

POST HARVEST PROFILE OF MAIZE

CONTENTS

	Page No.
1.0 INTRODUCTION	
1.1 Origin	1
1.2 Importance	3
2.0 PRODUCTION	
2.1 Major producing countries in the world	3
2.2 Major producing states in India	4
2.3 Important varieties of maize grown in India	5
3.0 POST-HARVEST MANAGEMENT	
3.1 Post-harvest losses	6
3.2 Harvesting care	8
3.3 Post-harvest equipments	9
3.4 Grading	10
3.4.1 Grade specifications	10
3.4.2 Adulterants and toxins	14
3.4.3 Grading at producers level and under Agmark	16
3.5 Packaging	17
3.6 Transportation	18
3.7 Storage	21
3.7.1 Major storage pests and their control measures	22
3.7.2 Storage structures	25
3.7.3 Storage facilities	26
i) Producers' storage	26
ii) Rural godowns	26
iii) Mandi godowns	27
iv) Central Warehousing Corporation	28
v) State Warehousing Corporations	29
vi) Co-operatives	29
3.7.4 Pledge finance system	30

4.0	MARKETING PRACTICES AND CONSTRAINTS	
4.1	Assembling	31
	4.1.1 Arrivals	33
	4.1.2 Dispatches	34
4.2	Distribution	34
	4.2.1 Inter-state movement	34
4.3	Export and import	35
	4.3.1 Sanitary and Phyto-Sanitary requirements	38
	4.3.2 Export procedure	39
4.4	Marketing constraints	40
5.0	MARKETING CHANNELS, COSTS AND MARGINS	
5.1	Marketing channels	41
5.2	Marketing costs and margins	41
6.0	MARKETING INFORMATION AND EXTENSION	44
7.0	ALTERNATIVE SYSTEMS OF MARKETING	
7.1	Direct marketing	47
7.2	Contract marketing	48
7.3	Co-operative marketing	49
7.4	Forward and future markets	49
8.0	INSTITUTIONAL FACILITIES	
8.1	Marketing related schemes of Govt./Public Sector	51
8.2	Institutional credit facilities	53
8.3	Organisations providing marketing services	54
9.0	UTILIZATION	
9.1	Processing	57
9.2	Uses	57
10.0	DOS AND DON'TS	59
11.0	REFERENCES	61

1.0 INTRODUCTION

Maize is one of the most important Cereal Crops in the world. It is next to Rice, Wheat and Jowar in respect of Area and Production in India. The importance of Corn is due to its wide diversity of uses. It is used both as food for human and feed for animals. Corn is nearly directly consumed as feed and as an edible table vegetable. Green cobs are roasted and eaten by people with great interest. Corn is converted in to a variety of foods such as popped snack food and staple alkali-cooked “Mexican” foods. It is also fractionated by either dry or wet milling into food and industrial ingredients. The starch, the major constituent of the corn kernel, is used in its native form or after chemical or enzymatic modification, in foods and industrial products. The starch is also converted into glucose or fructose for use as food sweetness. Glucose can be fermented in to ethanol for fuel or beverages or into many other chemicals.



Nutritional value of maize/corn is given in Table No. 1.

Table No.1: Nutrition value of maize

Content	Percentage dry matter basis
Starch	71 - 72
Protein	9 - 10
Fat	4 - 45
Fiber	9 - 10
Sugar	2 - 3
Minerals (ash)	1.4

Source: Technologies for processing speciality maize in India, Directorate of Maize Research, ICAR, New Delhi.

1.1 Origin:

Central America and Mexico where many diverse types of maize are found are considered to be the primary center of origin. Its production in India probably occurred about the beginning of the seventeenth century, during the early days of the East India Company.

Botanical Description :

Maize (*Zea mays*) is an annual plant, which usually grows to a height of one meter to 3 meters or more in some cases. It belongs to family Gramineae and Genus *Zea*. Maize is normally a monoecious plant having two types of inflorescence, the female inflorescence which develops into an ear (Cob) and male inflorescence which contains the male flowers. The male flowers are borne in a cluster (tassel) on top of end of the stem as a terminal

panicle, while the female flowers are borne inside the young cobs which spring from the nodes on the stem usually located about midway on the stalk. Corn is divided into seven groups based on the character of kernels.

Types of corn:

1. Zea mays indurata or 'flint corn' :

Kernel is soft and starchy in the center and completely enclosed by a very hard outer layer. The kernels are usually rounded but are some times short and flat. Colour may be white or yellow. This is the type most commonly cultivated in India.

2. Zea mays indentata or 'Dent corn' :

Kernels have both hard and soft starches. The hard starch extends on the sides and the soft starch is in the center and extends to the top of the kernels. In the drying and shrinking of the soft starch, various forms and degrees of indentation result. This is the most common type of maize grown in U.S.A.

3. Zea mays everta or 'Pop corn' :

It possess exceptional popping qualities. Size of the kernels is small but the endosperm is hard. When they are heated, the pressure built up within the kernels suddenly results in an explosion and the grain is turned inside out.



4. Zea mays saccharata or 'Sweet corn' :

Kernels possess a considerable amount of sugar, which absorbs water, making the cells turgid. On drying, these cells collapse, making the grains shrivelled or wrinkled. It has sweeter taste than other corns.

5. Zea mays amylacea or 'Soft corn' :

Kernels are soft and of all colours, but white and blue are the most common. They are like flint kernels in shape.

6. Zea mays tunicata or 'Pod corn' :

The pod corns are characterized by having each kernel enclosed within a pod or husk. It is a primitive type of corn, having less importance.

7. Zea mays Ceratina Kulesh or 'Waxy Corn' :

The kernel when cut or broken gives a waxy appearance. It produces the starch similar to tapioca starch for making adhesive for articles.

1.2 Importance :

Maize is grown all over the world, in more than 100 countries. It is one of the major crops in America, Africa and Asia. United States of America is the major producing country. India also contribute major share to to the production of maize. It is grown in almost all states of the country. Important states growing maize are Madhya Pradesh, Andhra Pradesh, Karnataka, Rajasthan, Uttar Pradesh, Gujarat, Maharashtra, Himachal Pradesh, Jammu and Kashmir and Bihar.

2.0 PRODUCTION

2.1 Major producing countries in the world

It has been reported that during the year 2004, area under cultivation of maize in the world was 1,45,142 thousand hectares, with the production of 7,05,293 thousand tonnes. Share of important countries in world production was U.S.A. (42.28%), China (18.69%), Brazil (5.95%), Mexico (2.84%), India (1.98%), Romania (1.88%), Argentina (1.84%), Indonesia (1.61%), South Africa (1.18%). India stood at fifth position with area of 68 lakh ha., and in production, it stood at 6th position with production of 140 lakh tonnes during the same year.

In case of productivity U.S.A. was having the highest productivity of 10,052 Kg/ha followed by France (8,766 Kg/ha), Argentina (6,247 Kg/ha), China (5,154 Kg/ha), and Romania (4,410 Kg/ha). Yield in India was 2,059 Kg/ha.

Area, production and average yield in major producing countries is given in Table No.2.

Table No. 2: Area, production and average yield of maize in the major producing countries

Country	Area ('000 ha)				Production ('000 tonnes)				Yield(Kg/ha)		
	2002	2003	2004	% to world	2002	2003	2004	% to world	2002	2003	2004
1. U.S.A.	28050	28789	29668	20.44	228806	256905	298234	42.28	8157	8924	10052
2. China	24661	24093	25584	17.63	121497	115998	131860	18.69	4927	4815	5154
3. Brazil	11751	12957	12437	8.57	35933	47988	41947	5.95	3058	3704	3373
4. Mexico	7120	7781	8000	5.51	19299	19652	20000	2.84	2711	2526	2500
5. India	6662	7000	6800	4.69	10300	14720	14000	1.98	1546	2103	2059
6. Nigeria	4490	4700	4700	3.24	4934	5150	5150	0.73	1099	1096	1096
7. Indonesia	3127	3355	3353	2.31	9654	10910	11359	1.61	3088	3252	3388
8. S. Africa	3350	3350	3200	2.20	10076	9705	8311	1.18	3008	2897	2597
9. Romania	2895	3119	3000	2.07	8400	9577	13231	1.88	2902	3070	4410
10. Argentina	2432	2323	2081	1.43	15000	15040	13000	1.84	6168	6475	6247
11 Others	43880	45925	46319	31.91	138095	134419	148201	21.02	3147	2927	3200
World	138418	143392	145142	100	60194	640064	705293	100	4349	4463	4859

Source : Food and Agriculture Organization (FAO) Production Year Book 2004.

2.2 Major Producing States in India:

India is one of the major producing countries of maize. It is grown in almost all states of the country, prominently northern and western states. In the year 2002-03, Madhya Pradesh occupied the highest position in production of maize with 1.50 thousand tonnes of production (14.56%). Share of other states in production was Andhra Pradesh (14.47%), Karnataka (13.69%), Rajasthan (8.45%), Uttar Pradesh (8.16%), Gujarat (7.67%), Maharashtra (7.18%), Himachal Pradesh (4.66%), Jammu & Kashmir (4.56%), and Bihar (4.37%).

In regards to Area under Maize, during 2002-03, Rajasthan ranked first with 0.98 thousand hectares (15.58%), followed by Madhya Pradesh (13.51%), Uttar Pradesh (12.08%), Karnataka (10.33%), Andhra Pradesh (8.43%), Gujarat (7.31%), Maharashtra (5.88%), Jammu & Kashmir (5.15%), Himachal Pradesh (4.77%), and Bihar (4.13%). While productivity is concerned during 2002-03, Andhra Pradesh ranked first with 2825 Kg/ha, followed by Karnataka (2164 Kg/ha.), Punjab (2039 Kg./ha), Maharashtra (2004 Kg./ha.), West Bengal (1996 Kg./ha.). National Productivity was 1642 Kg./ha.

Area, production and average yield in major producing states is given in Table No.3.

Table No. 3: Area, production and average yield of maize in the major producing states during 2000- 2001, 2001-2002 & 2002-2003

Name of State	Area ('000 hectares)				Production ('000 tonnes)				Yield Kg/ha		
	2000-01	2001-02	2002-03	%	2000-01	2001- 02	2002-03	%	2000-01	2001-02	2002-03
Rajasthan	0.97	1.02	0.98	15.58	1.02	1.48	0.87	8.45	1047	1454	885
U. P.	0.91	0.94	0.76	12.08	1.47	1.52	0.84	8.16	1622	1628	1101
M. P.	0.84	0.86	0.85	13.51	1.22	1.68	1.50	14.56	1149	1968	1766
Bihar	0.62	0.60	0.26	4.13	1.50	1.49	0.45	4.37	2413	2504	1662
Karnataka	0.67	0.58	0.65	10.33	2.14	1.45	1.41	13.69	3193	2504	2164
Gujarat	0.38	0.44	0.46	7.31	0.29	0.88	0.79	7.67	753	1995	1706
A. P.	0.53	0.43	0.53	8.43	1.58	1.46	1.49	14.47	2994	3404	2825
J & K.	0.33	0.32	0.33	5.17	0.53	0.54	0.47	4.56	1592	1648	1412
Maharashtra	0.33	0.32	0.37	5.88	0.30	0.59	0.74	7.18	920	1804	2004
H.P.	0.30	0.30	0.30	4.77	0.68	0.77	0.48	4.66	2293	2550	1613
Punjab	0.17	0.17	0.15	2.38	0.46	0.45	0.31	3.01	2794	2721	2039
Tamil Nadu	0.08	0.11	0.12	1.91	0.14	0.12	0.20	1.94	1717	1616	1677
Jharkhand	0.09	0.09	0.13	2.07	0.11	0.21	0.24	2.33	1267	1495	1799
W.B.	0.04	0.03	0.03	0.52	0.09	0.09	0.06	0.58	2501	2595	1996
Others	0.35	0.37	0.37	5.91	0.51	0.43	0.45	4.37	--	--	--
I India	6.61	6.58	6.29	100	12.04	13.16	10.30	100	1822	2000	1638

Source : Agricultural Statistics at a glance, 2003 & 2004, Department of Agril. & Co-op. New Delhi.

