special	0.10	0.10	2.0	2.0	Nil	Nil	7.0	20.0	20.0
Standard	0.50	0.25	3.0	3.0	0.5	0.5	9.0	18.0	30.0
General	0.75	0.25	4.0	7.0	2.0	1.0	12.0	15.0	40.0

* Impurities of animal origin shall not exceed 0.10%.

Note. - The total of column (2) to (7) shall not exceed 11% in General grade.

General Characteristics:

Soybean shall be;

i) the mature, dried, clean and wholesome seeds of the plant Glycine max (L) Merrill;
ii) of uniform size, shape and colour characteristic of the variety;
iii) free from mould, musty odour or added colouring matter;
iv) completely free from admixture of any poisonous, toxic, harmful or non-edible seeds like neem, argemone, khesari, castor, mahua, etc;
v) free from pesticides/insecticide residue, except to the extent permissible under the PFA Rules and shall not contain uric acid exceeding 100 mg/kg and mycotoxin including afflatoxin exceeding 30 micrograms per kilogram.

Explanations:

1) Damaged and discoloured:	Include beans or pieces of beans which are sprouted, mouldy, diseased or materially damaged due to heat, moisture or microbial action.
2) Insect infected :	Include beans or pieces of beans that are partially or wholly bored or eaten by insects.
3) Immature and shriveled :	Include beans which are not fully mature or properly developed and shrunk out of shape.
4) Splits, broken and cracked : beans	Include mechanically damaged beans or pieces of beans with broken seed coat.
5) Inorganic foreign matter :	Includes sand, dust, dirt, stones, lumps of earth.
6) Organic foreign matter :	Includes chaff, stem, straw, husk and other edible seeds.

B). Tradable parameters of soybean for trading under e-NAM:

Soybean Seed shall be-

- wholesome, mature, clean, dried, uniform in size, shape and colour characteristic to the variety; and
- free from insect & fungus infestation, mould growth, added artificial colouring matter, rodent hair and excreta.

#	**Tradable Parameters**	**Reference Results**		
		Range-I	**Range-II**	**Range-III**
1	Oil content (% by wt)	Above 20.0	18.0 - 19.9	15.0 - 17.9
2	Moisture (% by wt)	Upto 7.0	7.1 – 9.0	9.1- 12.0
3	Foreign matter (% by wt)	Upto 0.20	0.21-0.75	0.76-1.00
4	Split or Cracked seed (% by wt)	Upto 2.0	2.1-3.0	3.1-4.0
5	Immature, shriveled and green seeds (% by wt)	Upto 2.0	2.1-3.0	3.1-4.0
6	Damaged and Weevilled seeds (% by wt)	Nil	Upto 0.5	0.6-2.0
7	Other edible seeds (% by wt)	Nil	Upto 0.5	0.6-1.0
8	Uniformity	More uniform	Slightly less uniform	Less uniform
9	Luster	Normal	Medium	Poor

Explanations:

a) Foreign matter includes dust, dirt, stones, lumps of earth, chaff, stems or straw, food grains including oil seeds of any other verity or any other impurity.
b) Damaged and Weevilled seeds that are partially or wholly bored or eaten by insect or are internally damaged as a result of heat, moisture, insect or microbial action.
c) Immature and shriveled seeds which are not fully mature or properly developed and shrunk out of shape.
d) Split or cracked seeds means mechanically damaged seeds or pieces with broken seed coat.
e) Uniformity means having similar characteristics mainly regarding the size or weight, and colour.
f) Variety: that differs from others of the same general kind or of the group to which it belongs.

Sampling Plan (Bags): 5% of the bags will be sampled from the lot.
Sampling Procedure:

1. The sample size shall be at least 500gm.
2. The entire quantity of oilseeds in bulk shall be divided into a suitable number of sub-lots of approximately equal weight.
3. One gross sample shall be drawn from each from each of the sub-lots so that these will be as many gross samples as the number of sub-lots into which the lot has been divided.
4. Sampling of oilseeds shall be carried out as far as practicable when the material is in motion. In case of oilseeds in the bag, the number of bags bags to be selected from sub-lot shall be done randomly from different layers.
5. In case of unbagged oilseeds, the sub-lots should be indicated by suitably marking the line of demarcation on the surface of a lot. The surface of each of the sub-lot shall then be leveled and from the various parts randomly chosen from the surface, a minimum of 50 increments shall be drawn with the help of suitable sampling instrument.

C). FSSAI Standards

C1). Soybean

(1) Soybean shall be obtained from the plants of Glycine max (L.) Merr. , which shall be mature, clean and dried seeds free from mould and musty odour and shall also be free from non-edible and toxic seeds.

(2) The product shall conform to the following standards, namely: -

Parameters	**Limit**
Moisture (per cent. by mass), Maximum	12.0
Extraneous Matter	Not more than 1.0 per cent by weight of which not 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.
Organic per cent. (Maximum percentage)	
Inorganic (Maximum percentage)	
Other edible grains (per cent. by mass), Maximum	1.0
Immature, Shriveled and green seeds (per cent. by mass), Maximum	6.0

Weevilled Seeds by count (no. of grains/100g) (Maximum percentage)	2.0
Damaged or split or cracked seed (per. cent by mass), Maximum	4.0
Oil content (per. cent on dry basis),Minimum percentage	13.0
Acid Value of extracted oil (Maximum)	2.5
Uric acid (mg per kg), Maximum	100

C2). Soybean oil means the oil expressed from clean and sound soybeans from which the major portion of the gums naturally present have been removed by hydration and mechanical or physical separation. It shall be clear, free from rancidity, suspended or other foreign matter, separated water added colouring or flavouring substances or mineral oil. It shall conform to the following standards: -

Butyro-refractometer reading at 40 °C	58.5 to 68.0
Or	
Refractive Index at 40°C	1.4649-1.4710
Saponification value	189 to 195
Iodine value	120 to 141
Unsaponifiable matter	Not more than 1.5 per cent

C3). Partially Hydrogenated Soybean Oil

1. Partially hydrogenated and winterised soybean oil means deodourised product obtained by light (mild or "Brush") hydrogenation of degummed, deacidified, decolourised and winterised soybean oil. The oil shall be degummed by water with or without a food grade additive, deacidified by either neutralisation with alkali or steam distillation (physical refining) or miscella refining using permitted food grade solvent, decolourised with bleaching earth and/or carbon, partially hydrogenerated using nickel catalyst, winterised with or without the use of a food grade solvent, filtered in a suitable filter press and deodourised with steam.

   The product shall be clear, free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances, castor oil, mineral oil, and other vegetable and animal fats.

   It may contain food additives permitted in the section on Regulations and Appendices.

   It shall conform to the following standards:

Moisture	Not more than 0.1 percent by weight
Refractive Index at 40°C	1.4630 - 1.4690
Or	
Butyro-refractometer reading at 40°C	55.6 - 64.8
Saponification value	189 - 195
Iodine value (Wij's method	107 - 120
Acid value	Not more than 0.50
Unsaponifiable Matter	Not more than 1.5 percent by weight

Linolenic Acid (c18: 3)	Not more than 3 percent by weight
Cloud Point (°C)	Not more than 10°C

Flash Point (Pensky Marten Closed method) Not less than 250 oC
Test for argemone oil shall be negative.

Further, if the oil is obtained by the method of solvent extraction and the oil imported into India whether obtained by solvent extraction or otherwise, it shall be supplied for human consumption only after refining and shall conform to the standards laid down under regulation 2.2.1 (16). The oil so refined shall not contain Hexane more than 5.00 ppm.

2. Partially hydrogenated soybean oil means deodourised product obtained by light (mild or "brush") hydrogenation of degummed, deacidified, decolorised soybean oil. The oil shall be degummed by water with or without a food grade additive, deacidified by either neutralisation with alkali or steam distillation (physical refining) or miscella refining using permitted food grade solvent, decolourised with bleaching earth and/or carbon and partially hydrogenated using nickel catalyst. The product shall again be deacidified, bleached and deodourised with steam.
The product shall be clear liquid at 35 degree C. It shall be clear on melting, free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances, castor oil, mineral oil or other vegetable and animal Oils & fats.
It shall conform to the following standards:

Moisture	Not more than 0.1 percent by weight
Refractive Index at 40 °C	1.4630 - 1.4670
Or	
Butyro-refractometer reading at 40 °C	55.6 - 61.7
Saponification value	189 - 195
Iodine value (Wij's method)	95 - 110
Acid value	Not more than 0.50
Unsaponifiable Matter	Not more than 1.5 percent by weight
Linolenic Acid (c18: 3)	Not more than 3 percent by weight
Cloud Point (°C)	Not more than 25°C
Flash Point (Penske Marten Closed method)	Not less than 250 oC

Test for argemone oil shall be negative

Note: The edible oils prescribed under regulation 2.2.1 shall be free from Castor oil. Further, if the oil is obtained by the method of solvent extraction and the oil imported into India whether obtained by solvent extraction or otherwise, it shall be supplied for human consumption only after refining and shall conform to the standards laid down under regulation 2.2.1 (16). The oil so refined shall not contain Hexane more than 5.00 ppm.

C4). Soy Protein Products

(1) Soy Protein Products (SPP) means the food products obtained by the reduction or removal from soybeans of the major non-protein constituents (water, oil, carbohydrates), which shall be clean, sound, mature and dry seeds. The Soy Protein Products so obtained shall be of following three types, namely: -

(a) Soy Protein Flour (SPF);

(b) Soy Protein Concentrate (SPC); and

(c) Soy Protein Isolate (SPI).

The product shall conform to the following standards, namely: -

Parameters	**Limits**		
	SPF	**SPC**	**SPI**
Moisture (per cent. by mass), Maximum	10.0	10.0	10.0
Crude Protein (per cent. on dry mass basis) *	more than 50.0 and less than 65.0	more than 65.0 and less than 90.0	More than 90.0
Total Ash (per cent. on dry mass basis), Maximum	8.0	8.0	8.0
Crude Fibre (per cent. on dry mass basis), Maximum	5.0	6.0	0.50

Note: - * The protein content is calculated on dry mass basis excluding added vitamins, mineral, amino acids and food additives.

C5). Textured Soy Protein (Soy Bari or Soy Chunks or Soy Granules)

Textured Soy Protein (Soy Bari or Soy Chunks or Soy Granules) is obtained by extrusion of defatted soy flour or grits. Textured Soy Protein shall conform to the following standards, namely: -

S.No.	**Parameter**	**Limit**
1	Moisture (per cent. by mass), Max.	7
2	Protein (N x 6.25) (per cent. on dry matter basis), Min.	50
3	Fat (per cent. not more than) on dry mass basis	1
4	Total Ash (per cent. on dry mass basis), Max.	8
5	Crude Fiber (per cent. on dry mass basis) Max.	3.5
6	Acid Insoluble Ash (per cent. on dry mass basis), Max.	0.3
7	Hexane, Max.	10 ppm
8	Urease Index Value	0.05-0.2 pH Units rise

C6). Tempe

(1) Tempe is a compact, white, cake-form product, prepared from dehulled boiled soybeans through solid state fermentation with Rhizopus spp.

(2) Product covered by this standard shall consist of the following ingredients:

(I) Soybean (any variety);

(II) Mould of Rhizopus Spp. (R.oligosporus, R. oryzae and/ or R. stolonifer) mix with Cooked rice powder, rice bran powder and/ or wheat bran powder as an inocula.

It shall conform to the following standards, namely: -

S.No.	Parameter	Limit
1	Moisture (per cent. by mass), Max.	65
2	Protein Content (on dry matter basis), Min per cent.	15
3	Fat Content (per cent. on dry mass basis), Min.	7.0
4	Crude Fibre (per cent. on dry mass basis) Max	2.5
5	Urease Index Value	0.05-0.2 pH Units rise

C7). Soybean Sauce:

1. Soybean Sauce means the product obtained from wholesome soybeans, by fermenting the soybean paste in which trypsin inhibitors have been inactivated & blending with salt, nutritive sweeteners. It may contain spices and condiments and other ingredients appropriate to the product preserved by using permitted preservative.
2. The product may contain food additives permitted in these regulations including Appendix A. The product shall conform to the microbiological requirements given in Appendix B. It shall meet the following requirements: -

(i) Total Soluble solids (m/m) Not less than 25.0 percent Salt free basis

(ii) Acidity as acetic acid Not less than 0.6 percent

3. The container shall be well filled with the product and shall occupy not less than 90.0 percent of the water capacity of the container, when packed in the rigid containers. The water capacity of the container is the volume of distilled water at 20ºC which the sealed container is capable of holding when completely filled.

C8). Solvent Extract Soya Flour: means the product obtained from clean, sound healthy soybeans by a process of cracking, dehulling, solvent extraction with food grade hexane and grinding. It shall be in the form of coarse or fine powder or grits, white to creamy white in colour of uniform composition and free from rancid and objectionable odour, extraneous matter, insects, fungus, rodent hair and excreta. It shall be free from any added colour and flavour. It shall conform to the following standards, namely: -

(a) Moisture Not more than 9.0 per cent by weight

(b) Total ash Not more than 7.2 per cent by weight on dry basis

(c) Ash insoluble in dilute HCl Not more than 0.4 per cent by weight on dry basis.

(d) Protein (Nx6.25) Not less than 48 per cent by weight on dry basis.

(e) Crude fibre Not more than 4.2 per cent by weight on dry basis.

(f) Fat Not more than 1.5 per cent by weight on dry basis

(g) Total bacterial count Not more than 50,000 per gm.

(h) Coliform bacteria Not more than 10 per gm.