2.3 Important varieties of Maize grown in India:

In India considerable work has been done for development of speciality corns such as sweet corn, pop-corn, baby-corn, quality protein maize with high lysine and tryptophan, green-eared corn, high oil corn, waxy-corn, fodder maize, etc. A list of the varieties released in each of these speciality corn types is given below in Table No. 4.

Table No. 4 : Varieties of maize released in speciality type of corn

Type of corn	Varieties developed and released in India
Sweet Corn	Madhuri, Priya Sweet Corn
Pop Corn	Amber Pop Corn, VL Pop Corn
Baby Corn	Co 1, Him 123, Early Composite, VL 64, PEHM-1 & PEHM-2 etc.
Green-eared Corn	Harsha, Ashwini, Varun, Rohini, Megha
Quality Protein Maize	Shakti-1, Shktiman-1, and Shktiman-2.
High Starch Corn	Ganga 111, Histarch, Deccan 103, Deccan 105, Trishulata, Sheetal, paras.
High Oil	HOP-1, HOP-2.
Fodder Maize	African tall, PFM-66, J-1006.

Source : Directorate of Maize research, Indian Council of Agricultural Research, New Delhi

In India, Maize is cultivated through out the year in different parts of the country. The varieties suitable for different agro-climatic conditions have been developed and are grown in various states as Kharif, Rabi or Summer crops.

Varieties grown in various states are given in Table No. 5.

Table No. 5: Varieties grown in various States

Sl. No.	State	Varieties
1	Andhra Pradesh	Ashwini, Harsha, DHM-15, Varun, DHM-103, Trashulata, Amber, Popocorn, Madhuri.
2.	Assam	Vijay, Navjot, NLD, Kishan, Ganga-5, Rajendra, Macca-1.
3.	Bihar	Vijay composite, Ganga white-2, Ganga-5, Rajenndra HYV, Diyara Composite
4.	Gujarat	Gujarat Maize-1, Gujarat Maize-2, Gujarat Maize-3, Gujarat-safed-2, Ageti-6, Ganga-5.
5.	Himachal Pradesh	Early Composite, Paravati, Naveen Composite, Him 123, Sartaj, Popcorn.
6.	Jammu & Kashmir	Maize GS-2, HIM 123, Apna Makka, Pioneer Series, Kanchan series, Navjot, Mansor, C-6, C-8, C-15.
7.	Karnataka	Agsun-126, AP-407, AB 2001-2002, Deccan 103, CMH-6644, Ganga -11, MMH 3816, VMH-108, Laxmi-4950, Vijay, INH-666, Kanaka, Swarna, VMH-869, G.K.Series, MH Series, VMH Series, Kaveri Series, Pioner.

8.	Madhya Pradesh	Ganga (White)-2, Ganga 5 & 11, Macca-101, 103. M.D.II, M-103&105, Chandan M-3, Navjot, Pusha 2, Mopset, Surya-11, Jawahar Maize-81
9.	Maharashtra	MSSC-1100
10.	Orissa	Bijay, Ganga-1, Ganga-5, Ganga-101, Kishan, Vikaram.
11.	Punjab	F-9572-A, Paras, Prabhat, Kesari, Punjab Sathi.
12.	Tamil Nadu	K1, K2, Col, COH-I, COH-2, COH(M)4, Ganga-5, DECCAN, COBC1.
13.	Uttar Pradesh	Ganga-2, Ganga-11, Tarun, Naveen, Kanchan, Sweta, D-765, Surya, Azad, Utlam, Nav Jyoti, Mahi Kanchan, Meerut Pili, Jaunpuri, Sartaz, Prakash, Dacan, Prabhat, Gaurav.
14.	West Bengal	Bijay, Ganga-2, Ganga-5, Ganga-101, kishan, Vikaram.

Source: State Agriculture Deptts. through the Sub-offices of D.M.I.

3.0 POST- HARVEST MANAGEMENT

3.1 Post-harvest losses:

It is estimated that about 2.45 percent of maize is lost at farmers' level during harvesting, threshing, winnowing, transportation and storage. Estimated post-harvest losses at producers' level is given in Table No. 6.

Table No.6: Estimated post- harvest losses of maize at producers' level

Sl.No.	Operations	Losses (percent to total production)
1.	Transport from field to threshing floor	0.58
2.	Threshing	0.80
3.	Winnowing	0.53
4.	Transport from Threshing floor to storage	0.19
5.	Storage at farmers level	0.35
Total		2.45

Source : Marketable Surplus and Post Harvest Losses of Maize in India, 2002, Directorate of Marketing & Inspection, Nagpur.

To minimise post harvest losses, the following measures should be followed.

- * Maize cultivated for obtaining kernels (grains) should be harvested when the kernels are matured with 25 to 30 percent moisture.
- * Use proper method of harvesting.
- * Dry the cobs immediately before threshing and kernels should be dried sufficiently before storage.
- * Losses in threshing and winnowing should be avoided by using proper machineries.
- * Follow sanitation during drying, packing and handling to avoid contamination of kernels and protect from insects, rodents and birds etc.
- * Use proper techniques for cleaning and further processing.
- * Adopt grading practices for proper evaluation and obtaining better price.
- * Use strong, and free from infestation packaging material for storage and transport.
- * Use proper scientific technique in storage for maintaining optimum moisture content.
- * Use pest control measures (fumigation) before storage.
- * Provide aeration to stored grain and stir grain bulk occasionally.
- * Use proper techniques while handling (loading & unloading), good and fast transport to avoid losses during transport.



3.2 Harvesting Care :

Maturity period for harvesting of maize:

Varieties	Days after planting	Where grown/suitable areas
Long duration	100-110 days or more	Areas where irrigation for early sowing is available or rainy season starts early.
Medium duration	85-95 days	Where late sowing is done and irrigation is available.
Short duration	80-85 days	Where sufficient rain fall is available or grown as intercropping.
Very short duration	75-80 days	River side areas where sudden floods are caused.

Source : Kharif Maize (Kharif Makka) by Directorate of Maize Research, I.C.A.R.New Delhi.

The following harvesting care should be taken :

- Maize crop grown for grain should be harvested when it attains full maturity i.e. when husk has turned yellow and grains are hard enough having 25 to 30 percent moisture.
- Do not wait for stalks and leaves to dry because they remain green in most of the hybrid and composite varieties.
- The cobs of maize are to be cut at the stalk.
- Remove the hair and husk from the cobs and then dry them in sun for seven to eight days.
- Protect the Maize cobs from rain and excessive dew by covering.
- Avoid pest infestation during drying and threshing etc.
- Kernels should be separated by beating the cobs or by Maize shellers.
- Avoid loss during shelling and winnowing.
- Dry the maize kernels (grain) sufficiently prior to packing and storing.
- Pack the maize kernels in jute bags free from infestation and obnoxious smell.



3.3 Post-harvest equipments :

To obtain good quality of maize grains, it is necessary to harvest the crop at proper time i.e. after attaining the full maturity. In regions where the maize is cultivated on small scale, harvesting is done by manual labourers. However, on large scale threshing and winnowing is done by machines.

The suitable machinery viz. Harvesters, threshers, winnowers etc. should be used for harvesting, threshing and winnowing.

Post-harvest equipments:

a) CIAE Multi-crop Thresher:

It consists of spike tooth cylinder, aspirator type blower and sieve shaker. Two top covers, three concaves, three sieves, variable cylinder speed (7-21m/s) are provided for threshing. It saves 26-39 percent labour and 22 percent on cost of operation compared to threshing by single crop thresher. It's threshing capacity is 1635 kg/hour.

b) Semi-Axial Flow Multi Crop Thresher:

It consists of spike-tooth cylinder, aspirator type blower and sieve shaker. It works on axial flow principle but crop flow is restricted by inserting a semicircular plate between cylinder and thrower. It saves 27-40 percent labour and operating time and 19 percent on cost of operation compared to conventional spike tooth thresher. It's out put capacity is 1350 kg/hour.

c) CIAE High Capacity Multi-crop Thresher:

It consists of a spike tooth cylinder, three aspirator blowers, cleaning sieves and automatic feeding and bagging systems. The thresher is provided with accessories such as extra pulleys, concaves and sieves for threshing different crops. It saves 50 percent labour and operating time and 54 percent cost of operation compared to conventional spike tooth thresher. It's output capacity is 2890 kg/hour.

d) Tubular Maize Sheller :

It is manual hand operated sheller suitable for shelling maize from dehusked cobs. Shelling is done by holding the Sheller in left hand and gradually inserting the cob in to the sheller by right hand with little forward and backward twist.

3.4 Grading:

Grading is the process of sorting of produce according to the grades or classes. In case of maize, the quality factors such as moisture content, foreign matter, other food grains, admixture of other varieties, damaged grains, immature grains, weevilled and shrivelled grains are considered while grading. The farmers, in order to improve the quality of produce and obtain better price, clean the maize with sieves to remove the dust, broken grains and small size shrivelled grains etc. The buyers offer the price on the basis of visual inspection of the lot or available sample considering above mentioned quality factors.

3.4.1 Grade specifications :

i) Specifications under AGMARK:

Under the Agricultural Produce (Grading and Marking) Act 1937, the national standards for maize are notified, considering the quality factors like a) moisture, b) foreign matter, c) other food grains, d) admixture of different varieties, e) damaged grains, f) immature grains, and g) weevilled and shrivelled grains.

A) General characteristics :

Maize shall :-

- be the dried mature grains of *Zea mays* L.;
- be sweet, hard, clean, wholesome, uniform in size, shape, colour and in sound merchantable condition;
- be free from added colouring matter, moulds, weevils, obnoxious substances, discolouration, poisonous seeds and all other impurities except to the extent indicated in the schedule;
- Uric acid and aflatoxin shall not exceed 100 miligrams and 30 micrograms per kilogram respectively;
- be free from rodent hair and excreta;
- Comply with the restrictions in regard to pesticides/insecticides residue (Rule 65), poisonous metals (Rule 57), naturally occurring toxic substances (Rule 57-B) and other provisions prescribed under the Prevention of Food Adulteration Rules, 1955 and as amended from time to time.

Note : In foreign matter, the impurities of animal origin shall not be more than 0.10 per cent by weight.

B) Special characteristics :

Grade designation	Maximum limits of tolerance (per cent by weight)							
	Moisture	Foreign matter		Other Edible Grains	Admixture of different varieties	Damaged Grains	Immature And shrivelled Grains	Weevilled Grains (Percent by count)
		Organic	Inorganic					
Grade I	12.00	0.10	Nil	0.50	5.00	1.00	2.0	2.0
Grade II	12.00	0.25	0.1	1.00	10.00	2.00	4.0	4.0
Grade III	14.00	0.50	0.25	2.00	15.00	3.00	6.0	6.0
Grade IV	14.00	0.75	0.25	3.00	15.00	4.00	6.0	8.0

C) Definitions :

- 1) **Foreign matter:** - It includes dust, stone, lumps of earth, chaff, stem or straw and any other impurity including non-edible seeds.
- 2) **Other Food Grains:-** Edible food grains other than Maize.
- 3) **Damaged Grains:-** Grains that are internally damaged or discoloured, damage and discolouration materially affecting the quality.
- 4) **Slightly Damaged Grains:-** Grains that are superficially damaged or discoloured, damage and discolouration not materially affecting the quality.
- 5) **Immature and Shrivelled Grains:-** Grains that are not properly developed.
- 6) **Weevilled Grains:-** Grains that are partially or wholly bored or eaten by weevils or other grain insects.

ii) CODEX STANDARDS:

CODEX ALIMENTARIUS COMMISSION (CAC) : Codex Alimentarius Commission (CAC) implements joint FAO/WHO Food Standards Programme. The purpose of the CAC programme is to protect the health of consumers and ensure fair practices in the food trade. The CAC is a collection of internationally adopted food standards presented in a uniform manner. Sanitary and Phyto-Sanitary Agreement and Technical Barriers to Trade Agreement of World Trade Organization recognizes standards framed by CAC with respect to safety and quality aspects of food items. Thus for international trade, standards framed by CAC are recognized.

CODEX STANDARD FOR MAIZE (CORN)

CODEX STAN 153-1985 (Rev. 1 - 1995)

The Annex to this standard contains provisions which are not intended to be applied within the meaning of the acceptance provisions of Section 4.A (1)(b) of the General Principles of the Codex Alimentarius.

1. SCOPE

This standard applies to maize (corn) for human consumption, i.e., ready for its intended use as human food, presented in packaged form or sold loose from the package directly to the consumer. This standard specifies requirements for whole grain shelled dent maize, *Zea mays indentata* L., and/or shelled flint maize, *Zea mays indurata* L., or their hybrids. It does not apply to processed maize.

2. DESCRIPTION

2.1 Product Definition

Maize (corn) is the shelled grains of the species defined in the scope.

3. **ESSENTIAL COMPOSITION AND QUALITY FACTORS**

3.1 **Quality Factors - General**

3.1.1 Maize shall be safe and suitable for human consumption.

3.1.2 Maize shall be free from abnormal flavours, odours and living insects.

3.1.3 Maize shall be free from filth in amounts which may represent a hazard to human health.

3.2 **Quality Factors - Specific**

3.2.1 **Moisture Content** 15.5% m/m max

Lower moisture limits should be required for certain destinations in relation to the climate, duration of transport and storage. Governments accepting the Standard are requested to indicate and justify the requirements in force in their country.

3.2.2 **Extraneous matter** are all organic and inorganic materials other than maize, broken kernels, other grains and filth.

3.2.2.1 **Filth** are impurities of animal origin (including dead insects). 0.1% m/m max

3.2.2.2 **Toxic or Noxious Seeds**

The products covered by the provisions of this standard shall be free from the following toxic or noxious seeds in amounts which may represent a hazard to human health. *Crotalaria* (*Crotalaria* spp.), Corn cockle (*Agrostemma githago* L.), Castor bean (*Ricinus communis* L.), Jimson weed (*Datura* spp.), and other seeds are commonly recognized as harmful to health.

3.2.2.3 **Other organic extraneous matter** which is defined as organic components other than edible grams of cereals (foreign seeds, stems, etc.) (1.5% m/m max).

3.2.2.4 **Inorganic extraneous matter** which is defined as any inorganic component (stones, dust, etc.) (0.5% m/m max).

4. **CONTAMINANTS :**

4.1 **Heavy Metals**

Maize (corn) shall be free from heavy metals in amounts which may represent a hazard to human health.

4.2 **Pesticide Residues**

Maize (corn) shall comply with those maximum residue limits established by the Codex Alimentarius Commission for this commodity.

4.3 **Mycotoxins**

Maize (corn) shall comply with those maximum mycotoxin limits established by the Codex Alimentarius Commission for this commodity.

5. **HYGIENE**

5.1 It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 2-1985, Codex Alimentarius Volume 1B) and other Codes of Practice recommended by the Codex Alimentarius Commission which are relevant to this product.

5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the product :

- shall be free from micro-organisms in amounts which may represent a hazard to health;
- shall be free from parasites which may represent a hazard to health; and
- shall not contain any substance originating from micro-organisms in amounts which may represent a hazard to health.

6. **PACKAGING**

6.1 Maize (corn) shall be packaged in containers which will safeguard the hygienic, nutritional, technological, and organoleptic qualities of the product.

6.2 The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They should not impart any toxic substance or undesirable odour or flavour to the product.

6.3 When the product is packaged in sacks, these must be clean, sturdy and strongly sewn or sealed.

7. **LABELLING**

In addition to the requirements of the Codex General Standard for the Labelling of Prepackaged Foods (CODEX STAN 1-1985, Rev. 1-1991, Codex Alimentarius Volume 1A), the following specific provisions apply:

7.1 **Name of the Product**

7.1.1 The name of the product to be shown on the label shall be "maize (corn)."

7.2 **Labeling of Non-Retail Containers**

Information for non-retail containers shall either be given on the container or in accompanying documents, except that the name of the product, lot identification and the

name and address of the manufacturer or packer shall appear on the container. However, lot identification and the name and address of the manufacturer or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

ANNEXURE

In those instances where more than one factor limit and/or method of analysis is given we strongly recommend that users specify the appropriate limit and method of analysis.

FACTOR/DESCRIPTION, LIMIT, METHOD OF ANALYSIS:

KERNELS OF OTHER COLOURS:

In yellow maize, maize grains which are yellow and/or light red in colour are considered to be yellow maize. Maize grains which are yellow and dark red in colour, provided the dark red colour covers less than 50% of the surface of the grain, are also considered to be yellow maize. In white maize, maize grains which are white and/or light pink in colour are considered to be white maize. White maize also means maize grains which are white and pink in colour, provided the pink colour covers less than 50% of the surface of the grain MAX: 5.0% by weight of maize of other colours MAX: 2.0% by weight of maize of other colours

Visual Examination in red maize : Maize grains which are pink and white or dark red and yellow in colour are considered to be red maize, provided the pink or dark red colour covers 50% or more of the surface of the grain. mixed maize MAX: 5.0% by weight of maize of other colours

KERNELS OF OTHER SHAPE:

In flint maize, in dent maize MAX: 5.0% by weight of maize of other shapes MAX: 5.0% by weight of maize of other shapes RANGE: 5.0% to 95% by weight of flint maize Visual Examination *CODEX STAN 153*.

DEFECTS

Blemished grains: Grains which are insect or vermin damaged, stained, diseased, discoloured, germinated, frost damaged, or otherwise materially damaged · broken kernels · other grains MAX: 7.0% of which diseased grains must not exceed 0.5% MAX: 6.0% MAX: 2.0% Visual Examination ISO 5223-1983 (4.50 mm metal sieve) Visual Examination

3.4.2 Adulterants and toxins

Toxins: Aflatoxin :-

Aflatoxins are the type of mycotoxins, which are derived from the fungi, which affect human health. Aflatoxins are produced by *Aspergillus flavus*, *Aspergillus ochraceus* and *Aspergillus paraciticus*. It is found that *Aspergillus flavus* and *Aspergillus parasitica* produce Aflotoxin in maize. Contamination of Aflatoxins occurs at any stage from field to storage,

whenever environmental conditions are conducive for fungi, which grow under conditions of relatively high moisture/humidity. It has been observed that Aflatoxin content is low at harvest and increases during storage. Field drying and mechanical drying were found most effective for controlling Aflatoxin. Solution of ammonium bis propionate and propionic acid will give temporary control and prevention of the growth of fungi in high moisture maize, but do not destroy aflatoxin present before treatment of the grain. The grain must be dried. Maize highly contaminated with aflatoxin can be detoxified efficiently with ammonia. The resulting grain is safe and can be used for feeding cattle and swine but is not suitable for human consumption.

Prevention and control of Aflatoxin :

Avoid mechanical damage to seed during harvesting, drying, and storage. Maize should be rapidly dried sufficiently (14% moisture) before storage. It should be stored at safe moisture level. Use proper scientific storage method. Clean grain-bins/storage areas before storing the new crop. Prevent insect infestation by adopting chemical treatment to avoid fungus contamination. Separate the infested grains. Stock bags on wooden planks and store in well aerated water proof area. Avoid stacking of harvested crop with cobs intact.

Chemical treatment :

Aflatoxin affected maize can be treated with sodium bi-sulphate, ammonia and propionic acid : ammonium bis propionate at a ratio of 9:1. Sodium bisulphate and ammonia treatments both result in grain with strong residual odour, the ammonia treatment also produces darker grain. The most promising reagent is the propionic acid-based fungicide formulation, which has been shown to effectively control both mould growth (*A.flavus*) and Aflatoxin formation, while not adversely affecting the physical quality of the grain.

Why Aflatoxins are important?

- Contaminated grain and food/feed is toxic to humans and animals (cattle, small ruminants, poultry, especially young ones) and result in serious health problems.
- Liver cirrhosis, liver cancer, immunosuppression, malnutrition syndrome.
- Lactating animals fed with contaminated feed results in aflatoxin contamination in milk.
- They cause illness to humans and animals.
- They are also associated with malnutrition syndrome, and can lead to many other disorders and even death.
- They cause economic losses.
- Humans and animals fed on aflatoxin contaminated food results in ill health, lowered animal production.

- Maize contaminated with aflatoxins lower its market value and export potential.
- Add to the management and monitoring costs.

Health Risks:

Aflatoxins are problematic when they occur in food products above the levels established for human and animal consumption.

- 1.) 20 ppb is the highest level allowed for humans.
- 2.) 50 ppb is the highest level allowed for animals.
- 3.) 100 ppb results in slowed growth of young ones.
- 4.) 200-400 ppb results in slowed growth of adults.
- 5.) >400 ppb results in liver damage and cancer.

Source: P. Lava Kumar, S. Veera Reddy and F. Waldiar, ICRISAT.

3.4.3 Grading at producer's level and under Agmark :

The scheme, Grading at producer's level was introduced in 1962-63 by the Directorate of Marketing & Inspection (DMI). The main objective of the scheme is to bring quality awareness among the producers and offer quality produce for sale. Under the scheme, the produce is subjected to simple tests and assigned a grade before sale. The programme is being implemented by the State Governments through the Agricultural Produce Markets. In India, till 31.3.2005, 1968 grading units were set up. During the year 2004-2005, about 90682 tonnes of Maize valued at Rs. 4360 lakh was graded at producers level.

Table No. 7: Grading at producers level, state wise quantity graded and estimated value during 2004-2005

State	Quantity graded (in tonnes)	Value (Rs. in lakhs)	N0. of grading units
Rajasthan	1738	97	38
Tamil Nadu	12468	718	272
Uttar Pradesh	76476	3546	161

Source : D.M.I., Faridabad (Agmark grading Statistics 2004-2005)

Grading under Agmark :

Grading under Agmark is carried out by the Directorate of Marketing & Inspection in accordance with the grade specifications notified by the Govt. of India under the provisions of Agricultural Produce (Grading & Marking) Act, 1937 and rules made there under. The

Directorate of Marketing & Inspection has prescribed the grade standards for Maize (Commercial Grades).

3.5 Packaging :

Good packaging is necessary for easy handling, transportation and storage. The maize corn is transported from field (threshing floor) to the market and storage godown in gunny bags. Good quality gunny bags either new or second hand with proper treatment are necessary to avoid spoilage and to protect the corn from moisture and insect attack etc. For good packaging, the packages must possess following qualities:

- ▶ It must protect corn well.
- ▶ It should be strong enough to sustain weight while handling and transportation.
- ▶ It must be convenient to handle.
- ▶ The size of the package should be restricted in such a way that it should be easy to lift and handle by a single person.
- ▶ It should be attractive, clean and free from any infestation etc.
- ▶ It should be marked with the description of the content viz. Commodity, name and address of packer, quantity, quality (Grade), variety and date of packing etc.

Method of packing :

- The graded corn should be packed in new, clean, sound and dry jute bags, cloth bags, polywoven bags, polyethylene, polypropylene, high molecular high density polyethylene, paper packages or in other food grade plastic / packaging materials.
- The packages should be free from insect infestation, fungus contamination, deteriorous substances and obnoxious smell.
- Each package should contain maize of one grade only.
- Each package should be securely closed and suitably sealed.
- Maize shall be packed in quantities as specified under the provisions of the standards of Weights and Measures (Packaged Commodities) Rules, 1977 as amended from time to time.
- Suitable number of consumer packs containing graded material of the same lot may be packed in master container.