(i) Salmonella bacteria Nil in 25 gm

(j) Hexane (Food grade) Not more than 10.00 ppm

3.4.2 Adulterants and toxins

CONTAMINANTS, TOXINS AND RESIDUES

Type	Name	Article of food	Limit
metal contaminants	Lead	Vegetable oils crude including soy oil	0.1 ppm
		Vegetable oils edible including soy oil	0.1 ppm
	Arsenic	Vegetable oils crude including soy oil	0.1 ppm
		Vegetable oils edible including soy oil	0.1 ppm
	Nickel	All hydrogenated, patially hydrogenated, interesterified vegetable oils and fats including partially hydrogenated soyabean oil	1.5 ppm
Aflatoxin		Oilseeds or oil Oilseeds for further processing Ready to eat	 15 µg/kg 10 µg/kg
Insecticide residues	Trichlorfon	Oil seeds	0.1 mg/kg.(ppm)
		Edible Oil (refined)	0.05 mg/kg.(ppm)
	Carbofuran	Oil seeds	0.1 mg/kg.(ppm)
	Cypermethrin	Oil seeds except groundnut	0.2 mg/kg.(ppm)
	Phenthoate	Oilseeds	0.03 mg/kg.(ppm)
		Edible oils	0.01 mg/kg.(ppm)
	Phorate	Oilseeds	0.05 mg/kg.(ppm)
		Edible oils	0.03 mg/kg.(ppm)
	Alachlor	Soyabeans	0.1 mg/kg.(ppm)
	Fluchloralin	Soya Beans	0.05 mg/kg.(ppm)
	Permethrin	Soya Beans	0.05 mg/kg.(ppm)
	Triazophos	Soyabean oil	0.05 mg/kg.(ppm)
	Metolachlor	Soyabean Oil	0.05 mg/kg.(ppm)
	Metribuzin	Soyabean Oil	0.1 mg/kg.(ppm)
	Pendimethalin	Soyabean Oil	0.05 mg/kg.(ppm)
	Imazethapyr	Soyabean oil	0.1 mg/kg.(ppm)
	Fenoxy-prop-p-ethyl	Soyabean seed	0.02 mg/kg.(ppm)
	Quizalofop-ethyl	Soyabean seed	0.05 mg/kg.(ppm)
	Clomazone	Soyabean seed	0.01 mg/kg.(ppm)
		Soyabean oil	0.01 mg/kg.(ppm)

3.4.3 Grading at producers' level

Grading of agricultural produce is very important for agricultural commodities because of their heterogeneity due to various factors such as different varieties, climate, soil, Shape, Size, Colour, Maturity etc. The grading of agricultural commodities at producers' level benefits the farmers/sellers as they are in a better bargaining position and get price in commensuration with the quality produced by them. About 18700 tonnes of soybean valued at Rs. 3807 Lakhs was graded at the producers' level in the year 2011-12. Under different schemes, soybean seed grading machines were provided to the farmers in different districts for the purpose.

3.5 Packaging

The Government of India has made it mandatory to pack food grains cereals, pulses etc., in Jute bags and an official notification in this regard was issued by the Ministry of Textiles on June 30, 1997. The jute gunny bags of 89x54 cms size are usually used for packing of soybean. The standard capacity of the bag for Soybean is 95 kgs. The small size seed of soybean can be filled up to 100 kgs. However, it has been observed that sometimes small consumer packaging is carried out in transparent thick polyethylene bags.

Criteria for selection of packaging material for Soybean:

- Packaging material should be;
    - Suitable according to transportation and storage method.
    - Suitable according to climatic and environmental conditions.
    - Safe to handle during transportation.
    - Cheap, economical, readily available, easy to handle and store.
    - Convenient and suit the need of the customer.
    - Attractive for display.
    - Environment friendly and biodegradable.
    - Conform to the requirements as laid down under PFA standards as amended from time to time.
- Soybean seed should be packed in clean, hygienic bags of any material, which does not affect the produce and prevents it from absorbing moisture.
- The packing material used should have sufficient aeration facilities
- The material must provide protective strength to the produce.

3.6 Transportation

The crop produce is being transported by road or rail network from farm to assembling markets and to processing centres.

A. Road: Road transport is the most popular means for movement of Soybean to the assembling markets as well as to the distribution centres.

a). Bullock / camel carts: Bullock or camel carts were the primary means of transport in most rural areas of India. It is convenient due to following reasons: -

- Cheap and early available conveyance.
- Good for small quantity of produce.
- Easy transport to short distance.
- Operational cost is low.

No special type of road is required, can be operated on kaccha road, muddy or sandy path also. But with the improvement in road connectivity and easy availability of mechanized means of faster transport, this mode of transport is now not preferred by the producers.

b). **Tractor trolley/ Pickup Van:** Transportation by tractor trolley/ pickup van is convenient due to following reasons –

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

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

c). Mini Trucks/ Trucks: The movement of Soybean from assembling markets to the secondary markets and consuming markets is invariably by mini trucks/ trucks. For larger or bulk quantity, the truck is the most convenient mode of transport throughout the country and in some cases better than railway wagons since the railway wagon transportation poses some difficulties like timely non-availability of wagons, safety of goods and problems of loading-unloading of produce directly at godowns. It is convenient due to following reasons:

- Easy availability
- Time saving
- Quick movement of stocks
- Door to door delivery
- Comparatively cheaper for short / medium distances
- Suitable for smaller quantities at a given time
- Flexibility in operation and reliability in handling of produce
- Minimum transit losses due to least handling of loading and unloading

B. Rail: Railway network in India is the World's fourth largest in terms of route kilometers after USA, China and Russia. For faster movement of goods, super express goods trains operate at fixed timings on trunk and other important routes. The transportation of Soybean by railway wagons may become convenient for following reasons:

- Suitable for carrying larger quantity of produce over long distances throughout the country.
- Comparatively cheaper and safer mode of transport available through a wide network of railways.

Facilities of three categories of tariff are as :

1) Telescopic/Class rate 2) Wagon load scale 3) Station to station rate

During transportation, following care should be taken:

- The packs of Soybean should be handled and transported in such a way so that they remain well protected from sun, rain or other sources of excessive heat, objectionable odour and from any type of cross infestation especially, while transporting through ships.
- During transportation, there should be proper arrangement of sufficient aeration and insulation to reduce the heat.
- Stacking height should be kept up to 6 to 10 tiers.
- While handling and lifting of bags during transportation, too much use of hooks by labourers should be avoided, which may cause spoilage losses from the Soybean bags.

3.7 Storage

Storage is an interim and a repeated phase during transit of agricultural products from producer to processor and its products from processor to consumer. Storage of grain and control of quality occur in three locations; on the farm, at aggregation points serving a number of farms, and at terminal points where grain is processed or moved forward in larger bulks. There are costs involved for loading and unloading of grains at each stage of storage, for transportation between storages and for storage itself. Additional costs are involved in conditioning of grains, mainly cleaning and drying, and for the control of quality. Most of the farmers store soybean in their own houses. They usually store in gunny bags. The filled bags are stacked above wooden planks and gunny bags or straw is spread over the floor to avoid dampness. The large farmers normally have pucca-floored houses, where the soybean is stored.
Traders, commission agents and brokers usually have their own godown facilities. They keep the soybean in bags in their own godowns in packed condition. The processing units are the main agencies who stock soybean for a longer period. They purchase and stock soybean to meet the requirements for the whole year. Generally, soybean is not stored in loose form. The bags are stored in the godowns, which have cemented floors.

Basic requirements for safe storage:

The following requirements are basic prerequisite for safe storage of Soybean:

- Selection of godown
- Cleaning of godowns
- Use of dunnage
- Cleaning of bags
- Cleaning of vehicles
- Aeration of godown
- Separate storage of old and new stock
- Cleaning and drying of Soybean
- Regular inspection of stocks

The code of storage practices of Soybean meant for milling and other industrial purposes are as follows:

Godowns:

- The godown for storage of Soybean shall be of 'A' Class construction with moisture proof flooring, leak proof roofing, tight fitting doors and ventilators. High plinth level of godown may prevent the entry of rodents and water.
- Soybean shall not be stored in compartment having fertilizer, cement or any other substance having deleterious effect. Godowns where fertilizers have recently been stored shall thoroughly be washed with caustic soda, fully aerated and when no traces of odour are present, Soybean shall be stored.

Dunnage:

- Wooden crates dunnage is preferable for the storage of Soybean. However, in the absence of wooden crates, polythene film sandwiched between two layers of bamboo mats may be used. Mat dunnage used for fertilizer, cement etc. should not be used for Soybean.

Stacking:

- Soybean bags shall be stacked in the godowns away from walls, pillars, doors, etc. leaving an alleyway space of 0.6 – 0.9m (2 to 3ft.). the main alleyway may not be less than 1.2m (4ft.). The base of stack shall not be more than 9.14m x 6.06m (30 x 20 ft.)
- Stack height of 15 layers is considered suitable for freshly harvested Soybean. Well dried stock with moisture content of less than 9 percent can however, be stacked a few layers higher.

Preservation:

- The Soybean which is rich in protein, as well as fat is vulnerable to infestation by insects, mites. Soybean containing less than 9 percent moisture generally remains free from the attack of pests.
- In case infestation occurs, fumigation shall be done with recommended chemical at the prescribed dosage. In any case, banned chemical pesticides should not be used.
- Excellent godown hygiene should be maintained to minimize the chances of insect infestation. Selective aeration of stock on clear sunny days should be done to maintain the quality of stock.
- Regular prophylactic treatments should be provided to the stocks with approved chemicals at recommended dosages.
- Regular inspection of stock should be done fortnightly by the usual procedure to examine the health of stock and to plan future pest control measures.

Insurance:

- Soybean is classified as non-hazardous for the purpose of fire insurance.

3.7.1 Major storage pests and their control measures

The details of the major insects and their control measures are given in Table- 7.

Table 7. Major storage insect pests and their control measures

Insect		Insect	
1. Cigaratte beetle *Lasioderma serricorne* (Fabricus)		2. Lesser grain borer *Rhizopertha dominica* (F)	
Indian meal moth: *Plodia interpunctella* (Phycitidae: Lepidoptera)		Pulse beetle: *Callosobruchus chinensis*	
Been Weevil: *Callosobruchus analis*		*Callosobruchus maculatus*	
Saw-toothed grain beetle: *Oryzophilus surinamsis*(L)			

Control measures		
Type	**Method**	**Details**
Ecological method	Temperature control	Temperature below 15°C and above 42°C retards growth and development. Heating of grains to 50–60°C for 10–20 min kills almost all pests
	Moisture control	Grains stored at around 10% moisture content escape attack by insect pests except for khapra beetles
	Oxygen control	Oxygen level >1% is lethal to all insect pests
Mechanical methods	Screening of grains	Regular screening and destruction of infested bags
Physical methods	Heat treatment	Infrared heating of grains
	Controlled atmosphere	Use of low O_2 (2–4%) and high CO_2 (9–9.5%) is lethal to all insects
Biological methods	Bioagents	Use of Bt, parasitoids, predators, etc.
Cultural methods	Airtight storage	Use of airtight sealed structure does not allow insects to survive
	Drying of grains	Store proper dried grains
	Superheating	Godowns to be heated by burning charcoal at the rate of 8 kg per cubic feet

Chemical methods	Prophylactic treatment	Malathion 0.5%, pyrethrum with 2% pyrethrin EC, primiphos methyl 0.5% in 1:100 ratio at 3/100 m3 at 15-day intervals
	Knockdown chemicals	Pyrethrum sprays, lindane smoke generators or fumigation stripes against flying insects
	Grain protectants	Pyrethrum dust or 5% malathion at 250 g/100 kg of seed
	Fumigants	Aluminium phosphide at two tablets (3 g each)/t Ethylene bromide at 3 ml/100 kg for wheat and pulses and 3 ml/100 kg for rice and paddy Ethylene dichloride/carbon tetrachloride mixture at 55 ml/100 kg stored grains
	IGRs	methoprene and hydropene at a dose of 10-20 mg/kg

3.7.2 Storage structures

Grain is generally stored either in bags or in bulk. A combined system of bag-cum-bulk storage is also practiced in some parts of the country. In villages the bulk storage system is more common than the storage in bags which is considered to be a practicable method· of storing grain in the government godowns as well as in trade. Mainly following three types of storage structures are available for storage of grains.

- Traditional storage structures
- Improved storage structures
- Modern storage structures
- Farm Silos

Traditional Storage Structures

In these types of storage structures the grain is generally stored in bulk. These types of storage structures generally have capacity between 1 to 50 tonnes. The storage of grain is generally done in one of the following storage structures in the different rural and urban regions of India in bulk as well as in bag storage.

- Morai type storage structures
- Bukhari type storage structures
- Kothar type storage structure
- Mud Kothi type storage structure
- Muda type storage structure
- Kanaj type storage structure
- Kuthla type storage structure
- Metal/ Steel bin type storage structure
- Bag type storage structure

Improved Storage Structures

Improved storage structures are the storage structures for storage of food grains. In this type of storage structures there are some improvements made in traditional storage structures. This type of storage structures having a higher storage capacity and long term storage of food grains than traditional storage structures. Improved type of storage structures having capacity is generally 2 to 150 tonnes. The storage of grain is generally done in one of the following storage structures in the different rural and urban regions of India in bulk, bag as well as bag and bulk storage.

Pusa bin

Pusa bin is like other traditional storage structures made of mud. To make the storage structure moisture proof a plastic film is used in all the inner sides of the bin. Pusa bin is just like other traditional storage structure and is made of mud. To make this storage structure moisture proof, a plastic film is used on inner side of the bin. A platform of mud bricks is made, first. On this platform, a sheet of 700-gauge plastic is spread in such a way that it overlaps the platform on all sides by at least 6 cm. On the plastic sheet, a layer of 7 cm thick kachcha bricks is then laid. Walls are made of kachcha bricks and these are sealed with mud plaster. Now the walls are raised to proper height and a wooden frame is placed on it. The upper roof of the structure is made of burnt bricks. For unloading of grains, an inclined wooden or steel pipe is fixed in such a way that grains may come out of structure by gravity. The mouth of pipe is closed by a cover. The inside of all the four walls and roof are covered with a plastic sheet. On the top, an open space of about 50 cm x 50 cm is left for loading of grains. Leaving this open space, the roof is sealed by mud. After the bin is filled with grains, the top open space is well covered by a plastic sheet so that air may not enter the bin.

Brick and cement bin

These type of storage structures are very strong and effect of seasons on these is minimum. These storage structures are very strong and therefore, the effect of season on them is negligible. The bin is made on a platform raised at 60 cm above the ground. A ladder is provided on one side of the bin for loading of the grains. A hole of about 60 cm diameter is provided on the roof for the purpose of loading the material i.e. grains. The walls of bin are about 23 cm thick with cement plastered on both the sides. Roof is made of R.C.C. The base of bin is made inclined and an outlet is provided for unloading of grains. The capacity of such bin is usually between 1.5 to 60 tonnes. For cleaning of bin and complete unloading, a provision of iron rings steps is provided inside the bin for person can enter and exit the bin.