Availability of packaging material :

Maize/corn is packed in the bags of following material :

1. Jute bags
2. H.D.P.E./P.P.Bags
3. Polythene impregnated jute bags
4. Poly pouches for corn for pop corn and processed baby corn
5. Cloth bags for seed

Jute bags vs. H.D.P.E. bags: Jute is bio degradable material, while synthetic is not environment friendly. The disposal of unserviceable jute bags is easy compared to synthetic bags. Summary of comparative properties of HDPE (High Density Poly Ethylene) and jute bags is given as under :

Table No. 8: Properties of jute bags and HDPE bags

Properties	HDPE bags	Jute bags
1. Seam strength	Poor	Strong
2. Surface texture	Smooth	Rough
3. Operational convenience	Poor (With accident risk)	Good
4. Capacity utilization	Poor	Excellent
5. Stack stability	Poor	Excellent
6. Resistance to hooking	Poor	Fair
7. Drop test performance	Poor	Good
8. End use performance (w.r.t. bursting, damage, spillage, replacement)	Poor	Good
9. Grain preservation efficiency	Poor	Excellent

Source: Indian Institute of Packaging, Packaging India.

Qualities of good packaging material :

- ✓ It should be convenient in operations.
- ✓ The packaging material must preserve the quality of produce.
- ✓ It should be convenient to stack.
- ✓ It should be able to prevent spillage during transit and storage.
- ✓ It should be cost-effective.
- ✓ It should be clean and attractive.
- ✓ It should be biodegradable.
- ✓ It should be helpful in reducing the marketing cost by reducing the handling and retailing cost.
- ✓ Packing material should be reusable.

Economics of packaging :

Usually, the cost a HDPE bags may be around 50-60 percent of the cost of jute bags. In maize, usually B-Twill jute bags are used. The initial cost of packaging varies according to the type of material used for making bags. Maize is stored in HDPE bags for six months, whereas in jute bags, for 3 months. Thus, the economics of packaging depends not only on the type of packaging material but also the duration for which the maize is likely to be stored.

3.6 Transportation :

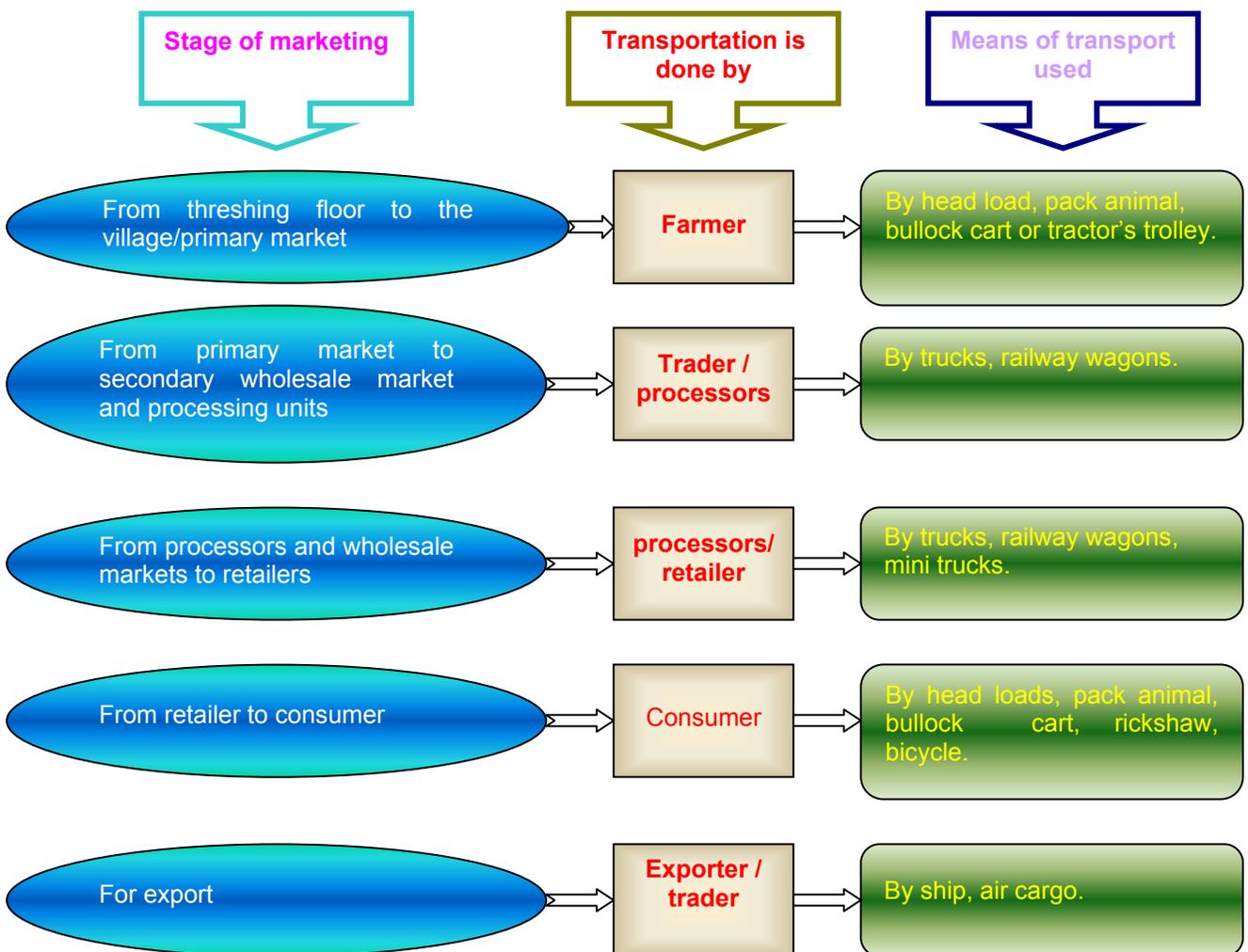
Maize is transported from fields to markets and from markets to mills and other terminal markets. The mode of transport depends on the quantity to be transported, distance and connectivity by roads etc.

Maize is transported from field to the markets in bulk as well as in bags. Whereas from markets to mills and other terminal markets maize is invariably transported in bags.

Maize is transported in bullock carts, tractor trolleys and small trucks etc. from threshing floors to the primary markets

In tribal areas, the quantity sold by individual farmers is very small, hence it is transported as head load or on pack animals.

CHART NO. 1
Means of transportation used at different stages of marketing



Modes of Transport used :

Maize is transported by various modes like, by road, by rail and by sea. Maize is transported by road to internal markets but for export sea mode is used.

1. Road Transportation : Road transport is the most common and predominant mode of transport used for the movement of Maize. With the improvement of roads there is increase in use of motorized vehicles like tractor trolleys, mini trucks and large trucks etc.

Following means of road transport are employed in different parts of the country to transport maize.

- | | |
|-----------------|-----------------------|
| (a) Head load | (b) Bullock cart |
| (c) Camel carts | (d) Tractor Trolleys. |
| (e) Mini truck | (f) Truck |

2. Railways : Railway is one of the most important means of transportation of maize. Railway is suitable for transportation to long distance and large quantity of maize. It is cheaper than road transport. However, the losses in transportation are more due to handling while loading and unloading. It also requires more labour charges.

3. Water transport : This is the cheapest mode of transport as the natural sources like river, canal, sea water etc. is used for navigation. This form of transport is used in case of cities/towns located on or near the bank of river canal or coastal areas. The export of maize and maize products is done by sea transport. It is the cheapest mode of transport though it is slow.

The following means of water transport are used for maize transport :

- (a) **River transport :** This system is used in states where perennial rivers flow.
- (b) **Canal transport :** Canals are used for navigation in states where canals are available.
- (c) **Sea transport :** Sea ferries are used for transporting maize from the towns situated on the coast of sea and for export to other countries.

Selection of mode of transport :

Following points may be considered while selection of mode of transportation:

- ★ Mode of transport should be selected as per the requirement according to quantity and distance.
- ★ It should be easily available at the time of transport, particularly during peak period after harvest.
- ★ It should be comparatively cheaper among available alternatives.
- ★ It should protect maize from adverse weather conditions.

- ★ It should be free from pilferage.
- ★ It should be insured against any accident, natural calamities, etc.
- ★ It should ensure delivery of goods within specified time and at specified destination.

3.7 Storage :

Requirements for safe and scientific storage :

Following requirements should be considered for safe and scientific storage of maize:

- I Selection of site :** The storage structure should be located on a raised well drained site. It should be easily accessible. The site should be free from water logging, dampness, excessive heat, insects, rodents, termites etc.
- II Selection of storage structure :** The storage structure should be selected according to the quantity of maize or maize products to be stored and the period of storage. In godowns sufficient space should be provided between two stacks, between stacks and walls, so that proper aeration can be available.
- III Cleaning and fumigation :** Before, storage of maize, godown/structure should be properly cleaned and fumigated. There should be no cracks, holes or crevices in the structure.
- IV Drying and cleaning grains :** Before storage maize grains should be properly dried and cleaned to avoid quality deterioration.
- V Cleaning of bags :** Always use new gunny bag. In case of second hand gunny bags, it should be disinfested by boiling in one percent Malathion Solution for 3 to 4 minutes and fully dried.
- VI Separate storage of new and old stock :** to prevent contamination from the old stock to new stock, it is advised to store them separately.
- VII Use of dunnage :** Bag of maize should be kept on wooden crates or bamboo mats along with cover of polythene sheet to avoid absorption of moisture from the floor.
- VIII Proper aeration :** Proper aeration should be provided during dry and clean weather but care should be taken to avoid aeration in rainy season to protect the stock from moisture.
- IX Cleaning of vehicles :** The vehicles used for transportation of maize should be cleaned by phenyl to avoid infestation.
- X Regular inspection :** To maintain proper health and hygiene of stock regular inspection of stored maize is necessary. Periodic fumigation should be carried out in case of long storage.

3.7.1 Major storage pests and their control measures:

Various insects and pests during storage damage maize. Losses due to damage are both qualitative and quantitative. It also damages viability of seed. Some of the maize pests often start infestation in the field several weeks before the crop is harvested. The ability of the insects to fly long distances between fields and maize stores can quickly spread the infestation.

Nature of Infestation :

The eggs are laid either on the surface of grain kernel (normally on physically damaged part of the grain) or inside a tiny hole partly bored on the kernel by the parent. The eggs hatch into larvae which voraciously eat their way within the grain and are responsible for major damage. The larvae gradually transform into pupae, a dormant non-feeding stage. These later hatch into adults which eat their way out of the grain kernel and (if beetles) immediately start aggressive feeding on and further destruction of the grain. The *prostephanus truncatus* or larger grain borer (LGB) cause losses in the range of 10 to 35 percent in 5-6 months in household storage and up to 60 percent losses over 9 months storage period.

Nature of damage :

- Bored holes in the grain and disappearance of a large portion of the endosperm.
- Injury to the germ reducing the nutritive value and loss of viability of seed.
- Heating, condensation and molding of the grain are causing reduction in nutritive value and risk to formation of toxic substances as aflatoxin.
- Contamination of stored grain with excrement and frass.
- Infested grain, especially by *Sitotroga cerealella*, may have a sickening smell and taste that makes grain unpalatable.

Causes of infestation :

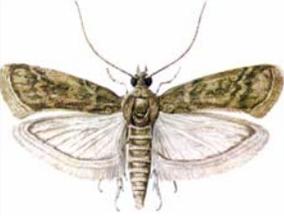
- Careless disposal of all crops and residue swept from infested store.
- Poorly managed store structure.
- Leaving cobs and pieces of infested cob-maize in unploughed fields, or lying all around the farm yard.

Factors affecting severity of damage:

- The severity of infestation depends on following factors.
- Moisture in grain at the time of storage.
- Relative humidity in atmosphere.
- Temperature inside the store/container.
- Type of storage structure used.
- Storage period.
- Processing method adopted.
- Sanitation.
- Fumigation frequency etc.