Bunker Storage

This type of storage structure is used for long term storage and a larger volume of grains storage. Bunker storage structure is used for long term storage of a larger volume of grains. The structure is successful as a means of storing grains safely, securely and economically. By controlling

insects and the moisture, the losses in stored grains can be reduced upto 0.5%. In this type of storage structure, the grain is stored on a plastic sheet which is spread over ground and top covered with plastic sheet. A drain is also provided for drainage of rain water.

'CAP' Storage structures

The word 'CAP' is used for cover and plinth, plinth from the bottom and cover from the top. This type of open storage is considered as transit storage and serves the purpose of storage of food grains in bags for short period.

The 'CAP' is used for cover and plinth storage. The word plinth is means plinth from the bottom and cover means cover from the top. This type of open storage is considered as intermediate storage and serves the purpose of storage of food grains in bags for short period. This type of storage facility is cheaper as compared to conventional bag storage godowns. The cover is rectangular in shape having five sides and made from polyethylene film of 1000 gauge, leaving the bottom side open. The cover is used for protecting stack of bags. Normally the stack is built over a space of 9.11 x 6.1 m with a height of 18 bags which gives the storage capacity of around 150 tonnes. The cover having a dimension of 9.4 m x 6.4 m x 5.5 m normally weighs around 52 kg. Sometimes smaller covers are used for covering the stacks in covered varandah of conventional godowns. Such covers are called "Varandah covers". For storage of food grains under varandah covers, the stacks are built to a height up to 7 bags having an average capacity of 24 tonnes.

The following steps are normally followed in the construction of 'CAP' storage

(i) Select a high elevated ground and make it level.

(ii) Wooden sleepers are spread with one or two layers of bamboo mat cover on the top as dunnage.

(iii) The Gutters are provided all around the area to drain off rain water easily.

(iv) The stacking is done to the height upto 18 bags on the dunnage and is covered with polyethylene.

(v) The stacks arc covered with polyethylene covers and tied with ropes to prevent from blowing off with high velocity wind.

Modern Storage Structures

In India, larger volume of food grains is stored in bulk is 'silo' and conventional godowns (Shed) designed for bagged storage. The godowns side walls are of brick or stone masonry and sloped roofing in asbestos or Corrugated Galvanized Iron (CGI) sheets over steel trusses. Silos are constructed from steel or reinforced concrete. There are a cluster of adjoining silos in any modern large/ capacity processing plant. The modern permanent storage system should be selected for the safe keeping of stored grains and other products. The modern storage structures should be selected on the basis of first on quality and then on cost considerations. There are following types of modern storage structures.

Silo type of storage structures

Silos/bins are classified into two groups depending upon the relative dimensions of the container. These are classified as, (1) deep bins and (2) shallow bins.

Shallow bins

Squat silos are shallow bins. A squat silo has a wall height to diameter ratio 0.5 or even less. Squat silo can compete with sheds for low-cost quality storage.

Deep bins

Vertical Silos comes under this type of storage structures. There are two types of vertical silos a) Flat bottom vertical silo and b) Hopper bottom vertical silo.

Shed

Generally, a horizontal sheds have been used to provide low-cost, large volume storage. For storing grains and other products a very large volume sheds have also been constructed by Central Warehousing Corporation.

Farm Silos

Farm silos are a farm structure used to store and protect the animal fodder so that it is preserved in an ideal condition for farm animals. Animal fodder is cut and packed in the air tight silo to allow a partial fermentation to occur. The storage fodder is known as silage. There are two types of farm silos i) Tower silos and ii) Horizontal silos.

Tower silos

- Cylindrical Shape and made of masonary, wood or metal
- Cost of construction is comparatively much higher than that of horizontal type.
- Loading of animal fodder is difficult.
- Mechanical loader or a large capacity of blower is essential.

- This type of storage structures are not recommended under Indian conditions.

Horizontal silos

In horizontal silos pit type, bunker type and trench or stake type of storage structures used for storage of animal fodder.

- These are surface as well as below ground (underground) types of storage structures used on most of dairy farms as temporary and permanent storage structures for silage.
- The spoilage of silage and dry matter losses of these silos ranges between 20 to 30 percent.

Pit Silos

- Permanent pit silo is a circular deep well which is lined all around the side, and sealed from bottom, so that water may not rise in to it.
- Made in areas where the soil is deep and the water table is very low.
- Made of bricks, stones or concrete, and either cement or lime can be used as a binding material.
- A 22.5 cm thick wall will be used satisfactory up to 15-meter depth.
- The entire surface which is coming in contact with the silage should be plastered to make it smooth, air tight and water tight.
- Simple roof is made over the silo to protect the silage from sun and rain.
- Corrugated metal sheet dome or half pitch roof with ample overhang on all the sides are most economical and provide more space for filling.
- Stairs may be built along with wall for removing silage from the silo.
- The diameter of a silo is usually limited to 6 m and its depth is kept 2 to 3 times that of diameter.
- When the silo is opened for removing the silage, nobody should enter till the gases are removed.

Trench Silos

- Unlined trench silo can be made easily without involving any investment on building materials such as brick, cement and sand.
- Unlined silos give more spoilage and are likely to have caved side walls due to excessive rain and tend to become muddy at the bottom. So, lined trench silos are therefore become popular.
- The walls of the trench silos can be lined with brick, concrete or cement plaster with reinforcing wire mesh.
- If possible the silo should be roofed.
- Drains should be made around trench to intercept surface water.
- To facilitate drainage, it is desirable to locate the trench silo on slopping ground.
- Capacity depends on size of herd and number of day the silage is fed in a year.
- It is always economical to construct only one trench silo, even if it is quite larger.

- Sidewalls are given generally 33 per cent slope.

3.7.3 Storage facilities

3.7.3.1 At producers' level

Producers store Soybean in bulk at farm godown or own house using various types of traditional and improved structures. Generally, these storage containers are used for short period. Different organizations/institutions developed improved structures for storage with varying capacities like Hapur Kothi, Pusa bin, Nanda bin, PKV bin, etc. Different storage structures are also used for this purpose like bricks-built rural godown, mud stone godown, etc. Producers also use flexible PVC sheets covering for temporary storage. Some producers also pack Soybean in jute gunny bags or in gunny bags lined with polythene and stack in room.

3.7.3.2 Rural godowns

Considering the importance of rural storage in marketing of agricultural produce, a large storage capacity has been created under Rural Godown Scheme initiated by the Directorate of Marketing and Inspection in collaboration with NABARD and NCDC. Its objective was to construct scientific storage godowns with allied facilities in rural areas and to establish a network of rural godowns in the States and Union Territories. The main objectives of Rural Godowns Scheme were:

- Creation of scientific storage capacity with allied facilities in rural areas to meet the requirements of farmers for storing farm produce, processed farm produce, consumer articles and agricultural inputs;
- Promotion of grading, standardization and quality control of agricultural produce to improve their marketability;
- Strengthen agricultural marketing infrastructure in the country by paving the way for the introduction of a national system of warehouse receipts in the respect of agricultural commodities stored in such godowns;
- Prevention of distress sale immediately after harvest by providing the facility of pledge financing and marketing credit; and
- Reverse the declining trend of investment in the agriculture sector by encouraging the private and cooperative sectors to invest in the creation of storage infrastructure in the country.

3.7.3.3 Mandi godowns

Most of the Soybean is moved to the market after the harvest. Generally, Soybean is stored both in bulk and in bags in every mandi. Most of the States and Union Territories have *mandies* operated by Agricultural Produce Market Committees. The APMCs constructed storage godowns

in the market yards. At the time of keeping produce in godown, a receipt is issued indicating the kind and weight of produce stored. The receipt is treated as negotiable instrument and eligible for pledge finance. The CWC and SWCs were also allowed to construct godowns in the market yards. Co-operative societies also constructed godowns in the market yards, both in producing and consuming areas/markets. Traders also possess permanent storage in the form of own godowns or warehouses, or on hire basis.

3.7.3.4 Central warehousing corporation

Central Warehousing Corporation, the largest public warehouse operator in the country, was established during 1957. As on March 2021, CWC operated 422 warehouses in the country, with a total storage capacity of 124.54 lakh tonnes. This included custom bonded warehouses, CFCs/ ICDs and ACCs/AFS. State-wise storage capacity with CWC as on 31st March 2021 is given on Table 8 below.

Table 8. 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.

3.7.3.5 State warehousing corporation

Different States have set up their own warehouses in the country. The area of operation of the State Warehousing Corporations is district places of the State. The total share capital of the State Warehousing Corporations is contributed equally by the Central Warehousing Corporation and concerned State Government. The SWCs are under the dual control of the State Government and the CWC. As on March, 2021, SWCs were operating 2203 warehouses in 19 States of the country with the total capacity of 439.12 lakh tonnes. The State-wise storage capacities with SWCs as on 31st March, 2021 are given on Table 9 below.

Table 9. 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.

3.7.3.6 Co-operative storage facilities

Cooperative storage facilities are provided to the producer at cheaper rates, which reduces the storage cost. These cooperatives also provide pledge loan 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 construction of storage facilities by cooperatives, particularly

at rural and market level. The number and capacity of cooperative godowns assisted by NCDC in major states are given below.

Table 10. 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.

3.7.4 Pledge finance

It is a well-known fact that the prices of agricultural commodities immediately after harvest, tend to be low compelling the farmers specially the small and marginal farmers with low or no holding capacity, to resort to distress sale. There has been a felt need to provide the farming community with pledge finance to enable the farmers to avail credit when the prices are low and to sell their produce when the prices are favourable. Initially, pledge finance facility was extended through the State and Central Warehousing Corporations' warehouse receipts by the financing banks. However, since the godowns of State & Central Warehousing Corporations were limited and located at division or district level involving transportation charges, the facility was not of much avail to the farmers. Therefore, to facilitate the farmers with credit when the agricultural prices are low, the Agricultural Marketing Departments/ Boards of various States have started implementing the pledge finance scheme, through their APMCs. However, due to limited storage infrastructure available with the APMCs and also since the APMCs are distantly located, not many farmers were benefitted through the pledge finance schemes of the Agricultural Marketing Departments/ Boards. The pledge finance schemes being implemented by the State Agricultural Marketing Departments/ Boards, State and Central Warehousing Corporations and Collateral Management Service providers in various States.

Further, the banks extending post-harvest loans under pledge finance had problems of assessment of the quality of the agricultural produce, security of the produce pledged and also the security of the loan. This gave rise to the emergence of Collateral Management Service providers like National Collateral Management Services Ltd., (NCMSL), National Bulk Handling Corporation Ltd., (NBHC), etc., which are being promoted by a consortium of banks and other related organisations. These Collateral Management Service providers assay the quality of the produce, issue the warehouse receipts, maintain and manage the produce and also offer collateral security of the produce stored, to the banks on behalf of the farmers who store the produce. They in turn charge their margin for the services provided. The banks extend pledge finance to the farmers based on the warehouse receipts issued by the Collateral Management Service providers.

3.7.5 WDRA/ NWRs

The Government of India constituted the Warehousing Development and Regulatory Authority (WDRA) on 26th October, 2010 under the Warehousing (Development and Regulation) Act, 2007. The main objectives of WDRA are to implement the Negotiable Warehouse Receipt (NWR) system in the country, improve the fiduciary trust of the depositors and the banks on the NWRs issued by the registered warehouses, increase liquidity in the rural areas, encourage scientific storage and warehousing, lower the cost of financing, promote shorter and efficient supply chains, enhance rewards for standardization and grading, and ensure better price discovery of the produce. The NWRs can be traded as well as endorsed by the holder of the receipt. As far as financial institutions are concerned, NWRs issued by public warehouses constitute at least a possessory pledge, which is superior to the pledging of the assets in the borrowers' possession.

4. MARKETING PRACTICES AND CONSTRAINTS

4.1 Assembling

4.1.1 Major assembling markets

The major assembling markets for soybean are located in Madhya Pradesh, Maharashtra and Rajasthan. Some major assembling markets of soybean in major producing states in India are listed below in Table 11.

Table 11. Assembling markets of soybean in major soybean producing states

State	District	Major assembling markets/ mandies
Madhya Pradesh	Ashoknagar	Ashoknagar, Mungoli
	Betul	Betul, Multai
	Bhopal	Bhopal, Berasia
	Dewas	Dewas, Khategaon, Sonkatch, Kannod, Hatpipalya
	Dhar	Dhar, Badnawar, Rajgarh, Dhamnod, Manawar
	Indore	Indore, Gautampura, Sanwer, Mhow
	Mandsaur	Mandsaur, Pipliya, Daloda, Sitamau
	Neemuch	Neemuch, Manasa
	Ratlam	Ratlam, Jaora, Alot, Sailana
	Rajgarh	Biaora, Jirapur, Kurawar, Narsingarh, Pichour
	Sehore	Sehore, Astha, Nasrullaganj, Jawar, Ichhawar
	Shajapur	Shujalpur, Shajapur, Agar, Nalkheda
	Ujjain	Ujjain, Badnagar, Tarana, Mahidpur, Khachrod
Maharashtra	Ahmednagar	Kopargaon, Rahata, Shrirampur, Rahuri
	Akola	Akola, Akot, Murtizapur, Telhara
	Amrawati	Achalpur, Amrawati, Anjangaon, Chandur bazaar, Daryapur, Dhamngaon rly., Morsi, Nangaon
	Beed	Ambejaogai, Kille Dharur, Parali Vaijyanath
	Buldhana	Khamgaon, Lonar, Buldhana, Chikali, Mehekar, Malkapur, Deoulgaon Raja, Shegaon
	Chandrapur	Bhadrawati, Chandrapur, Chimur, Gondpimpri, Rajura, Varora
	Hingoli	Basmat, Hingoli, Hingoli(Kanegoan Naka), Jawala-Bajar, Sengoan
	Jalna	Jalna
	Latur	Ahmedpur, Asua, Latur, Latur(Murud), Udgir

	Nagpur	Bhiwapur, Kalmeshwar, Katol, Mandhal, Nagpur, Sanver, Umared
	Nanded	Dharmabad, Nanded, Mudkhed, Loha, Umari
	Nasik	Lasalgaon, Lasalgaon(Niphad), Sinner
	Parbhani	Gangakhed, Jintur, Manwat, Parbhani, Purna, Selu, Tadkalas
	Sangli	Sangli, Islampur
	Satara	Koregaon,
	Wardha	Arvi, Hinganghat, Pulgaon, Sindi(Selu), Wardha
	Washim	Karanja, Malegaon(Vashim), Mangrulpeer, Manora, Risod, Washim
	Yavatmal	Arni, Babhulgaon, Kalamb, Ner Parasopant, Pasud, Umarked, Vani, Yeotmal
Rajasthan	Baran	Anta, Atru, Atru (Kawai Salpura), Baran, Chhabra, Chhabra (Chhipabadod)
	Bundi	Bundi, Keshoraipatan, Sumerganj
	Chittorgarh	Badrisadri, Nimbahera
	Jhalawar	Aklera, Bhawani Mandi, Bhawani Mandi (Choumehla) , Bhawani Mandi (Raipur), Jhalarapatan, Khanpur
	Kota	Chechat, Itawa, Kota, Ramaganj Mandi,
	Pratapgarh	Pratapgarh
	S. Madhopur	Sawai Madhopur

Source: compiled by authors on the basis of data collected from Agmarknet

4.1.2 Arrivals

The total arrivals of soybean in major assembling markets of Madhya Pradesh were 3467466 tonnes during the year 2019-20 followed by Maharashtra with 1518255 tonnes and markets of Rajasthan with 498502 tonnes. The detailed information about the quantity of arrivals of soybean in major assembling markets of main producing states is shown in Table 12.

Table 12. Arrivals of soybean in main markets of major soybean producing states

S. No.	Year	Total Arrivals (Tonnes)			
		Madhya Pradesh	Maharashtra	Rajasthan	India
1	2014-15	4608455.71	574828.62	535472.10	5934638.13
2	2015-16	2852823.60	969511.00	703110.60	4796413.40
3	2016-17	3214676.21	1581484.00	500407.84	5602912.45
4	2017-18	3628184.09	1633183.00	606423.36	6141160.65
5	2018-19	4987257.62	1423951.00	562436.66	7209687.53
6	2019-20	3467466.97	1518255.00	498502.80	5812146.44
7	2020-21	2512898.69	1348372.00	480873.10	4569060.30

Source: AGMARKNET

Trends in prices and arrivals at major markets

Soybean starts arriving in the markets with the onset of harvesting in the month of October, peaks during November and December months and starts declining afterward. In the month of September, higher arrivals were seen mainly from the storage and harvesting of early maturing varieties. Prices of soybean observed to be higher, generally, in the months of April-June, the lean season.

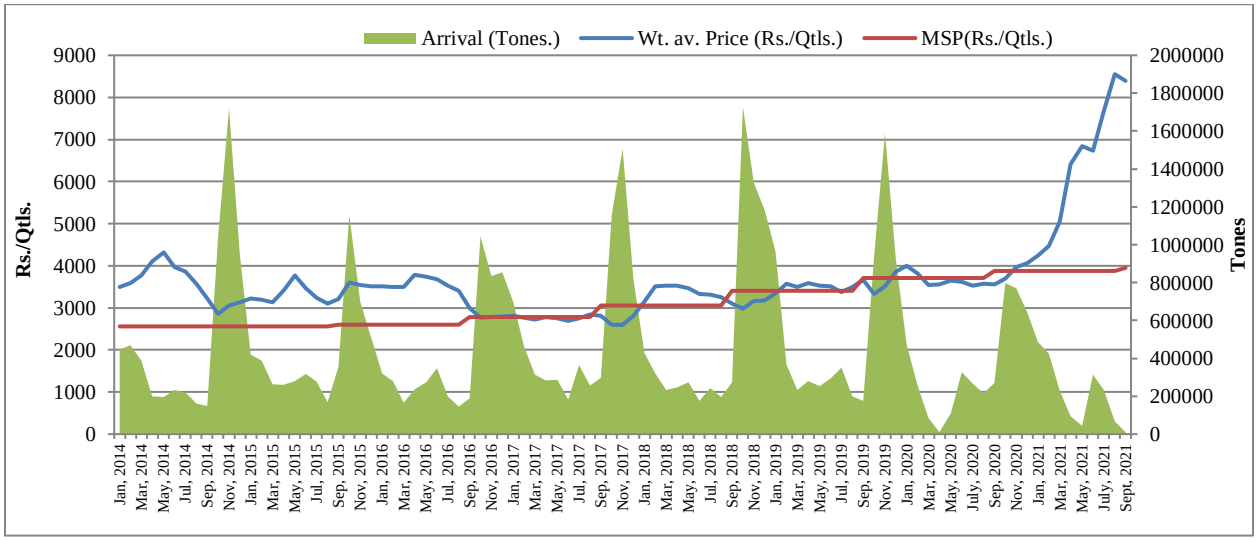


Figure 7. Trends in arrivals and prices of soybean

4.1.3 Dispatches

The maximum arrivals and dispatches in Madhya Pradesh were at Indore, Dewas, Ujjain, Mandsaur, Neemuch, Sehore, Ratlam, Sahajapur and Dhar markets. The processing units are mainly situated at Indore, Dewas, Sahajapur, Sehore, Pithampur and Betul, etc., and, as such, a major share of produce is dispatched were to these processing centers. Large scale dispatches outside the state were to Jamnagar and Rajkot in Gujarat. Major assembling markets in Maharashtra are Akola, Amrawati, Nasik, Nagpur, Washim, Wardha and Yavatmal. Soybean from these markets is being despatched to Mumbai, Nasik, Aurangabad and Akola. Kota, Bundi, Baran, Chittorgarh and Jhalawar are the important assembling markets in Rajasthan state. Soybean was dispatched to processing centers in Kota, Bundi in Rajasthan, and Gujarat, Madhya Pradesh and Delhi for further processing. The substantial quantity of soybean is moved to the processing units in Madhya Pradesh from Uttar Pradesh. The trend of despatches of Soybean observed as follows:

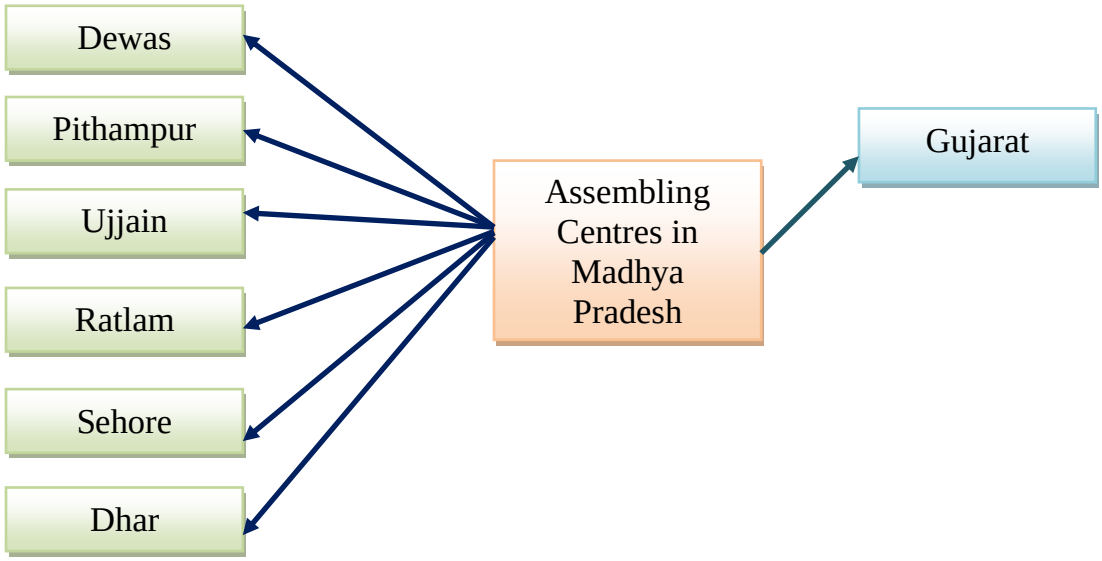
S.No.	Place of dispatch	Place of arrival
1.	Indore, Dewas, Ujjain, Mandsaur, Neemuch, Ratlam, Sahajapur, Sehore, Dhar	Pithampur, Sehore, Betul, Jamnagar, Rajkot
2.	Akola, Amrawati, Nasik, Nagpur, Washim, Wardha, Yavatmal	Mumbai, Nasik, Aurangabad, Akola
3.	Kota, Bundi, Baran, Chittorgarh, Jhalawar	Kota, Bundi, Madhya Pradesh, Gujarat, Delhi

4.2 Distribution

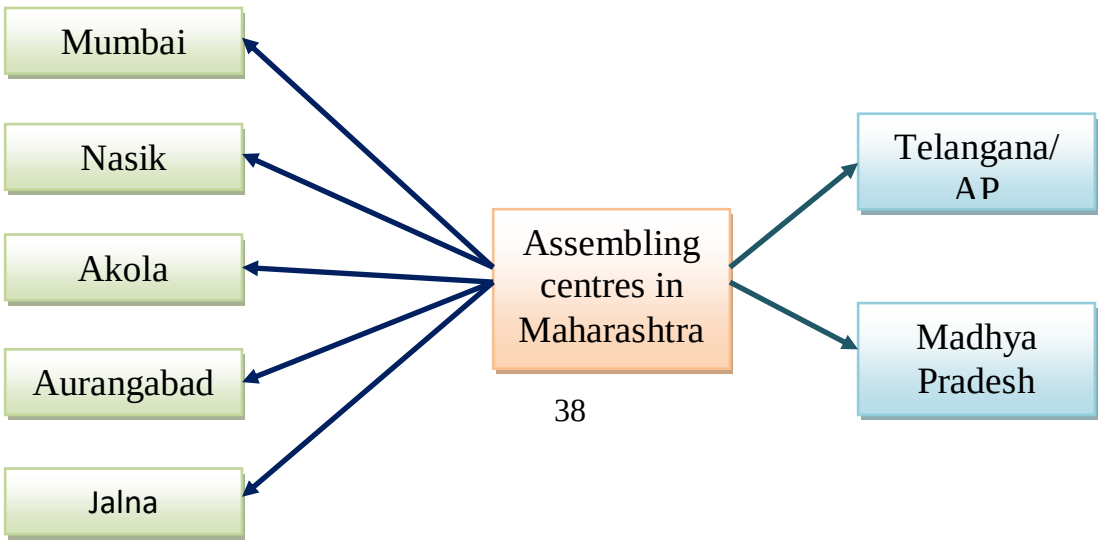
In the producing states, commission agents are the major agency in the distribution of Soybean. In the consuming states, the distribution is confined to retailers. The purchase of Soybean for processing units is mainly done by the commission agents in all major assembling markets. They attend to handling, packing and dispatch of soybean on behalf of their clients. In the assembling markets, processing units also purchase and dispatch soybean to their units. Brokers and wholesalers play some role in the distribution of soybean but not to the extent of commission agents. Contract farming and direct procurement are also being explored by the processing industries. The distribution for retail sale in the non-producing states is mainly affected through wholesalers.

4.2.1 Inter-state movement: The inter-state movement from the major producing states are exhibited in the diagrammatic flow chart below:

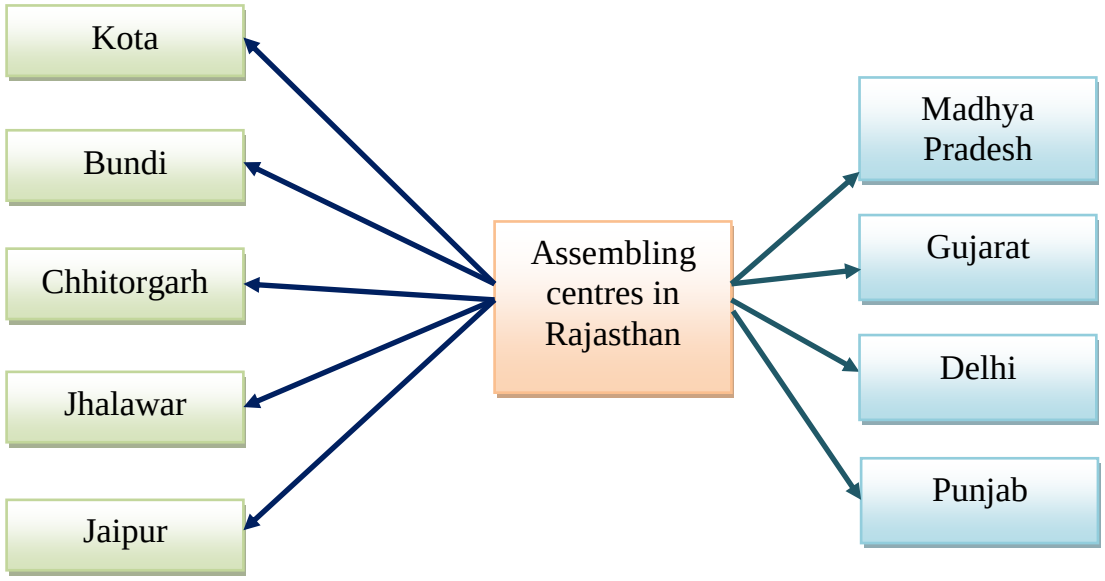
I. Madhya Pradesh State



II. Maharashtra



III. Rajasthan



4.3 Export and import

Export of Soybean Products:

The country mainly exports soybean meals/ de-oiled cake, soybean, soybean flour, soy oil, soy sauce and soy milk drinks to different countries. Export of soybean meals/ de-oiled cakes during the period 2020-21 totaled at 20.69 lakh tonnes valued at Rs. 8352.69 crores. The major export destinations for soybean meal from India were USA (19.89%), Nepal (8.86%), Indonesia (8.33%), France (8.07%), Germany (6.87%), Bangladesh (6.73%), Vietnam (5.42%), Netherland (5.27%), and Iran (4.18%). The country also exported 0.61 lakh tonnes of soybean (HS 120190) valued at Rs. 27941.2 lakhs during the financial year 2020-21, destined mainly to USA (40.18%), Canada (24.95%, Belgium (24.59%) and Nepal (5.94%).