Major Stored grain pests of Maize with control measures :

Name of pest	Figure of pest	Damage	Control measures
1. Maize weevil <i>Sitophilus Zeamais.</i>		Larvae develop inside kernel and feed on starchy interior. Adults hatch and eat their way out and continue to feed voraciously on the grain.	Two types of treatments are followed to control infestation. A) Prophylactic treatment. Use following Insecticides to prevent infestation In godown and stock of maize.
2. Larger grain borer <i>Prostephanus truncatus</i>		Larvae enter grain and feed on starchy interior. Adults bore grain freely and voraciously eat and may destroy entire grain kernels.	1. Malathion (50 percent E.C.) Mix 1 litre in 100 Liter of water. Use 3 litre prepared solution per 100

<p>3. Saw toothed grain beetle</p> <p><i>Oryzaephilus surinamensis</i> (Linn)</p>		<p>Larvae and adults feed on broken and damaged grain.</p>	<p>square metre area.</p>
<p>4. Confused flour beetle.</p> <p><i>Tribolium confusum</i> (J. duv.)</p>		<p>Larvae and adults feed on broken and damaged grain</p>	<p>2. D.D.V.P. (76 percent E.C.) Mix 1 litre in 150 litre of water. Use 3 litre prepared solution per 100 square metre area. Do not spray on stock. Spray on walls and floors of the godown as and when required or once in a month.</p> <p>3 Deltamethrin (2.5%WP) Mix 1 kg. In 25 litre of water. Use 3 litre prepared solution per 100 square metre area. Spray on gunny bags after 3 months interval.</p>
<p>5. Angoumois grain moth</p> <p><i>Sitotroga cerealella</i> (oily)</p>		<p>Primary pest, attacks grain in field. Most damage occurs in storage only through larvae.</p>	<p>B) Curative Treatment : Use following fumigation insecticide to control infested stock / godown of maize in airtight condition.</p>
<p>6. Tropical ware house moth</p> <p><i>Ephestia cautella</i> (walk)</p>		<p>Primary pest, attacks grain in field. Most damage occurs in storage only through larvae.</p>	<p>1. Alluminium Phosphide : For stack fumigation use 3 tablets/tonne and put polythene cover on infected stock.</p>
<p>7. Rice moth</p> <p><i>Corcyra cephalonica</i> (Staint)</p>		<p>Damage is caused by larvae. characterised by heavy webbing and frass on produce</p>	<p>For godown fumigation, use 120 to 140 tablets per 100 cubic metre area and keep godown structure airtight and closed for 7 days.</p>

<p>8. Rodents</p>		<p>Rodents eat whole grains, broken grains, flour etc. They spill more grains than they eat. Rodents also contaminate maize grains with hair, urine and feces, which cause diseases like cholera, food poisoning, ringworm, rabies etc. They also damage the storage structures and other accessories of store like wire and cable etc.</p>	<p>Rat cage : Different types of rat cages are available in the market. Rates caught in cage can be killed by dipping in water.</p> <p>Poison baits : Anti-coagulant pesticide like zinc phosphate is mixed with bread or any other food stuff used as bait. Baits are kept for a week.</p> <p>Rat burrow fumigation: Tablets of Aluminum phosphate are put in each hole and burrow and holes are blocked by mud mixture to make airtight.</p>
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3.7.2 Storage structures:

Maize is stored to maintain the supplies between two harvests. Storage provides protection against weather, moisture, insects, micro-organisms, rats, birds and any type of infestation and contamination. In India, maize is stored in following manner.

<p>Traditional Storage structures</p>	
<p>1. Mud-bin</p>	<p>Made by bricks and mud or by straw and cow dung. These are usually cylindrical in shape with varying capacity.</p>
<p>2. Bamboo reed bin</p>	<p>Made by bamboo splits plastered with mixture of mud and cow dung.</p>
<p>3. Thekka</p>	<p>These are made up of gunny or cotton cloth wound around wooden support and generally in rectangular shape.</p>
<p>4. Metal drums</p>	<p>Made up with iron sheets in cylindrical and square shape with various sizes.</p>
<p>5. Gunny bags</p>	<p>Made up of jute.</p>

Improved storage structures	
1. Improved bins	Different organisations developed and designed improved storage structures for scientific storage of food-grains, which are moisture resistant and rodent-proof. These are: a) Pusa Kothi c) Nanda bins e) PKV bins b) PAU bins d) Hapur Kothi f) Chittore stone bins etc.
2. Brick-built godowns	These are made by brick-walls with cemented flooring for storing maize in bulk and bags.
3. Cement plastered bamboo bin	These bins are developed by Post Harvest Technology centre, Kharagpur, in which bamboo strips are used to form the skeleton of the bin and cement-sand mortar (1:2.5 ratio) is plastered on outer and inner surface of the bin.
4. CAP (Cover and Plinth) storage	It is an economical way of storage on a large scale. The plinth is made by cement concrete and bags are stacked in open and covered by ploythene cover.
5. Silos	Silos are used for storage of foodgrains. These are made from concrete, bricks and metallic materials with loading and unloading equipment.

3.7.3 Storage facilities :

I) Producer's storage:

Producers store maize in bulk at farm godown or in own house using various types of traditional and improved structures. Generally, these storage containers are used for short period. Different organisations/institutions developed improved structures for maize storage with various capacities like Hapur kothi. Pussa bin, Nanda bin, PKV bin, etc. Other storage structures are also used for this purpose like brick-built rural godown, mud- stone godown etc. Producers also pack maize in jute gunny bags or in gunny bags lined with polythene and stack in room.

II) Rural Godowns:

Considering the importance of rural storage in marketing of agricultural produce, the Directorate of Marketing and Inspection initiated a Rural Godowns Scheme, in collaboration with NABARD and NCDC. Its objective is 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 are as under:

- i) To prevent distress sale of foodgrains and other agricultural commodities immediately after harvest.
- ii) To reduce quantity and quality losses arising from sub-standard storage.
- iii) To reduce pressure on transport system in the post-harvest period.
- iv) To help the farmers in getting pledge loans against the stored produce.

Though a total of 90 lakh tonne capacity of Rural Godown was targeted during 10th Plan period, the same has now been revised upwards to 140 lakh tonne on the target of 90 lakh tonne capacity was already achieved during 2004-05 itself. Increased requirement of Rural Storage has been necessitated on account of increase in the production of food grain and its continuing increasing trend. During last three years 9483 storage projects having a capacity of 141.83 lakh tonne have already been sanctioned under the scheme by now. The capacity-wise break-up of godown are given below:-

Capacity-wise breakup of sanctioned project

100-500 tonne	501-1000 tonne	1001-5000 tonne	5000-10000 tonne	Total
5602	1224	2221	436	9483

Out of 9483 godowns sanctioned so far, 335 godowns are in public sector, 2376 are in farmers cooperative, 5050 godowns belong to farmers and 1722 godowns are owned by others like traders, companies, etc.

The year-wise physical and financial performance under the scheme is given in Table No.9.

Table No.9: The year-wise physical and financial performance under the Rural Godown Scheme

Year	Physical capacity (Lakh tonnes)	
	Target	Achievement
2001-03	20	67.35
2003-04	27	37.57
2004-05	38	36.91
2005-06	26	--
2006-07	10	--
Total	121	141.83

Source: www.agmarknet.nic.in

III) Mandi godowns :

Most of the maize is moved to the market after the harvest. Generally, maize is stored both in bulk and in bags in every state. Most of the states and U.Ts. have enacted Agricultural Produce Marketing Regulation Acts. 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 is 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 centers/markets, traders also possess permanent storage in the form of godowns or warehouses, or on hire basis.

IV) Central Warehousing Corporation (CWC):

CWC was established during 1957. It is the largest public warehouse operator in the country. In March 2005, CWC was operating 484 warehouses in the country. It has 16 regions, covering 225 districts, with a total storage capacity of 101.86 lakh tones. State-wise capacity with CWC as on 31.03.2005 is given below.

Table No.10 : State-wise storage capacity with CWC as on 31-03-2005

Name of State	No of warehouses	Total capacity (in tonnes)
1.Andhra Pradesh	50	1439916
2.Assam	6	64200
3.Bihar	13	97179
4.Chandigarh	1	13602
5.Chhattisgarh	10	236826
6.Delhi	11	181342
7.Goa	2	103847
8.Gujarat	29	622886
9.Haryana	25	439517
10.Himachal Pradesh	3	7040
11. Jammu & Kashmir	1	21150
11.Jharkhand	3	35913
12.Karnataka	32	453332
13.Kerala	9	129452
14.Madhya Pradesh	31	674748
15.Maharashtra	63	1564146
16.Nagaland	1	13000
17.Orissa	11	188206
18.Pondicherry	1	8940
19.Punjab	30	773999
20.Rajasthan	27	375347
21.Tamil Nadu	26	801127
22.Tripura	2	24000
23.Uttaranchal	7	75490
24.Uttar Pradesh	50	1155926
25.West Bengal	40	685264
Total	484	10186395

Source : Central Warehousing Corporation, New Delhi.

V) State Warehousing Corporations (SWCs) :

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 the concerned State Government. The SWCs are under the dual control of the State Government and the CWC. As on 1st April 2005, SWCs were operating 1599 warehouses in the country with the total capacity of 195.20 lakh tonnes. The state-wise storage capacity available with SWCs as on 01.04.2005 are given below:

Table No.11: State-wise storage capacity available with SWCs as on 01.04.2005

Name of SWC	Total capacity (in lakh tonnes)
1. Andhra Pradesh	22.82
2. Assam	2.48
3. Bihar	2.03
4. Chhattisgarh	6.07
5. Gujarat	2.27
6. Haryana	16.07
7. Karnataka	8.98
8. Kerala	1.92
9. Madhya Pradesh	11.38
10. Maharashtra	12.20
11. Meghalaya	0.11
12. Orissa	4.05
13. Punjab	60.12
14. Rajasthan	7.19
15. Tamil Nadu	6.36
16. Uttar Pradesh	28.88
17. West Bengal	2.27
Grand Total	195.20

Source: Central Warehousing Corporation, New Delhi.

VI) Cooperatives :

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

cooperative, particularly at rural and market level. The number and capacity of cooperative godowns assisted by NCDC in major states are given in table No. 12.

Table No.12: State-wise co-operative storage facilities as on 31-3-2004

Name of State	Rural level	Market level	Total capacity (in tones)
1. Andhra Pradesh	4003	571	690470
2. Assam	770	264	298900
3. Bihar	2455	496	557600
4. Gujarat	1815	401	372100
5. Haryana	1454	376	693960
6. Himachal Pradesh	1640	209	204800
7. Karnataka	4958	960	693590
8. Kerala	1959	133	323335
9. Madhya Pradesh	5166	1024	1305900
10. Maharashtra	3852	1492	2010920
11. Orissa	1951	595	486780
12. Punjab	3884	830	1986690
13. Rajasthan	4308	378	496120
14. Tamil Nadu	4757	409	956578
15. Uttar Pradesh	9244	762	1913450
16. West Bengal	2834	469	483060
17. Other States	1046	233	644830
Grand Total	56096	9602	14119083

Source: National Co-operative Development Corporation, New Delhi.

3.7.4 Pledge finance :

Micro level studies indicate that distress sale by small farmers accounts for about 50 percent of the marketable surplus. To meet the immediate financial requirements, the farmers are often compelled to sell their produce immediately after harvest, when the prices are low. To avoid such distress sale, Government of India, promoted Pledge Finance through a network of rural godowns and negotiable warehouse receipt system. Through this scheme, small and marginal farmers can get immediate financial support to meet their requirements and retain the produce till they get remunerative price.