Table 13. Export of soybean and products from India (Qty in tonnes and Value in Rs. Lakhs)

Crop commodity	2019-20		2020-21		2021-22	
	Qty.	Value	Qty.	Value	Qty.	Value
Soybeans w/n broken of seed qlty	9851.6	4176.0	7471.3	3451.2	5054.9	3575.6
Other soybeans w/n broken	64818.0	27082.0	61045.3	27941.2	38418.4	27569.1

Flours and meals of soybeans	23532.6	11793.2	20903.9	11728.9	12625.9	10255.1
Soybean crude oil w/n degummed	2031.9	1630.1	3273.5	2755.6	89.4	111.6
Soybean oil of edible grade	7796.2	6998.6	10719.1	11643.0	10012.4	15524.3
Soybean oil other than edible grade	2021.4	1966.6	439.0	503.2	4.6	20.6
Soy sauce	1092.7	724.6	1177.2	991.6	1105.3	844.6
Soy milk drinks w/n sweetnd or flavrd	18.8	11.0	2.7	2.1	9.3	25.3
Oil-cake & oil-cake meal of soybean expeller variety	397229.3	167528.6	672706.3	305265.8	234331.3	150064.1
Oil cake of soybean solvent extracted (defatted) variety	8564.9	2969.7	69212.1	24991.6	15807.1	8313.6
Meal of soybean solvent extracted (defatted) variety	343976.7	119737.5	1040187.7	392542.1	401749.0	195420.2
Other solid residues resulting from of extraction soybean oil	120580.1	44701.2	286633.7	112469.5	98742.1	58535.8
Isolated soya protein	155.6	375.3	875.1	1683.2	1742.4	3900.8

Source: DGCI&S, Kolkata

Table 14. Export of soybean from India

S.No.	Country	Values in Rs. Lacs		Quantity in tonnes	
		2020-21	2021-22	2020-21	2021-22
SOYA BEANS, WHETHER OR NOT BROKEN: SEED (HS 120110)					
1	Canada	1,855.19	576.94	4,097.00	880.22
2	U S A	711.12	1,906.73	1,534.00	2,676.77
3	Belgium	345.81	239.41	674.5	337.5
4	France	182	-	417	-
5	UAE	175.95	202.6	365.83	281.39
6	Nepal	71.19	-	179	-
7	Qatar	25.61	32.16	54.6	39.99
8	Sri Lanka	-	570.78	-	783.51
9	**Total**	3,451.19	3,575.61	7471.28	5054.9
SOYA BEANS- OTHER (HS 120190)					
1	U S A	11,623.00	6,322.60	24,526.26	8,354.92
2	Belgium	6,978.56	697.62	15,011.04	982.5
3	Canada	6,880.14	11,999.20	15,233.72	16,148.28
4	Nepal	1,449.11	748.83	3,625.26	1,277.30
5	Taiwan	263.55		995	
6	France	255.15		572	
7	UAE	254.34	339.39	645.4	813.08
8	Turkey	-	4687.45	-	7000.42
9	**Total**	27,941.18	27,569.07	61045.31	38418.35

Source: DGCI&S, Kolkata

Import of Soybean products:

The country imported 34.21 lakh tonnes of soybean crude oil valued at Rs. 21027.1 Crores during the year 2020-21 and 2.19 lakh tonnes of soybean oil of edible grade (HS 15079010) valued at Rs. 2119.46 crores. About 72.75 per cent of soybean crude oil is sourced from Argentina, 9.84 per cent from Brazil, 5.85% from Switzerland and 4.21% from the Netherlands. The Import of other soybeans (HS 120190) has increased tremendously to 4.51 lakh tonnes during the year 2020-21 valued at Rs. 1944.5 Crores, mainly sourced from Benin (37.3%), Togo (26.72%), UAE (10.83%), Mozambique (8.96%) and Ghana (3.25%).

Table 15. Import of soybean and products in India (Quantity in tonnes and Value in Rs. Lakhs)

Crop commodity	2019-20		2020-21		2021-22	
	Qty.	Value	Qty.	Value	Qty.	Value
Soybeans w/n broken of seed qlty	11149.6	4139.8	9671.3	4817.6	237.4	174.4
Other soybeans w/n broken	349500.3	130484.4	450971.2	194451.3	655895.5	413819.4
Flours and meals of soybeans	2.0	2.1	163.0	110.2	120.8	71.7
Soybean crude oil w/n degummed	3239816.0	1670599.5	3421131.0	2102710.1	3558872.9	3672757.3
Soybean oil of edible grade	73391.5	61081.5	219074.4	211945.9	332113.4	454025.9
Soybean oil other than edible grade	437.7	669.1	230.9	612.1	232.9	939.3
Soy sauce	1085.6	1460.2	644.3	938.3	1517.3	1876.9
Soy milk drinks w/n sweetnd or flavrd	497.6	230.8	49.1	41.2	45.6	54.4
Oil-cake & oil-cake meal of soybean expeller variety	859.7	374.5	7321.1	2674.4	32039.7	17312.0
Oil cake of soybean solvent extracted (defatted) variety					3305.2	1795.9
Meal of soybean solvent extracted (defatted) variety	74.5	36.6	19510.9	6279.1	641786.1	276605.6
Other solid residues resulting from of extraction soybean oil	295.9	250.4	1434.5	709.7	2711.7	1622.7
Isolated soya protein	6667.4	15951.9	7282.0	19019.6	12001.9	36869.9

Source: DGCI&S, Kolkata

Table 16. Import of soybean in India

S. No.	Country	Value in Rs. Lacs		Quantity in tonnes	
		2020-21	2021-22	2020-21	2021-22
SOYA BEANS, WHETHER OR NOT BROKEN: SEED (HS 120110)					
1	ETHIOPIA	2,797.63	122.04	6,060.00	154
2	UGANDA	2,019.98		3,611.26	
3	USA	0.03			
4	BENIN		52.37		83.42
	Total	4,139.79	4,817.64	11,149.62	9,671.26
SOYA BEANS- OTHER (HS 120190)					
1	TOGO	51,509.46	90,485.18	120,478.30	149,446.09
2	TANZANIA REP	96.59	86,316.44	214	123,332.77
3	MOZAMBIQUE	14,858.57	74,815.47	40,416.50	127,823.39
4	MALAWI	2,160.84	46,691.83	5,227.00	72,938.79
5	BENIN	74,713.05	43,273.44	168,218.59	66,505.25
6	BURKINA FASO	3,620.87	19,307.48	8,206.00	31,203.85

7	ETHIOPIA	5,141.79	17,145.05	11,510.00	25,391.50
8	U ARAB EMTS	21,308.60	9,581.67	48,838.66	15,689.26
	GHANA	6,529.22	4,682.05	14,671.28	8,901.92
9	NIGER	2,683.00	3,086.65	6,131.25	5,239.36
10	Total	194,451.25	413,819.44	450,971.20	655,895.47

Source: DGCI&S, Kolkata

4.3.1 Sanitary and phyto-sanitary requirements

The sanitary and phytosanitary (SPS) measures are an integral part of export trade as per agreement made under GATT (General Agreement on Trade and Tariffs), 1994. As per provisions made under this agreement, the standards framed should be such that the minimum level of protection required by an importing country may be fulfilled. Codex Alimentaris Commission (Codex) was set up in 1963 by the Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) to develop food standards by laying down guidelines and related texts such as code of tactics under the joint aegis of FAO/WHO. Food standards programme is aimed at protecting health of the consumers and ensuring fair trade practices in the food trade as well as to promote coordination of all food standards work undertaken by international governmental and non-governmental organizations. The SPS measures thus adopted safeguard the risks arising from;

- The entry, establishment or spread of pest, disease or any disease causal organism.
- The additives, contaminants, toxins or disease causing organism on foodstuff.
- The disease carried by animals, plants or their products.

During export, in order to make the plant/seeds free from any quarantine pests and diseases, the exporter should give a disinfection treatment by keeping the viability of the plant/ seeds unaffected. The disinfection treatment before shipment should be carried out by authorized expert/ technical personnel since this process is hazardous. To assure the pest free product, the disinfection treatment should be done just before shipment of produce.

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

The Soybean, which is rich in protein as well as fat is vulnerable to infestation by insects, mites and if contains more moisture makes it prone to the infection by fungi. Soybean should be dried to reduce its moisture content preferably below 9 percent before packing. Soybean should be packed in clean, dry, sound single hessian bags. In case, infestation occurs, fumigation should be done with prescribed chemical in recommended dosage. Banned chemicals should not be used in any case. Regular inspection of stocks to check health of the seed and regular prophylactic treatment should be provided with the approved chemicals.

4.3.2 Export procedures

Foreign Trade Policy 2015-2020 describes the following mandatory documents for import and export.

- Bill of Lading/ Airway bill
- Commercial invoice cum packing list
- Shipping bill/ bill of export/ bill of entry (for imports)

(Other documents like certificate of origin, inspection certificate etc may be required as per the case.) (for details see http://www.indiantradeportal.in/, http://plantquarantineindia.nic.in/PQISPub/html/Export.htm)

A number of IT initiatives have been introduced for providing secured online services to the exporters. These include facility for online filing of documents/ applications, a simplified system for issuance of Importer Exporter Code (IEC) online and setting up of a Complaint Resolution System for resolution of FDI related issues. In addition, an online system has been put up in place to resolve complaints received through public grievances portal of Department of Administrative Reforms and Public Grievances.

4.4 Marketing constraints

- Lack of procurement facilities in case market prices trade below minimum support prices.
- Markets are located at distant places. Lack of infrastructure for grading of produce and no grade based pricing of the produce in the krishi upaj mandies.
- Delayed payment of produce to the farmers.
- Lack of adequate scientific storage facilities in the villages. Although, the progress has been made for creating storage space under Rural Godown Scheme, the facilities in remote villages is still unavailable.
- Inadequate transport facilities from remote villages to the aggregation centres and high cost of transport.
- Soybean has not entered in to the general food habits of the common people of the country. Therefore, there is strong need to launch consumer awareness programme in order to popularize various soy products.
- There is a good scope for small units manufacturing protein rich food products from soybean. Such agro-based industries may help the cultivators to improve their economic conditions and provide protein rich Soybean products. Therefore, Government should encourage incentives for soy based agro industries.
- The grade specifications formulated by Directorate of Marketing and Inspection should be popularized among the farmers, traders and processors. Grading at producers' level should also be encouraged.

5. MARKETING CHANNELS, COSTS AND MARGINS

5.1 Marketing channels

Marketing of soybean through wholesaler in Krishi Upaj Mandi was most popular channel of marketing of soybean (66.3%) followed by marketing directly to processor (20.6%). The popular marketing channels for sale of soybean in Dewas district of Madhya Pradesh were (Singh, 2014):

Channel I: Producer – Village merchant – Wholesaler (mandi) – Processor or agent (oil)
Channel II: Producer – Processor or agent (oil)
Channel III: Producer – ITC (e-choupal) – Processor or agent (oil)
Channel IV: Producer – Wholesaler (mandi) – Processor or agent (oil)

Marketing channels for sale of soybean in Hingoli district of Maharashtra were (Vitthal, 2016):

Channel I: Producer – Village merchant – Wholesaler – Oil Processor
Channel II: Producer –Wholesaler – Oil Processor
Channel III: Producer – Processor or agent (oil)

Following distribution channels were reported in sale of soybean oil (Tirole, 2014):

Channel I: Company godown – Company distributor – Consumer
Channel II: Company godown – Company distributor – Retailer – Consumer
Channel III: Company godown – Super stockiest – Retailer – Consumer
Channel IV: Consignment sale agent – Company distributor – Consumer
Channel V: Consignment sale agent – Company distributor – Retailer – Consumer
Channel VI: Consignment sale agent – Super stockiest – Retailer – Consumer

Soy milk and tofu distribution channels were:

Channel I: Processor – Wholesaler – Retailer – Consumer
Channel II: Processor – Wholesaler – Consumer
Channel III: Processor – Retailer – Consumer
Channel IV: Processor – Consumer

5.2 Marketing costs and margins

Marketing Cost:

Marketing costs includes all the marketing charges paid by different agencies from farm gate (local assembling) to the consumers. It includes the following:

- Handling charges at local points
- Assembling charges
- Transportation and storage costs
- Handling by wholesalers and retailer charges to consumers

- Expenses on secondary services like financing, risk taking and market intelligence
- Profit margin taken out by different agencies

The marketing costs i.e. the charges which are to be paid by buyers and sellers, includes the marketing fee, agent/ Arthiya commission, loading and unloading charges, and other charges. These charges vary across commodity groups and states.

Marketing Costs and Margins:

The movement of products from the producers to the ultimate consumers involves costs, taxes, and cess which is called marketing costs. These costs vary with the channels through which a particular commodity passes through. Eg: - Cost of packing, transport, weighment, loading, unloading, losses and spoilages. Margin refers to the difference between the price paid and received by a specific marketing agency, such as a single retailer, or by any type of marketing agency such as retailers or assemblers or by any combination of marketing agencies such as the marketing system as a whole. Absolute margin is expressed in rupees. A percentage margin is the absolute difference in price (absolute margin) divided by the selling price. Mark-up is the absolute margin divided by the buying price or price paid.

Table 17. Marketing cost and margin in marketing of soybean in Dewas district of Madhya Pradesh

S.No.	Particulars	Channels (values in % of processors price)			
		I	II	III	IV
1	Producers sale price	93.23	97.26	96.29	97.12
2	Producers marketing cost	-	-	0.65	1.15
3	Net amount received by farmer	**93.23**	**97.26**	**95.64**	**95.97**
4	Village merchant marketing cost	1.44	-	-	-
5	Village merchant margin	2.45	-	-	-
6	Village merchant sale price or Wholesaler purchase price	97.12	-	-	97.12
7	Wholesalers marketing cost	1.08	-	-	1.08
8	Wholesaler margin	1.80	-	-	1.80
9	Wholesaler sale price	100.0	-	-	100.0
10	ITC purchase price	-	-	96.29	-
11	ITC marketing cost	-	-	1.98	-
12	ITC margin	-	-	1.73	-
13	ITC sale price	-	-	100.0	-
14	Processor purchase price (grain)	100.0	97.26	100.0	100.0
15	Processor marketing cost	-	1.30	-	-
16	Agent brokerage	-	1.44	-	-
17	Price paid by the processor	100.0	100.0	100.0	100.0

Source: Singh, 2014

Table 18. Marketing cost and margin in marketing of soybean in Hingoli district of Maharashtra

S.No.	Particulars	Channels (values in % of processors price)		
		I	II	III
1	Producers net price (producers share)	85.88	92.03	98.80
	Expenses incurred by producer	0.79	2.03	1.19
	Price paid by village merchant	86.67	-	-
	Expenses incurred by village merchant	2.01	-	-
	Price paid by wholesaler	94.00	94.06	-
	Expenses incurred by wholesaler	1.29	1.40	-
	Margin of wholesaler	4.69	4.52	-
	Price paid by processor (Rs. 3794.44)	100	100	100

Source: Vitthal, 2016.

6. MARKETING INFORMATION AND EXTENSION

The prices of soybean, soy meal and oil are published in the leading newspapers of each state and also are being covered in radio and television programmes. The concerned state agricultural marketing department collects the information on arrivals and prices of soybean on daily basis in all major markets where the commodity is being traded. The information so collected is being regularly uploaded on the website "https://agmarknet.gov.in" and also on the website of respective state agricultural marketing department/ board. The information is also being sent to farmers through SMS in the mobile phone.

Other cooperative and private agencies such as NAFED/ MARKFED/ OILFED/ SOPA, Indore/ SEA, Mumbai also collects the information on soybean production, arrivals, prices, stocks, exports, imports, etc. in the country. ITC Ltd. through e-chaupals in the villages provide complete information on soybean production, marketing and utilization through internet kiosks on a nominal price to the farmers.

This initiative now comprises about 6,100 installations covering over 35,000 villages and serving over 4 million farmers. While the existing e-Choupals and agri-extension programmes of ITC will continue to exist, it will not be expanded any further as the company will move to initiate the new plug and play ready digital platform for agri-startups to build and expand their businesses. E-Choupals, coupled with flagship agri extension programme - "Choupal Pradarshan Khet", has been famed for the dissemination of deep understanding of agricultural practices, collaborations with India's premier research institutes, and a competitive and efficient supply chain that helped ITC deliver immense value across the agricultural value chain. It has helped ITC's agri-business too as it routes its procurement needs almost entirely through such networks. In fact, ITC's strength in agri-business is the extensive backward linkages it has established with the farmers. This networking with the farming community has enabled ITC to build a highly cost effective procurement system.

6.1 Extension

ICAR-Indian Institute of Soybean Research, Indore, Madhya Pradesh, is the national level research institute under Indian Council of Agricultural Research. It is the main agency to develop, test, validate and recommend improved soybean production technologies and varieties through AICRPS centres. The soybean production technology is disseminated by ICAR-IISR to state agricultural departments, state agricultural universities, KVKs, and other stakeholders engaged in agricultural extension at the village level. Agricultural Universities, KVKs and All India Coordinated Project on Soybean also promotes cultivation of soybean and guides farmers on adoption of improved production technologies. The institute has also developed mobile apps 'SOYBEAN GYAN' to disseminate improved production technology to the farmers. ICAR-IISR regularly issues weekly advisory as per the prevailing climatic conditions and disseminates it widely through electronic and print media.

The institute also conducts training of farm women on the soybean processing and home preparations in order to enhance food uses of soybean. ICAR-Central Institute of Agricultural Engineering, Bhopal regularly conducts research and trainings on soybean processing and entrepreneurship. The institute also provides feedback information to industrialists and processors about the manufacturing technology.

6.2 Kisan Call Centre

Department of Agriculture and Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India launched Kisan Call Centres on 21st January, 2004 throughout the country with the objective of providing instant solution for problems faced by the farmers during crop cultivation and marketing under diverse challenging situations and facilitating their full comprehension by the use of local language.

The call centres are acting as composite help centres, which consist of a complex tele-communication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by farmers instantly in local languages. The subject matter specialists using telephone and computer are used to interact with the farmers to understand their problems and answer their queries as soon as possible.

Soybean farmers can avail this facility calling on a nationwide toll free no: 1551 or 1800 180 151

7. ALTERNATIVE SYSTEM OF MARKETING

In order to bring in reforms in the sector, the Ministry of Agriculture and Farmers Welfare prepared a Model Act in 2003, which it circulated to all the states and UTs for adoption. The Model Act, *inter alia*, provides for direct marketing, contract farming, establishment of markets in private and cooperative sectors, single point levy of market fee, promotion of e-trading and issue of a unified license for traders. These market reforms necessitate reforms in three areas, viz., direct marketing, contract farming and markets in the private and cooperative sectors. In these three areas, so far, only 18 state governments have amended their respective APMC Acts and only 10 states have notified rules thereunder to implement the amended provisions.

To meet the emerging agricultural marketing challenges, Government has formulated the 'Agricultural Produce Market Committee (APMC) Act 2017' which primarily includes: establishment of private market yards/ private markets managed by a person other than a market committee; direct marketing or direct purchase of agricultural produce from farmers; consumers'/farmers' market to facilitate direct sale of agricultural produce to consumers; promote and permit e-trading; single point levy of market fee; single registration/license for trade/transaction in more than one market; removal of provisions of essentiality of shop in market premises; excluding fruits and vegetables from APMC Act, etc. The Model APMC Act 2017, after incorporating inputs from all the stakeholders, has been sent to the State Governments for effective implementation. Government has also approved the implementation of National Agriculture Market (e-NAM) Scheme aimed to provide an online trading portal to farmers and enable them to have an access to transparent sale transactions and price discovery. Besides this other major policy decision like formulation of a model contract farming law will help in providing marketing infrastructure, developing marketing skills and in reducing risks associated with diversity in production.

7.1 Direct marketing

Direct marketing involves marketing of agricultural produce by the farmers directly to the processors/ exporters/ consumers without the involvement of any middlemen. Direct marketing enables producer farmers and processors and other bulk buyers to economize on transportation and other marketing costs and improve price realization. It also provides incentive to large scale marketing companies i.e. export houses/ processing industries to directly procure from the producing areas. Direct marketing by farmers to the consumers has been experimented in the country through farmers' markets popularly known as Apni mandi in Punjab and Haryana, Rythu Bazaar in Andhra Pradesh, Uzhavar Sandhais in Tamil Nadu and Shetkari Bazaar in Maharashtra. For the development of direct agricultural marketing in the country, the Government of India (GOI) enacted the Scheme for the Development of Agricultural Marketing Infrastructure, Grading and Standardization. Presently, many Indian states have adopted the concept of direct agricultural marketing.

7.2 Contract farming

Contract farming, taking various forms of contract between the farmers and farm produce buyers to reach a win-win situation in terms of better price, assured demand and input/investment support for farms and assured supply of high quality produce has become popular in the recent years. It has been in use for agricultural production for decades, but its popularity has increased in recent years. The use of contracts has become attractive to farmers because this arrangement can offer both an assured market and access to production support. Another major strength of this management solution is found in its effectiveness in the delivery of technology and inputs services, as compared to extension services of the Government. Contract farming maximizes economies of scale and is viewed as an effective approach for solving market access and input supply problems faced by small farmers.

Contract farming involves agricultural production carried out on the basis of an agreement between buyers and farm producers. Sometimes, the buyer specifies the quality required and the price, and the farmer agrees to deliver the produce at a future date. The farmer undertakes to supply the agreed quantities of a crop or livestock product based on the quality standards and delivery requirements of the purchaser. In return, the buyer, usually a company, agrees to buy the product, at a price that is often established in advance. The company often also agrees to support the farmer by supplying inputs, assisting in land preparation, providing production advice and transporting produce from the farmer's field to its premises. One major strength of this management solution is found in its effectiveness in the delivery of technology and inputs services, as compared to extension services of the Government. There are potential benefits for the national economy, as contract farming leads to economies of scale, and has also come to be viewed as an effective approach to solving many of the market access and input supply problems faced by small farmers. A number of soybean processing industries are into contract farming in the states of Madhya Pradesh and Maharashtra.

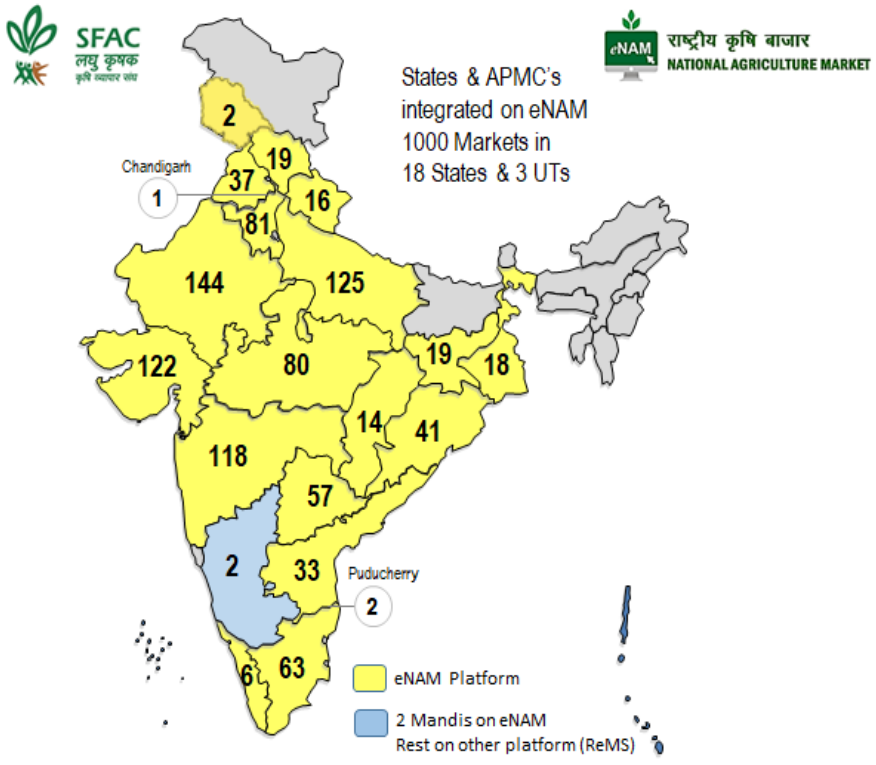
The implementation of the contract farming model, however, faces the serious problem in absence of a legal framework, which exposes the two parties, i.e., the farmers and lessee, to risks of becoming prey to fraudulent conduct by one another. A legal framework is required to prevent farmers from selling land under lease or under input investment contract or the lessee wriggling out of the promised price or quantity of produce or purchase of the produce completely. In this regard, Government of India formulated a model law on contract farming act "The --- State /UT Agricultural Produce & Livestock Contract Farming and Services (Promotion & Facilitation) Act, 2018" and circulated among the States for adoption.

7.3 E-NAM

Government has launched the National Agriculture Market (e-NAM) on 14.04.2016 as a pan-India electronic trading portal with a view to network the existing APMC and other market yards to create a unified national market for agricultural commodities. e-NAM is intended to enhance transparency in transactions, price discovery and farmers' reach to larger number of markets to sell their produce to buyers of their choice at their convenience. Transparency and competition will fetch better prices to the farmers for their produce and ensure cashless payments directly to their bank accounts. e-NAM creates a national network of physical mandis which can be accessed online. The main objectives of the e-NAM Scheme are to: i) liberalize agri-marketing sector by creation of a unified National Agriculture Market; ii) increase access of farmers to markets beyond the closest APMC market by the provision of inter mandi trade as well as making available prices in all the mandis in the vicinity; iii) enhance competition among traders for better price discovery by farmers; iv) promote digital operations to bring in transparency; and v) real time data for improved reporting on arrivals and prices in integrated markets bringing in information symmetry for informed decision by farmer as well as traders.

Benefits of Trading on NAM

- Transparent Online Trading
- Real Time Price Discovery
- Better Price Realization for Producers
- Reduced Transaction Cost for Buyers
- Stable Price and Availability to Consumers
- Quality Certification, Warehousing, and Logistics
- More Efficient Supply Chain
- Payment and Delivery Guarantee
- Error Free Reporting of Transactions
- Enhanced Accessibility to the Market



The main objective of the scheme is to give access to farmers about prices of various markets at one place so that the farmers can sell their yield under a transparent system to a buyer who offers

the best price. A total of 1000 mandis of 18 States and 3 Union Territories have been integrated with e-NAM.

Soybean is being traded on e-NAM platform in the Khandwa, Khategaon, Ganj Basoda, Harda, Berasia, Itarsi, Seoni, Khirkiya, Damoh, Gadarwara, Jabalpur, Sujalpur markets of Madhya Pradesh; Amaravati, Malkapur, Varora, Vani, Shegaon, Mangrulpeer, Daryapur, Katol, Nagpur, Chandrapur, Lonar, Yeola, Ahmednagar, Anjangaon Surji markets of Maharashtra and Kota, Baran, Keshoraipatan, Atru, Ramganj Mandi, Bundi markets of Rajasthan state.

7.4 Co-operative marketing

Cooperatives are an important tool of economic development in rural India, when it comes to cooperative marketing of agricultural produce and procurement of inputs, it gives an idea of collective efforts to achieve specific objective to carry out marketing strategy for agricultural products. It is defined as form of organization, where in person voluntarily associate together as human beings, on the basis of equality for the promotion if economic interests of themselves.

Benefits of cooperative marketing in India:

- **Increases bargaining strength of the farmers**: If the farmers join hands and form a cooperative society, they will be able to increase their bargaining strength because their produce will now be marketed by single agency.
- **Direct dealings with final buyers:** It outcast intermediaries which eliminates the exploiters and ensures fair prices to both, the producers and the consumers.
- **Provision of credit:** The marketing cooperative societies provide credit to the farmers to save them from the necessity of selling their produce immediately after harvesting. This ensures better returns to the farmers.
- **Easier and cheaper transport:** This reduces the cost and botheration of transporting produce to the market.
- **Storage facilities**: The cooperative marketing societies generally have storage facilities. Thus, the farmers can wait for better prices; also there is no danger to their crop from rains, rodents and thefts.
- **Grading and standardization**: This task can be done more easily for a cooperative agency than for an individual farmer. For this purpose, they can seek assistance from the government or can even evolve their own grading arrangements.
- **Market intelligence**: The cooperatives can arrange to obtain data on market prices, demand and supply and other related information from the markets on a regular basis and can plan their activities accordingly.