According to RBI guidelines, loan/advances up to 75 percent of the value of the produce stored in the godown can be advanced to farmers against pledge/hypothecation of agricultural produce including warehouse receipts subject to a ceiling of Rs. 5 lakh per borrower. Such loan shall be for a period of 6 month, which can be extended up to 12 months based on financing banks commercial judgement. The commercial/co-operative banks/RRBs provide credit to the farmers for the produce stored in the godown under this scheme. The banking institutions accept the godown receipt on its being duly endorsed and delivered to bank for pledge loan against hypothecation of produce as per RBI

guidelines. Farmers are given freedom to take back their produce once the pledge loan is repaid. Facility of pledge finance is extended to all farmers, whether they are the borrowing members of Primary Agricultural Credit Societies (PACS) or not and the District Central Cooperative Banks (DCCBs) directly finance individual farmers on the strength of the pledge.

Benefits :

- ▶ Increase the retention capacity of the small farmers to avoid distress sale.
- ▶ Minimises the farmers' dependence on the commission agents as the pledge finance provides financial support to them immediately after harvest period.
- ▶ Participation of the farmers, irrespective of their land holding, helps in increasing the arrivals in market yards throughout the year.
- ▶ Gives a sense of security to the farmers even if their produce is not sold out in market yard immediately.

4.0 MARKETING PRACTICES AND CONSTRAINTS

4.1 Assembling:

The various agencies engaged in the assembling of Maize are as below.

- i) Producers
- ii) Village Merchants
- iii) Itinerant merchants
- iv) Wholesale merchants and commission agents
- v) Flour mill agents
- vi) Co-operative Organizations
- vii) Govt. Organisations (F.C.I., State Govt. etc.)

Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar, Karnataka, Gujarat, Andhra Pradesh, Jammu & Kashmir, Maharashtra, Himachal Pradesh and Punjab are the important states for maize production and arrivals in markets.

Major assembling markets :

Major assembling markets for maize in important producing states are given in Table No.13.

Table No.13: Major markets for maize in various states

Sl.No.	Name of state	Name of markets
1.	Andhra Pradesh	Karim Nagar, Jammi Kunta, Warangal, Mahabubabad, Nizamabad, Armoor, Jogipet, Zaheerabad, Adilabad, Chennur, Kamareddy, Jagtial, Siddipet, Khammam.
2.	Arunachal Pradesh	Naharlagun, Nomsang, Bomdila, Seijusa, Along, Alikabali, Neba, Chanlong, Jawang, Tawang, Rupa.
3.	Assam	Dankomokan, Bokajan, Howrahghat, Halflong.
4.	Bihar	Patna, Bihta, Barh, Chapra, Siwan, Gopalganj, Muzaffarpur, Motihari, Betiah, Hazipur, Samastipur, Begusarai, Khagaria, Gulabghat, Munger, Hazaribagh, Dumka, Giridih.
5.	Gujarat	Godhra, Sahera, Lunawada, Halol, Delol, Meghraj, Malpur, Bhiladia, Prantig, Bardoli, Dhansura, Bayad, Modasa, Idar, Talod, Himatnagar, Khedbrahma, Vijainagar, Dahod, Limkheda, Palanpur, Anand, Borsad, Khambhat, Bharuch, Rajpipla, Hansot, Bhavnagar, Mahuva, Zalod, Santrampur, Vadodara
6.	Haryana	Ambala city, Narayan garh, Shahazadpur, Karnal, Hisar, Panipath, Sirsa, Rohtak, Gurgaon,
7.	Karnataka	Bangalore, Bellary, Chitradurga, Jamkhandi, Hospet, Gangavati, Davangere, Channagiri, Raichur, Honnali, Naragunda, Kottur, Koppal, Shimoga, Shikari pura, Periya patana, Kollegal, Gokak, Dhanwar, Hubli, Haveri Hirekerur, Ranibennur, Hanagal, Nandaha, Honnavar, Chintamani, Kolar, Chikabellapir, Bangarpet, Chelekere, Hosadurga, Tumkur, Madhugiri, Bhadravati, Sagar, Bidar, Hangal, Annagiri, Gadag, Rani benur, Belgaum, Mangalore, Mysore, Poligal, Yadgir, Gulbarga, Mandya, Arsikere, Hollenarsipur, Hollalaur, Tarikere, Kushtagi, Bhagalkot, Badami.
8.	Madhya Pradesh	Ujjain, Mandsaur, Neemuch, Shahdol, Guna,
9.	Maharashtra	Sangli, Jallana, Satara, Nadurbar, Akhuj, Chalisgaon, Malegaon, Dondaicha, Indapur, Pachora, Latur, Chikhali, Sillod, Sangola, Pandharpur, Bhokardan, Baramati, Deulgaon Raja.
10.	Manipur	Old Chura Chandpur, New Chura Chandpur, Ukhru, Mao, Senapati, Kokching, Imphal, Khawai Bazar, Lamlong, Jiriban.
11.	Meghalaya	Nonpah, Umsing, Pynurla, Burnihal, Kyrshai, Moheshkhola, Garobadha,
12.	Mizoram	Darlawn, Khawzowl.
13.	Nagaland	Mendiziphema, Pftsero, Lunhebato, Tsutsang, New Camp (Aliba), Impur Junction, Kubal, Chare, Mon, Nagini mora.
14.	Orissa	Anugul, Bhawanipatna, Kesinga, Phulbani, Koraput, Baripada.
15.	Punjab	Hoshiarpur, Bhagtabhaika, Bhucho, Kapurthala, Talwandi Sahib, Garah Shaukar, Nawanshehal, Bangra, Bala chauri, Roper, Kurali, Kharar, Monnda, Anandpur Sahib, Sirhind, Bassi Pathenna, Jallandar City, Jallandar Cantt. Adampur, Shahikot, Bhogpur, Ludhiana, Samrala, Machhiwara, Khanna, Jagraon,

		Sohneqal, Mullanpur, Raikot, Doraha, Dhakola, Bhawanigarh, Chamkor Sahib, Cheema, Malerkotla, Mohalkala, Sangrur, Sulargharat.
16	Rajasthan	Kota, Alwar, Jaipur, Gangapur, Hanumangarh, Jodhpur, Bara, Bundi, Banswara, Dungarpur, Udaipur.
17.	Tamilnadu	Kottai Theni, Koil Patti, Coimbatore, Dindigul.
18.	Tripura	Thalcherra, Tarakpur, Ramnagar, Bishalpur, Devipur, Kalmcharra, Bagmara, Mohan Bhog, Kotlamara, Golaghati, Maharaj Ganj Bazar, Dharma Nagar,
19.	Uttar Pradesh	Chharra, Mainpuri, Kasganj, Uttari Pura, Farrukhabad, Karimganj, Mohamdabad, Kannauj, Chhibramau, Bangarmau, Madhoganj, Bahriach.
20.	West Bengal	Siliguri, Kaling pong, Mallaguri, Alipurduar, English Bazar, Samsi, Kaliganj, Jangipur, Balarampur, Midnapore Sadar.

4.1.1 Arrivals :

The marketing period of maize is generally from October to December for Kharif maize and from January to May for Rabi crop. It was reported that during 2002-03, total arrivals of maize in 22 markets of Karnataka was 8,00,985 tonnes followed by Bihar 3,36,741 in 7 markets, Madhya Pradesh 2,50,724 tonnes in 12 markets, in Uttaranchal 2,08,392 tonnes in 20 markets and in Uttar Pradesh 2,05,710 tonnes in 12 markets.

Table No.: 14 Arrivals of maize in important markets of major producing states in India during 2000-01 to 2002-03

States	No. of Markets	Arrivals in tonnes		
		2000-2001	2001-2002	2002-2003
Andhra Pradesh	16	2,65,918	2,72,074	2,00,482
Bihar	07	1,17,865	3,02,479	3,36,741
Gujarat	07	29,402	57,881	74,232
Karnataka	22	7,19,767	5,97,568	8,00,985
Madhya Pradesh	12	1,22,889	2,85,599	2,50,724
Maharashtra	06	2,35,202	1,92,829	3,42,963
Orissa	07	38,540	57,248	15,601
Punjab	25	25,711	23,669	14,901
Tamil nadu	08	1,04,241	1,25,875	1,18,786
Uttar Pradesh	12	3,22,486	3,45,650	2,05,710
West Bengal	08	9,202	9,837	8,134
Rajasthan	12	1,03,163	1,65,113	1,15,416
Uttaranchal Qhs.	20	2,28,633	1,88,949	2,08,392
Assam	73	6,792	7,354	7,450
Jharkhand	04	16,694	15,804	18,475
Total	239	23,46,505	26,47,929	27,18,992

Source: State Departments of Agriculture Marketing.

4.1.2 Dispatches:

In most of the states, Maize is dispatched from assembling markets to the consuming markets within the state. In certain states like Andhra Pradesh, Gujarat, Karnataka, Orissa and Uttar Pradesh, maize is dispatched to adjoining states. The dispatches from major maize producing states to various destinations are given in Table No.15.

Table No.:15 Dispatches from major maize producing states in India

Sl. No.	States	Dispatches to states apart from local markets
1	Andhra Pradesh	Gujarat, Maharashtra, West Bengal and Tamil Nadu.
2	Gujarat	Rajasthan
3	Karnataka	Delhi, Tamil Nadu, Gujarat, Maharashtra, West Bengal
4	Madhya Pradesh	Maharashtra, Gujarat, Karnataka.
5	Orissa	West Bengal, Bihar, Andhra Pradesh, Madhya Pradesh, Orissa, Chattisgarh.
6	Uttar Pradesh	Delhi, Haryana, Rajasthan, West Bengal, Punjab Assam.

4.2 Distribution :

Assembling and distribution system of maize are inter-related. Though the assembling by producers is confined mainly to post-harvest period, the distribution is continued throughout the year, covering the largo area. Producers and itinary merchants assemble the produce in primary markets; there after various agencies are involved in distribution process up to the consumers. As per the survey of Marketable Surplus and Post-Harvest Losses of maize (2000), it has been estimated that the producers retained 41.45 percent of production for their various requirements. The marketable surplus was estimated to be about 48.34 percent of total production.

4.2.1 Inter-State Movement :

Maize is dispatched from major producing states to the consuming states. The major producing states from where the dispatches made are Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Orissa and Uttar Pradesh. The consuming states where the maize is arrived from other states are Maharashtra, West Bengal, Tamilnadu, Rajasthan, Delhi, Bihar, Chhatisgarh, Haryana and Assam. Maize is brought from major producing states to the consuming states for industrial use, processing and local consumption. The interstate movement also takes place due to variation in production and prices.

4.3 Export and Import :

After meeting its own requirement country, is exporting maize seed, other maize and maize (corn) flour to various countries. During the year 2004-2005, India exported 353093.05 tones of maize seed, valued at Rs 24981.99 lakh. Major export was made to Malaysia 138022.55 tonnes valued at Rs. 9058.46 lakh, followed by Korea Re. 81151.00 tonnes valued at Rs. 5283.76 lakh and Sri Lanka 47289.30 tonnes valued at Rs. 2941.90 lakh.

Export of maize (corn) flour, during 2004-05, was 2419.59 tonns valued at Rs. 320.75 lakh. Out of this, 760.00 tones valued at Rs. 141.19 lakh was exported to Ghana, followed by 624.00 tonnes valued at Rs. 34.69 lakh to Bangladesh and 327.00 tonnes valued at Rs. 55.00 lakh to Malaysia.

Export of maize during the years 2002-2003 to 2004-2005 is given in Table No. 16 and country wise export of maize is given in Table No. 17 and 18 respectively.

Table No. : 16 Export of maize from India during 2002-2003 to 2004-2005

**Quantity in tones
value in lakh Rs.**

Description	2002-2003		2003-2004		2004-2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Maize seed	9387.87	2759.24	126936.87	10240.29	353093.05	24981.99
Other maize	68790.38	4014.51	416334.00	25204.91	715584.35	45759.62
Maize (corn) flour	661.90	150.70	2409.12	226.93	2419.59	320.75

Table No. 17: India's country-wise export of maize seed.