- **Influencing market prices:** While previously the market prices were determined by the intermediaries and merchants and the helpless farmers were mere spectators forced to accept whatever was offered to them, the cooperative societies have changed the entire complexion of the game.
- **Provision of inputs and consumer goods**: The Cooperative marketing societies can easily arrange for bulk purchase of agricultural inputs like seeds, manures, fertilisers, pesticides, etc., and consumer goods at relatively lower prices and can then distribute them to the members.
- **Processing of agricultural produce**: The Cooperative societies can undertake processing activities like crushing oil seeds, ginning and pressing of cotton, etc.

7.5 FPOs

Farmers, especially small producers, are confronted by many challenges such as the small size of landholdings, lack of access to financial and non-financial inputs and services and appropriate technologies and high transaction costs. Farmer producer organizations offer a form of aggregation which lets individual producers hold onto land titles while using the strength of collective planning for production, procurement and marketing to add value to members' produce. They serve as an important link in risk mitigation strategies to overcome the challenges brought about by climate change. Recognizing the centrality of FPOs to meet national agricultural goals, Department of Agriculture and Cooperation, Government of India, had issued detailed Policy and Process Guidelines for Farmer Producer Organization during 2013. SFAC was nominated as a Single Window Agency by Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India, to support the State Governments in the formation of Farmer Producer Organizations (FPOs). SFAC has promoted FPOs across the length and breadth of country and at present FPOs are operating in 29 States covering wide array of crops. The SFAC has been engaged in the formation of FPOs since 2011. The project, which has been working across 29 states, has so far helped to mobilize approximately 8.13 lakh farmers in 818 FPOs registered. Another 70,000 are under mobilization under 79 FPOs, which are yet to be registered. Farmer producer organizations undertake input supply (seed, fertilizer and machinery), financial and technical support (credit, savings, insurance and extension), provision of marketing linkages (contract farming and procurement under MSP) and training and networking (HRD, policy advocacy and documentation).

Major services delivery by FPOs

FPCs leverage the benefits of economics of scale for both production and marketing ebaling more efficient production and better price discovery. Some of the major services that is being delivered are as follows:

- **Farm inputs:** The FPOs buys essential inputs such as seed, fertilizer, pesticide in bulk and sells through its retail outlet. The inputs are sold to the members at a price which is far

below the market price and thereby help the member farmers to reduce the cost of inputs. This activity also ensures timely delivery of quality inputs.

- **Custom Hiring Centre:** The need for having these machineries available at a local level at an affordable cost has been by realized since long. To address the ever increasing cost of farming by small and marginal farmers many FPOs have established Custom Hiring Centres with assistance from Central/ State Schemes on farm machinery. The FPOs rent out machineries and implements to members at affordable cost (much below the cost charged by private players). In fact, farm mechanization has helped the farmer in increasing the productivity.
- **Output market linkage:** Needless to mention that procuring produces from the farmers and selling them to big traders and companies for realizing better prices has its own set of challenges and opportunities. However, many FPOs have succeeded in creating market linkages for their produce. FPOs have tied with major retailers for selling their produce and have succeeded in getting remunerative prices for their produce. Besides, many of our FPOs, with assistance from State Government, have established retail outlets for marketing their produce.

Some of the FPOs have also gone ahead with value addition, processing and branding of their produce.

7.6 Commodity Futures Trade

A commodity futures contract is an agreement to buy or sell a specific amount of a commodity at a fixed date in the future at a predetermined price. This contract specifies further details, like the quality of the commodity and the delivery location. In 2015, the regulatory body of the commodities trading – Forward Market Commission (FMC) merged with Securities and Exchange Board of India (SEBI). Commodity trading in exchanges requires standard agreements as per the instructions so that trades can be executed without visual inspection.

Hedgers, speculators and arbitrageurs are the major participants in commodity market. Hedgers are the main players in the market with an underlying risk in a commodity. Speculators are traders or investors who take the benefit or profits based on price fluctuations. They essentially create more liquidity in the futures contracts. Arbitrageurs are other type of experienced group, making profits by exploiting the price discrepancies seen in different exchanges or the spot market. In agriculture commodities, global demand & supply, currency volatility, crop situation, imports & exports, carryover stocks, government policies, climatic conditions etc. will lead to price fluctuation. Soybean farmers and other value chain stakeholders can also take advantage of trading and risk management through commodity futures trading.

The major commodity trading exchanges in India are listed below.

- Multi Commodity Exchange – MCX
- National Commodity and Derivatives Exchange – NCDEX
- Indian Commodity Exchange – ICEX

The market regulator allowed some of the stock exchanges for commodity trade.

Features of commodity futures

1. **Organised:** Commodity futures contracts always trade on an organised exchange. NCDEX and MCX are examples of exchanges in India. NYMEX, LME, and COMEX are some international exchanges.
2. **Standardised:** Commodity futures contracts are highly standardised. This means the quality, quantity, and delivery date of commodities is predetermined by the exchange on which they are traded.
3. **Eliminate counter-party risk:** Commodity futures exchanges use clearinghouses to guarantee fulfilment of the terms of the futures contract. This eliminates the risk of default by the other party.
4. **Facilitate margin trading:** Commodity futures traders do not have to pay the entire value of a contract. They need to deposit a margin that is 5–10% of the contract value. This allows the investor to take larger positions while investing less capital.
5. **Fair practices:** Government agencies regulate futures markets closely. For example, there is the Forward Markets Commission (FMC) in India and the Commodity Futures Trading Commission (CFTC) in the Unites States. The regulation ensures fair practices in these markets.
6. **Physical delivery:** The actual delivery of the commodity can take place on expiry of the contract. For physical delivery, the member needs to provide the exchange with prior delivery information. He also needs to complete all delivery-related formalities as specified by the exchange.

7.7 Recent Reforms in Agricultural Marketing

The Government of India recently initiated three landmark decisions for helping farmers and transforming the agriculture sector, which include (i). amendment to the Essential Commodities Act, (ii). Farming Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020 and (iii). the Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020.

With the amendment to the Essential Commodities Act, commodities such as cereals, pulses, oilseeds, edible oils, onion and potatoes will be removed from the list of essential commodities. The government says this will remove fears of private investors about excessive regulatory interference in their business operations.

Farming Produce Trade and Commerce (Promotion and Facilitation) Ordinance will promote barrier-free inter-state and intra-state trade and commerce outside the physical premises of markets notified under the state Agricultural Produce Marketing legislations. The ordinance will create an ecosystem where farmers and traders will enjoy freedom of choice of sale and purchase of agri-produce. The ordinance basically aims at creating additional trading opportunities outside the APMC market yards to help farmers get remunerative prices due to additional competition. The ordinance will certainly pave the way for creating One India, One Agriculture Market.

The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance will empower farmers for engaging with processors, wholesalers, aggregators, wholesalers, large retailers and exporters on a level-playing field without any fear of exploitation. This Ordinance will act as a catalyst to attract private sector investment for building supply chains for Indian farm produce across global markets. Farmers will get access to

technology and advice for high-value agriculture products and get ready market for such produce.

8. INSTITUTIONAL FACILITIES

8.1 Marketing related schemes of public sector

The Government of India has been playing an important role in developing agriculture marketing system in the country. The marketing division of the Department of Agriculture, Cooperation & Farmers' Welfare is entrusted with the implementation of policy and programme related to agricultural marketing. Marketing Division of the Ministry of Agriculture and Farmers Welfare, Government of India is implementing the Integrated Scheme for Agricultural Marketing (ISAM). Marketing Division has following sub-schemes namely:

- Agricultural Marketing Infrastructure (AMI)
- Marketing Research and Information Network (MRIN)
- Strengthening of Agmark Grading Facility (SAGF)
- Agri-business Development through Venture Capital Assistance (VCA) and Project Development Facility

The details of the schemes can be accessed from:
https://dmi.gov.in/Documents/final_guidelines_2014.pdf
http://agricoop.nic.in/sites/default/files/finalopguidelines_1.pdf

The sub-scheme Agricultural Marketing Infrastructure (AMI) of Integrated Scheme for Agricultural Marketing (ISAM), implemented by the Directorate of Marketing & Inspection (DMI), Department of Agriculture, Cooperation and farmers welfare, is meant for holistic development of agricultural value chain critically focussing each linkage of post-harvest value chain including promotion of value addition and processing at farmers level so as to enhance their income by selling more marketable and processed produce in the market. The sub-scheme AMI lays special focus on developing and upgrading Gramin Haats as Gramin Agricultural Markets (GrAMs) through strengthening of infrastructure there for, which may function as farmer-consumer market (retails market) and collection/ aggregation points (spokes) with linkage to secondary market (hub) and also to processing/ exporting and retain chain with participation of FPOs, other farmers' groups and private sector eligible promoters. Farmer-consumer markets for agricultural and allied produce (livestock, fishery, poultry and such other allied produce) devoid of intermediaries and developed elsewhere also by eligible promoters will be focussed and eligible activity under this sub-scheme.

The updated details of these schemes can be accessed from:

https://dmi.gov.in/Documents/AMI_OG_Scheme_hindi.pdf
https://dmi.gov.in/Documents/SchemeGuidelinesAMIFf.pdf
https://dmi.gov.in/Documents/Final_GrAM_Guidelines_final_03012019.pdf

Moreover, several demand driven Schemes are being implemented to develop an efficient agricultural marketing network in the country. These include Integrated Scheme for Agricultural

Marketing and other capital investment schemes, like MIDH and RKVY. Besides, NABARD is also promoting development of various types of marketing infrastructures including warehouses, cold storages, etc., under RIDF/WIF. For setting up of integrated cold chain and preservation infrastructure facilities for horticulture and non-horticulture produce without any break from the farm gate to the consumer, the Ministry of Food Processing Industries is implementing a Central Sector Scheme of Cold Chain, Value Addition and Preservation Infrastructure.

8.2 Institutional credit facilities

Agricultural credit is disbursed in the form of short-term, medium-term and long-term loans through the following agencies:

- Commercial banks
- Regional rural banks
- Cooperatives

Type of institutional credit facilities which are available for production, post-harvest operations and marketing of agricultural commodities including soybean are given on Table 20.

Table 20. Credit facilities

Scheme	Eligibility	Facility
1. Produce Marketing Loan	All type of farmers, who can store the produce either in their own farm/premises itself or in a Warehouse.	This type of loan is given against pledge /hypothecation of agricultural produce (including warehouse receipts), upto 80% of value of produce depending upon the place of storage subject to a maximum of Rs.50 lacs for a period of 12 months.
2. Kisan credit card	• All farmers – individuals/Joint cultivator owners • Tenant farmers, oral lessees and share croppers etc. • SHGs or Joint liability groups including tenant farmers.	• Quantum of loan for 1st year will be assessed on the basis of Cost of cultivation, post-harvest expenses and farm maintenance cost • For subsequent 5-year loan will be sanction on the basis of increase in scale of finance • Get interest at saving bank rate on credit balance in KCC account • Free ATM cum debit card (State Bank Kisan Card) for all KCC borrowers • Interest subvention @2%p.a.is available for loan amount uptoRs. 3 Lacs • Additional interest subvention @3% p.a. for prompt repayments**.**
3. Credit schemes of commercial banks	Different categories of farmers as per scheme	Provide credit for market infrastructure, contract farming, producer cooperatives, agro-processing, value-chain finance, etc.
4. NBFCs	All stakeholders in the agriculture value chain	Financial services depending on the market opportunities and customer demand on all activities in the commodity value chain

8.3 Organizations/ agencies in agricultural marketing

Organization	Services provided
Directorate of Marketing and Inspection (DMI), Faridabad https://dmi.gov.in/ https://agmarknet.gov.in/	• To integrate development of marketing of agricultural and allied produce in the country. • Promotion of grading of agricultural and allied produce. • Market development through regulation, planning and designing of physical markets. • Liaison between the Central and State governments through its regional offices and sub-offices spread throughout the country.
State Agricultural Marketing Directorates/ Boards	• Implementation of the regulation of marketing in the state. • Provide infrastructural facilities for the marketing of notified agricultural produce. • Provide facilities for grading of agricultural produce in the market area, • To coordinate all the agricultural produce market committees for information services • Provide aid to financially weak and needy APMCs in the form of loans and grants • Eliminate malpractices in the marketing system • Promotion of post-harvest management and agri-business activities. • Arrange or organize seminars, workshops/ exhibitions and farmers training programmes on the various aspects relating to agricultural marketing.
Soybean Processing and Utilization Centre, ICAR-CIAE, Bhopal http://www.ciae.nic.in	• Developing technology for diversified soy based food products. • Commercialization of soy based food products technology through training and entrepreneurship development.
Soybean Processors Association of India, Indore http://www.sopa.org/	• Quality control services. • Arbitration. • Promotion of value added products. • Export promotion of Soybean meal and value added products. • Organising seminars and workshops.
State Cooperative Marketing Federations	• Procurement of the produce through local cooperative societies as and when required. • Provide subsidy and crop loan to the soybean farmers. • Construct godowns to provide scientific storage facilities to the soybean farmers. • Provide agricultural inputs to the member farmers through member societies to increase crop production and productivity.
ICAR-IISR, Indore	• Developing specialty soybean varieties for food uses (e.g.

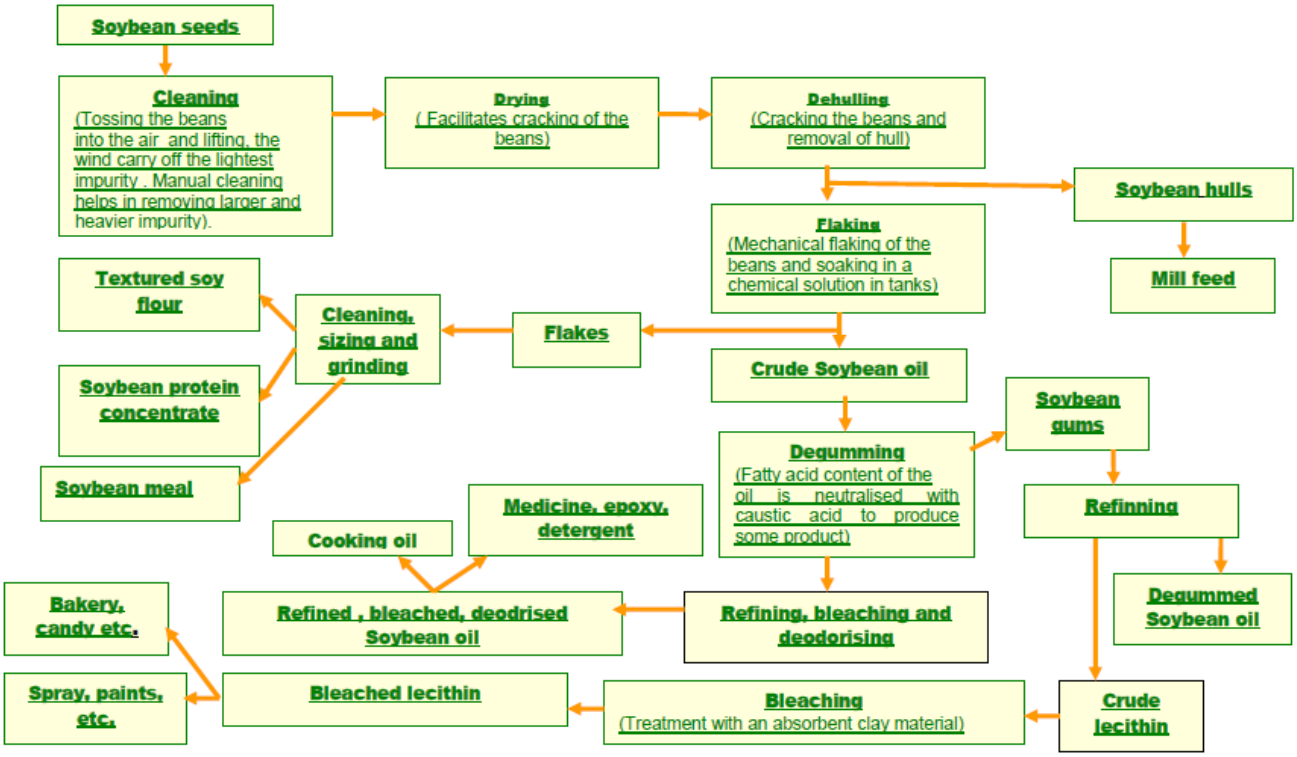
https://iisrindore.icar.gov.in/	null-KTI, Null-Lox, High oil, Vegetable soybean) • Training on processing and food uses of soybean • Publishes soybean market monitor
Central and State Warehousing Corporations	• Provide scientific storage and handling facilities. • Provide disinfestations services. • Training of scientific storage of agricultural produce.
National Cooperative Development Corporation (NCDC), New Delhi www.ncdc.in	• Planning, promoting and financing programmes for production, processing, marketing, storage, export and import of agricultural produce, food stuffs, certain other notified commodities • Supply of consumer goods and collection, processing, marketing, storage and export of produce through cooperatives. • Loans and grants are advanced to State Governments for financing primary and secondary level cooperative societies. • Margin Money assistance to Marketing Federations • Strengthening share capital base of primary / district marketing societies • Margin Money assistance to Processing Units: Food Grains / Oilseeds • Construction of godowns (Normal) • Up gradation/renovation of existing godowns
Securities and Exchange Board of India (SEBI), Mumbai	• Regulating commodity derivatives segment. • Conducting awareness programmes.
Commodity Exchanges	• Provide risk management tool, commodity futures contracts, for soybean and products.
Director General of Foreign Trade, New Delhi https://dgft.gov.in/	• Provides guidelines/ procedures of export and import of various commodities. • Regulation and promotion of foreign trade through regulation. • Allot export-import code number (IEC no) to the exporters of agricultural commodities.

9. UTILIZATION

9.1 Processing

Soybean have attained unique distinction for its' varied uses and extra-ordinary nutritional qualities. However, Soybean requires proper processing to make suitable for use as food, feed or industrial products. Largely, Soybean is processed to extract oil and meal. Consumption of soybean oil and other edible oils is increasing with the increase in population, and income of the consumers. The mechanical process was employed earlier to extract oil and meal by hydraulic press method. However, the processing has been shifted to the modern solvent extraction process, which is more efficient and tuned to the existing needs. Soy products like oil and protein foods namely soy-nuggets, soy milk, soy paneer (tofu), yogurt, soy-fortified bakery products (biscuits and muffins), soy-sauce, health and specialty foods have been established in the market and the consumers have started accepting them. Soybean requires careful processing prior to food uses as it contains some anti-nutritional factors. Whole soybean or partially/fully de-fatted cake/meal can be used for making various soy based food items. Various soy foods can be prepared altering conventional recipes for domestic utilization of soy foods to ensure nutritional security.

Soybean processing flow



9.2 Uses

In India, soybean oil is mainly used as cooking medium. The soya milk consumption now-a-days has emerged as a healthy drink habit as it is a high protein and low calorie food especially to those, who are intolerant to lactose present in animal milk. In addition, it also serves as raw material for manufacture of vanaspati. Soybean cake is mostly used as an ingredient in the manufacture of cattle feed. The emerging consumer acceptance has led to manufacture of many protein rich food products such as nutri-nuggets, protesnac, nutri soy powder, etc., which are being manufactured in the country from soy protein. The soybean meal has also been added in the manufacture of bread by some agencies for raising nutritive value of product without any significant change in flavour or price of the bread. Soybean plays an important role in preventing and treating chronic diseases such as heart ailments, osteoporosis, cancer, kidney ailments and menopausal syndromes. The major components of soybean have proteins (40 %), Carbohydrates (30 %), Fiber (05%), Lecithins (0.5%), Saponins (04%). Oil (18-20 %). There is wide scope for manufacturing number of processed products and widely used as a source of animal feed.

The Agro-Industries can exploit the potentialities of Soybeans because it has multifarious uses. It can be utilized in the preparation of Antibiotics, in the manufacture of lard, margarine, vegetable oil and ghee, paints, varnishes, linoleum, printing inks, glycerine, explosive, etc. besides, in every home its products like, Soy flour, Soy milk, Soy oil as cooking medium, Soybean cake is rich in nitrogen and mineral content and can be very well utilised as a manure for the soil and as cattle feed for the animals.

The multifaceted uses of Soybean at the national and global level are as follows:

- Whole Soybean products:
    - Seed
    - Soy flour
    - Soy sauce
    - Soy paneer (Tofu)
    - Soy milk
- Soybean oil products:
    - Cooking oil
    - Baking products
    - Margarine
    - Salad oil
- Soybean meal:
    - Animal feed
    - Poultry feed
    - Feed for aquaculture
- Soybean protein products:
    - Textured vegetable protein
    - Isolated soy protein
- Soybean based industrial products:
    - Printing inks

- Cosmetics
- Paints
- Soaps/detergents/toiletries
- Plastics and rubber industry
- Pharmaceuticals
- Pesticide industry

Food for Human Consumption

Soybean based products are gaining popularity due to high protein content, vitamins, minerals and fiber. Soybean has above 45 per cent protein of superior quality and all the essential amino and fatty acids, 4 percent minerals salts and also fairly rich in phosphorous and calcium. Variety of whole soybean based products -soymilk, Soy drinks, Soymilk shakes, spray dried soy milk powder, soy ice cream, soy *paneer* (Tofu), curd, shrikhand, *lassi, mattha.* The byproduct okara contains 65- 72 % moisture and 10-13% protein. It can be used in preparation of *halwa, gulabjamun, burfi, pakoda,* etc. The information about various products of soybean are given below.

Soymilk: Soymilk is hot water extract of soybeans. Soymilk can be handled and used in much the same way as dairy milk. Besides being rich in protein, vitamins and minerals, soymilk is lactose free, cholesterol free and low in saturated fat. Soymilk can be made into hot and cold beverages like coffee, tea, fruit shakes, yogurt, ice cream, or can be used as such. One kg of dry soybean yields 6-8 litres of soy milk nutritionally almost at par with cow milk. It can be used for feeding infants and as supplement to diets of preschool children. Soy milk can be substituted in diets of patients who have allergy to milk protein (lactose intolerance).

Soymilk can be added with food flavours like cardamom, fruit, (mango, apple, litchi), chocolate, etc. and used as beverage. The flavoured soymilk when served chilled is a highly acceptable.

Tofu: Tofu is the most popular among all the soymilk products. It is prepared by coagulating hot soymilk and removing the whey. Tofu is a versatile food and easily takes the flavour of the product with which it is cooked. Tofu looks like paneer, but has a different taste. You can make curry recipes, pulav, cutlets etc from tofu. Tofu is a highly perishable product just like dairy products. It should be kept immersed in water under proper refrigeration, and water should be changed often.

Tofu is a coagulated and pressed soy protein prepared from soy milk, a vegetarian food ingredient like dairy *paneer*. About 1.5 to 1.7 kg soy *paneer* can be prepared from one kg soybean. Soy milk and tofu is getting popular among the masses mainly due to product acceptability and availability at almost half the cost of dairy product.

Soy flour: This is nothing but addition of 10% defatted soy flour to wheat flour (add 1 kg defatted soy flour to 10 kg wheat flour) to make rotis, chapattis, puris etc. Addition of 10% soy flour to wheat flour increases protein in wheat flour from 11 to 16%. Several brands of wheat soy flour mix are already available in the market. Add 20 % de-fatted soy flour to besan and use it to

make products such as pakora, chilla, kadhi etc. The products made of this mix absorb 10% less oil than the products made out of just besan. Protein content and quality, of course, is enhanced. Besan is cheaper than soy flour in general. Nuggets and granules are made of 100% defatted soy flour which has more than 50% protein and less than one percent fat. Nuggets and granules are healthy alternate to meat and can be used easily in Indian cuisine.

Soy papad: Papad is another potential fortification opportunity for soybean in Indian traditional food products. Soy flour can be blended up to 30-40 per cent with black gram (urad dal) for manufacture of soy-fortified papad. Fortification of urad flour with soy flour at 30% will increase protein from 21% to 30%.

Soy chakli: Chakali is a traditional recipe made during festivals in Maharashtra and South India. It is very tasty and crispy recipe and can be made in various different styles by adding different ingredients to it.

Soy bakery items: In different bakery products i.e. biscuits, breads, muffins etc soy can be fortified with wheat flour, both for functional and nutritional reasons. In bakery products, three types of soy flour can be used based on the product. Currently a number of bakers are using enzyme active soy flour up to 1% as a bread improver. This enzyme active soy flour can be either full fat or defatted. Lecithinated soy flour is used as an alternate to whole eggs in cakes and dough nuts.

Soy nuts: Soy nuts are whole soybeans that have been soaked in water and then baked until browned. Most conventional nuts are incredibly high in fat but soy nuts have less fat and more protein compared to conventional nuts. Soy nuts are similar in texture and flavor to peanuts and far less expensive than peanuts. Soy nuts have 50% more protein and 50% less fat than peanuts. Regular consumption of soy products such as soy nuts reduce incidence of various chronic diseases especially heart diseases and cancer.

Soy *Badi* (Nuggets) and Granules: - Soybadi or Texturized vegetable protein (TVP) and granules made of 100% defatted soyflour (> 50% protein and < 1 % fat) can be used in Indian curries.

Roasted Soybean: The roasted soybean is the largest source of vitamin B and K, Energy, protein and fiber.

Soybean Grits: Soybean Grits are made from soybean seeds. The cleaned soybean seeds cracked, de-hulled and rolled into flake and the flakes go through highly efficient extraction. Soybean grits are used to make soymilk, Soybean Powder, tofu, Soya Flour, and isolated soybean protein products.

Soy Yoghurt: Soy Yoghurt is made from soymilk. It is available in the creamy form.

Soy Sauce: Soy Sauce is available in liquid form. This product is made from fermentation of soybean. It is used in cooking and it is available in various categories and taste.

Soy Butter: Soya butter is made from roasted whole soybean. This is a low fat soy product. Also soybean used to make Soy Noodles, Wheat-soy flour, Basan Soy Flour, Nuggets and Granules, Dal Analogue, various bakery products such as Biscuits, Bread, Soy papad etc.

Industrial Uses of Soybean: Soybean and other by products are used in the various industrial application such Biodiesel, Printing Ink, Waxes, Candles, Crayons, Lubricants and manufacturing of various plastics parts etc.

10. DO'S AND DON'TS

1. Harvest the crop, when plants turn yellow and moisture is around 14 percent to avoid shattering in the field. Do not harvest the crop before it turns yellow and moisture is more than 14 percent.
2. Avoid more beating of the pods to prevent damage to the seeds while threshing.
3. Adjust the speed of the harvester depending upon the moisture of the seed.
4. The produce should be cleaned and graded at producer's level to fetch higher price. Do not sell the produce without cleaning and grading.
5. The moisture in the soybean should be brought down to about 9 per cent before sale.
6. Store soybean in a damp proof and rat free room after reducing moisture level to about 9 per cent.
7. Store different varieties separately. Do not mix different varieties together.
8. Get the information on arrivals and prices of soybean in different markets and the select the market for selling the produce.
9. Sell the produce through farmers' cooperatives or directly in the selected AMPC market to get a higher price or contact directly to the processing industries without any middleman.
10. Store soybean in scientific rural godowns to hold the produce for some time in order to get higher prices during lean period. Do not sell soybean during the glut period.
11. Explore alternative methods for marketing of soybean such as: contract farming, direct marketing to processing industries, marketing through farmers' cooperatives or FPOs, commodity futures trade, etc.
12. Sell the produce at periodic intervals to fetch better price. Do not sell the entire produce immediately after harvest.
13. Avail the pledge finance facility by storing the produce in accredited warehouses. Do not store produce in unplanned and unscientific manner.

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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 Soybean under Price Support Scheme (PSS)

Year	Qty in Tonnes	Value in Lakhs
2016-17	162.19	45
2017-18	72280.74	22045.63
2018-19	19483.02	6622.28
2019-20	10677.68	3961.42
2020-21	3.69	1.43

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)