Quantity in tonnes
Value in Lakh Rs.

Sl. No.	Country	2002-2003		2003-2004		2004-2005	
		Quantity	Value	Quantity	Value	Quantity	Value
1	Bangladesh	666.76	38.90	5662.61	459.11	11688.50	838.60
2	Bahrain	19.80	3.03	38.00	3.79	3.79	0.00
3	Bhutan	0.00	0.00	58.00	2.37	59.40	3.24
4	China	120.00	13.50	443.00	42.91	0.00	0.00
5	Taiwan	0.00	0.00	1812.24	128.62	1525.00	107.49
6	France	0.00	0.00	1812.24	128.62	1525.00	107.49
7	Germany	0.00	0.00	0.00	0.00	0.00	0.00
8	U.K.	0.00	0.00	20.00	1.98	33.00	5.56
9	Hong Kong	0.00	0.00	647.61	42.71	1140.23	74.55
10	Indonesia	4200.00	1005.62	2990.00	361.09	24469.00	1790.95
11	Iran	0.00	0.00	0.00	0.00	0.00	0.00
12	Japan	21.00	17.51	35.50	27.40	24.00	161.10
13	Korea Republic	79.40	29.70	16600.00	1063.85	81151.00	5283.76
14	Kuwait	0.00	0.00	0.50	0.05	0.00	0.00
15	Sri Lanka	10.00	5.79	21746.00	1364.23	47289.30	2941.90
16	Malaysia	0.00	0.00	33241.91	1982.	138022.55	9058.46
17	Netherlands	40.00	5.60	0.00	0.00	0.00	0.00
18	Nepal	266.10	25.50	1392.50	98.16	4322.70	211.69
19	Oman	0.00	0.00	1348.30	248.75	0.00	0.00
20	Pakistan	40.00	9.51	177.71	47.66	28.00	6.32
21	Philippines	3061.89	1294.54	5023.26	1816.79	12693.57	2271.33
22	Korea Dp RP	0.00	0.00	15400.00	972.36	0.00	0.00
23	Russia	0.00.000	0.00	0.00	0.00	0.00	0.00
24	Saudi Arabia	0.00	0.00	50.00	9.81	0.00	0.00
25	Sudan	0.00	0.00	0.00	0.00	0.500	0.06
26	Singapore	0.00	0.00	1859.00	126.45	838.160	58.32
27	Seychelles	0.00	0.00	0.0	0.0	120.00	10.75
28	Thailand	450.000	207.11	550.06	237.78	23.00	2.21
29	Tanzania Rep.	0.00	0.00	0.00	0.00	77.00	6.89
30	U.A.E.	21.54	1.92	17758.10	1163.10	20537.00	1427.82
31	U.S.A.	9.50	0.29	0.00	0.00	0.00	0.00
32	Vietnam	291.40	100.75	62.53	36.26	3867.25	321.37
33	Yemen Rep	0.00	0.00	20.00	3.00	2700.00	186.47
Total		9387.87	2759.24	126936.87	10240.29	353093.05	24781.99

Table No. 18 : India's country-wise export of maize (corn) flour

Quantity in tonnes
Value – Lakh Rs.

Sl. No.	Country	2002-2003		2003-2004		2004-2005	
		Quantity	Value	Quantity	Value	Quantity	Value
1.	Australia	0.00	0.00	0.00	0.00	2.00	0.28
2.	Bangladesh	0.0	0.00	0.096	0.11379	624.00	34.69
3.	Bahrain	19.96	2.16	2.0	0.12	0.00	0.00
4.	Canada	0.00	0/00	0.70	0.07	0.00	0.00
5.	China P. RP.	0.00	0.00	52.08	6.55	0.00	0.00
6.	Taiwan	0.00	0.0	413.0	67.00	0.00	0.00
7.	U.K.	23.00	0.74	10.00	1.29	9.70	1.41
8.	Ghana	0.00	0.00	4.25	0.84	0.00	0.00
9.	Japan	0.00	0.0	146.00	25.35	760.00	141.19
10.	Kuwait	0.00	0.00	0.00	0.00	0.00	0.00
11.	Maldives	0.00	0.00	0.28	0.03	0.00	0.00
12.	Mauritius	56.00	8.00	0.00	0.00	0.00	0.00
13.	Malaysia	0.00	0.00	0.00	0.00	327.00	55.00
14.	Nigeria	0.00	0.00	0.00	0.00	74.00	9.81
15.	Nepal	35.80	3.78	1563.74	103.58	184.33	12.49
16.	Oman	0.45	0.05	3.30	0.47	0.0	0.00
17.	Philippines	199.80	106.70	0.00	0.00	0.00	0.00
18.	Qatar	7.00	0.62	7.24	0.87	0.00	0.00
19.	South Africa	0.00	0.00	0.0	0.00	0.00	0.00
20.	Saudi Arabia	16.30	1.01	3.83	0.40	40.00	5.32
21.	Sudan	0.00	0.00	48.00	5.96	0.0	0.00
22.	Switzerland	0.00	0.00	0.00	0.00	40.00	5.89
23.	Seychelles	2.09	0.22	0.00	0.00	0.31	0.05
24.	Turkmenistan	0.00	0.00	0.00	0.00	108.00	14.72
25.	U.A.E.	93.00	9.75	116.00	10.62	59.65	5.47
26.	U.S.A.	208.50	17.68	38.60	3.66	12.60	1.40
27.	Vietnam Soc. Rep.	0.00	0.00	0.00	0.00	178.00	33.03
Total		661.90	150.70	24.09	226.93	2419.59	320.75

Source: www.apeda.com

Trend of Export:

It has been observed that the export of maize and maize (corn) flour is increasing in recent years. During the year 2002-03, the export of maize seed was 9387.87 tonnes, which was increased to 3,53,093.05 tonnes in the year 2004-05. The export of maize (corn) flour in the year 2002-03 was 661.90 tonnes, which was increased to 2419.59 tonnes in 2004-05.

4.3.1 Sanitary & Phyto-Sanitary (SPS) requirements :

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

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

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

The SPS standards commonly applied by Governments, which affect imports are:

- i) **Import ban** (Total/partial) is generally applied when there is a significant rate of risk about a hazard.
- ii) **Technical specifications** (Process standards/Technical standards) are most widely applied measures and permit import subject to compliance with pre-determined specifications.
- iii) **Information requirements** (Labeling requirements/Control on voluntary claims) permit imports provided they are appropriately labelled.

Procedure for issue of SPS certificate for export:

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

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

4.3.2 Export procedure :

For export of maize from India, exporter can take the help of following laid down procedure.

- ▶ Registration with RBI and obtain RBI code number. {Apply in prescribed form (CNX) to obtain registration No. from RBI and the number is to be quoted on all export papers}.
- ▶ Importer – Exporter code (IEC) number to be obtained from Director General of Foreign Trade (DGFT).
- ▶ Register with Agricultural and Processed Food Products Export Development Authority (APEDA) to obtain registration cum membership certificate. This is required to obtain permissible benefits from the Government.
- ▶ Exporter then procures their export orders.
- ▶ Quality of the produce is to be assessed by the inspecting agency and a certificate is issued to this effect.
- ▶ Produce is then shifted to port.
- ▶ Obtain marine insurance cover from any insurance company.
- ▶ Contact clearing and forwarding (C. & F.) agent for sorting the produce in godowns and to get the shipping bill for allowing shipment by the Custom Authority.
- ▶ Shipping bill is submitted by C. & F. Agent to custom house for verification and verified shipping bill is given to the shed superintendent to obtain carting order for export.
- ▶ The C. & F. Agent presents shipping bill to preventive officer for loading into ship.
- ▶ After loading into ship, a mate's receipt is issued by captain of ship to the superintendent of the port, who calculates port charges and collects the same from the C. & F. Agent.
- ▶ After the payment, C. & F. Agent takes mate's receipt and requests port authority to prepare bill of lading to the respective exporter.
- ▶ Then C. & F. Agent sends the bill of lading to the respective exporter.
- ▶ After receiving the documents, exporter obtains a certificate of origin from chamber of commerce, stating that the goods are of Indian origin.
- ▶ Importer is informed by exporter regarding date of shipment, name of vessel, bill of lading, customer's invoice, packing list etc.
- ▶ Exporter submits all documents to his bank for verification and bank verifies the papers against original letter of credit.
- ▶ After verification, bank sends documents to foreign importer to enable him to take delivery of produce.
- ▶ After receiving papers, importer makes payment through bank and sends the GR form to RBI, an evidence of realisation of export proceeds.
- ▶ Exporter now applies for various benefits from duty draw-back schemes.

4.4 Marketing constraints :

- ★ **Unstable prices:** Generally, the price of maize goes down in the post harvest period (3-4 months immediately after harvest) due to heavy arrivals in the market and later shoots up.
- ★ **Spurt in production and heavy arrivals:** After the introduction of high yielding varieties of maize, the production has increased manifolds, increasing the arrivals in the markets, which results in distress sale after harvest.
- ★ **Lack of marketing information:** Due to lack of market information regarding prevailing prices, arrivals etc., most of the producers market the maize in the village itself, which deprives them of getting remunerative returns.
- ★ **Adoption of grading:** Grading of maize at producers' level ensures better prices to producers and better quality to consumers. However, most of the markets are lagging behind in providing grading services at producers' level.
- ★ **Inadequate storage facilities in rural areas:** Storage facilities in villages are found to be inadequate which contributes to distress sale. Due to lack of storage facilities at rural stage, substantial quantity is lost.
- ★ **Transportation facilities at producers' level:** Due to inadequate facilities of transportation at village level, in most of the states, producers are forced to sell maize in the village itself to itinerant merchants or traders directly at low prices.
- ★ **Training of producer:** The farmers are not trained in marketing system. Training shall improve their skill for better marketing of their produce.
- ★ **Malpractices in markets:** Many malpractices prevail in the markets of maize i.e. excess weighment, delay in payment, high commission charges, delay in weighing and auction, different kinds of arbitrary deductions for religious and charitable purposes etc.
- ★ **Financial problem:** Lack of market finance is one of the major marketing problems in the smooth running of marketing chain.
- ★ **Infra-structure facilities:** Due to inadequate infra-structural facilities with producers, traders, millers and at market level, the marketing efficiency is affected adversely.
- ★ **Superfluous middlemen:** The existence of a long chain of middlemen reduces the producer's share in consumer's rupee.

5.0 MARKETING CHANNELS, COSTS AND MARGINS

5.1 Marketing channels :

The following are the important marketing channels existing in the marketing of maize:

- 1) **Producer ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**
- 2) **Producer ⇒ Commission Agent ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**
- 3) **Producer ⇒ Itinerant Merchant ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**
- 4) **Producer ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**
- 5) **Producer ⇒ Retailer ⇒ Consumer**
- 6) **Producer ⇒ Consumer.**

Criteria for selection of channels :

There are many marketing channels involved in marketing of maize. The following are the criteria for the selection of efficient marketing channels.

- ★ The channel, which ensures reasonable return to producer, is considered to be good or efficient.
- ★ Transportation cost in that channel.
- ★ Commission charges and market margins received by the intermediaries, such as trader, commission agent, wholesaler and retailer.
- ★ Financial resources.
- ★ The shorter channel with minimum market cost should be selected.

5.2 Marketing costs and margins :

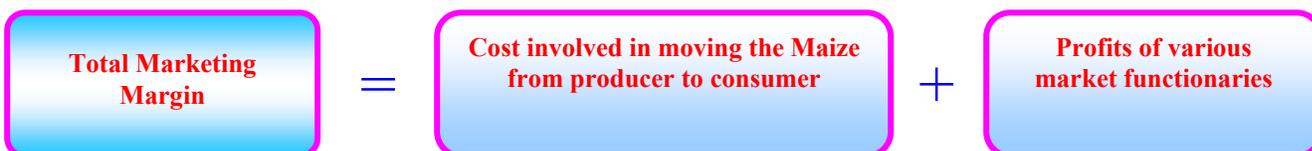
Marketing costs :

Marketing costs are the actual expenses incurred in bringing goods and services from the producer to the consumers. The marketing costs normally include;

- i) handling charges at local points
- ii) assembling charges
- iii) transport and storage costs
- iv) handling charges by wholesaler and retailer
- v) expenses on secondary services like financing, risk taking and market intelligence, and
- vi) profit margins taken by different agencies.

Marketing margins :

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, i.e. retailers or wholesalers or by any combination of marketing agencies in the marketing system as a whole. Total marketing margin includes cost involved in moving the maize from producer to consumer and profits of various market functionaries.



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

i) Market fee : It is charged either on the basis of weight or on the basis of the value of the produce. It is usually collected from the buyers. The market fee differs from state to state. It varies from 0.5 percent to 2.0 percent ad valorem.

ii) Commission : The charges are usually made in cash and vary from market to market.

iii) Taxes : Different taxes are charged in different markets such as toll tax, terminal tax, sales tax, octroi etc. These taxes leviable on maize differ from market to market in the same state as also from state to state. These taxes are usually payable by the seller.

iv) Miscellaneous charges : In addition, some other charges are also levied. These include handling, weighing, loading, unloading, cleaning, charity contribution in cash and kind, etc. These charges may be payable either by the seller or by the buyers.

Market charges and taxation in different states are given in the Table No.18.

Table No.18 : Market fees, commission charges and taxes on maize in major states

Sl. No.	State	Market fee	Commission charges	Sales tax	Other charges	License fee Rs. per annum
1.	Andhra Pradesh	1%	2%	--	--	A Rs. 3000/- for 5 years. B Rs. 2000/- for 5 years. C. Rs. 1000/- for 5 years.
2.	Assam	1%	-	-	-	Rs. 10/- per annum.
3.	Delhi	1%	2%	-	-	Trader A & B Rs 100/-
4.	Gujarat	0.5 to 0.8 %	1%	-	-	
5.	Himachal Pradesh	2%	5%	3.5%	--	Traders : Rs. 100/-

6.	Karnataka	1%	2%	--	--	Traders : Rs. 200/- per annum.
7.	Kerala	8%	-	-	Entry Fee: Head load 2/- Bullock cart 10/- Mini truck 30/-	--
8.	Madhya Pradesh	2%	-	-	-	Trader/ Processor Rs.1000/-
9.	Maharashtra	0.8 to 1.05 %	2-3.25%			
10.	Orissa	1%	0.5%	4%	Loading & Unloading Rs. 2/-	Traders : Rs 100/- to Rs.500/- C.A. : Rs.50/- Brokers : Rs 50/- Retailers : Rs. 25/-
11.	Punjab	2%	2.5%	4%	--	Traders : Rs. 100/-
12.	Rajasthan	1.6 %	4%	--	--	Traders : A & B Rs. 200/- C.A. cum Trader Rs.300/-
13.	Uttaranchal	2.5%	1.5%	4%	Dalali 0.5%	Traders 250/-
14.	Uttar Pradesh	2.5%.	1.5%	4%	--	A. Wholesaler Cum Commission Agent Rs. 250/- B. Storage & Transport Agency Rs. 200/- C. Small Processing Unit Rs. 150/- D Retailers Rs. 100/- E. Weighmen & Palledar Rs. 25/-
15.	Tamil Nadu	1%	--	--	--	Wholesaler : Rs. 100/- Other traders: Rs. 75/- Ware housing man : Rs. 25/-
16.	West Bengal	1%	--	--	2%	Traders : 150/-

Source: Sub Offices of Directorate of Marketing and Inspection. The charges prevalent at the time of survey are indicated in the table.

6.0 MARKETING INFORMATION AND EXTENSION

Marketing information :

Marketing Information is essential for producers in planning production and market led production. It is equally important for other market participants for trading.

Recently, Govt. of India has launched Agricultural Marketing Information Network Scheme through Directorate of Marketing & Inspection (DMI) to bring out improvement in the present market information scenario by linking all Agricultural produce wholesale markets in the States and Union Territories. The data received from markets is being displayed on the website www.agmarknet.nic.in.

Marketing extension :

Market extension is a vital factor enlightening the farmers about proper marketing and removal of marketing constraints and improves their awareness in various modern post harvest measures for efficient and cost effective marketability.

Benefits:

- ★ Provides the up-to-date information on the arrivals and prices of agricultural commodities in different markets.
- ★ Guides the producers to take right decision, when, where and how to market their produce.
- ★ Educate the producers/traders about the post harvest management i.e.
 - Harvesting care
 - Techniques to minimise losses during post harvest period.
 - Value addition to the produce by proper cleaning, processing, packaging, storage and transportation.
- ★ Orient the producers/traders about prevailing price trends, demand and supply situation etc.
- ★ Orient the producer regarding the importance of grading, cooperative/group marketing, direct marketing, contract farming, future trading etc.
- ★ Provides the information about the sources of credit availability, various Govt. schemes, policies, rules and regulations etc.

Sources :

The following are the sources of marketing information available in the country.

Source / Institution	Activities for marketing information and extension
<p>Directorate of Marketing and Inspection (DMI), NH-IV, CGO Complex, Faridabad. Website: www.agmarknet.nic.in</p>	<ul style="list-style-type: none"> ➤ Provides information through nationwide Marketing Information Network (“AGMARKNET” portal). ➤ Marketing extension through training to educate producers, graders, consumers etc. ➤ Marketing research survey. ➤ Publication of reports, pamphlets, leaflets, Agricultural Marketing journal, Agmark standards etc.
<p>Central Warehousing Corporation (CWC), 4/1 Siri Institutional Area Opp. Siri fort, New Delhi-110016 Website : www.fieo.com/cwc/</p>	<ul style="list-style-type: none"> ➤ Farmers Extension Service Scheme (FESS) was launched by CWC in the year 1978-79 with the following objectives : <ul style="list-style-type: none"> i) To educate farmers about the benefit of scientific storage and use of public warehouses. ii) To impart training to the farmers on the techniques of scientific storage and preservation of foodgrains. iii) To assist farmers in getting loans from the banks against pledge of warehouse receipt. iv) Demonstration of spraying and fumigation methods to control insects.
<p>Director General of Commercial Intelligence & Statistics (DGCIS), 1, Council House Street Kolkata -1</p>	<ul style="list-style-type: none"> ➤ Collection, compilation and dissemination of marketing related data i.e. export-import data, inter-state movement of foodgrains etc.
<p>Directorate of Economics and Statistics, Shastri Bhavan, New Delhi Website: www.agricoop.nic.in</p>	<ul style="list-style-type: none"> ➤ Compilation of agricultural data for development and planning. ➤ Dissemination of market intelligence through publication and internet.
<p>Agriculture Produce Marketing Committee (APMC)</p>	<ul style="list-style-type: none"> ➤ Provides market information on arrivals, prevailing prices, despatches etc ➤ Provides market information of adjoining / other market committees. ➤ Arranges training, tours, exhibitions etc.
<p>Federation of Indian Export Organisations (FIEO), PHQ House(3rd Floor)</p>	<ul style="list-style-type: none"> ➤ Provides information to its members about latest developments in export and import. ➤ Organises seminars, workshops, presentation, tours, buyer-seller meets, sponsoring participation in

Opp. Asian Games , New Delhi-110016	<p>international trade fair, exhibitions and providing advisory services with specialized divisions.</p> <ul style="list-style-type: none"> ➤ Provides useful information on India's export and import with diverse database.
<p>State Agricultural Marketing Boards, At different State capital</p>	<ul style="list-style-type: none"> ➤ Provides marketing related information to co-ordinate all the market committees in the state. ➤ Arrange training, seminars, workshops and exhibitions on subjects related to agricultural marketing.
<p>Kisan Call Centers (New Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Banglore, Chandigarh and Lucknow)</p>	<ul style="list-style-type: none"> ➤ Provides expert advise to the farmers. ➤ These centers will operate through toll free telecom lines throughout the country. ➤ A country wide common four digit number 1551 has been allocated to these centers.
<p>Mass Media Support to Agriculture Extension</p>	<ul style="list-style-type: none"> ➤ Mass media support to agriculture extension has been augmented with three new initiatives. <ul style="list-style-type: none"> i) The first component establishes a cable satellite channel for national broadcast using the existing facilities available with Inira Gandhi National Open University (IGNOU). ii) The second component is use of low and high power transmitters of Doordarshan for providing areas specific telecast. Initially, 12 locations chosen to launch broadcasting are Jalpaiguri (West Bengal), Indore (Madhya Pradesh), Sambhalpur (Orissa), Shillong (Meghalaya), Hissar (Haryana), Muzzafarpur (Bihar), Dibrugarh (Assam), Varanasi (Uttar Pradesh), Vijaywada (Andhra Pradesh), Gulbarga (Karnataka), Rajkot (Gujarat), Daltonganj (Jharkhand). iii) The third component of the mass media is use of FM transmitter network of All India Radio (AIR) to provide area specific broadcasting through 96 FM stations.
<p>Agriculture-Clinics and Agri-Business by Agriculture Graduates</p>	<ul style="list-style-type: none"> ➤ A central sector scheme "Establishment of Agriculture-Clinics and Agri-business Managed by Agriculture graduates" is being implemented since 2001-02. ➤ The aim is to provide opportunity to all eligible agriculture graduates, to support agriculture development through economically viable ventures. ➤ The scheme is being jointly implemented by NABARD, National Institute of Agricultural Extension Management (MANAGE) and Small Farmers' Agri-business Consortium (SFAC) in association with about 66 reputed training institutes in the country.

<p>Different websites on Agricultural Marketing Information</p>	<p> www.agmaknet.nic.in www.agricoop.nic.in www.fciweb.nic.in www.fieo.com/cwc/ www.ncdc.nic.in www.apeda.com www.nic.in/eximpol www.fmc.gov.in www.nmce.com www.icar.org.in www.fao.org www.agrisurf.com www.agriculturalinformation.com www.agriwatch.com www.kisan.net www.agnic.org www.indiaagronet.com www.commodityindia.com www.maize.agron.iastate.edu </p>
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7.0 ALTERNATIVE SYSTEMS OF MARKETING

7.1 Direct marketing :

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

Benefits :

- ★ Direct marketing helps in better marketing of maize.
- ★ It increases profit of the producer.
- ★ It minimises marketing cost.
- ★ It encourages distributional efficiency.
- ★ It satisfies the consumer through better quality of produce at reasonable price.
- ★ It provides better marketing techniques to producers.
- ★ It encourages direct contact between producers and consumer.
- ★ It encourages the farmers for retail sale of their produce.

7.2 Contract marketing :

“Contract marketing” is a system of marketing in which the commodity is marketed by farmers under a pre-agreed buy-back contract with an agency engaged in trading or processing. In contract marketing, a producer will produce and deliver to the contractor, a quantum of required quality of produce, based upon anticipated yield and contracted acreage, at a pre-agreed price. In this agreement, agency contributes input supply and renders technical guidance. The company also bears the entire cost of transaction and marketing. By entering in to contract, farmer’s risk of price reduces and the agency reduces the risk of non-availability of raw material. The inputs and extension services provided by the agency include improved seed, credit, fertilizers, pesticides, farm machinery, technical guidance, extension, marketing of produce etc.

In present scenario, contract marketing is one of the ways by which producers, especially small farmers, can participate in the production of good quality maize to get higher return. Contract marketing enables producers to adopt new technologies to ensure maximum value addition and access to new global markets. It also ensures efficient post harvest handling and meeting specific needs of customers.

Benefits :

Contract marketing is beneficial to both producer as well as to contracting agency. These benefits are summed up below:

Benefits	To Producer	To Contracting agency
Risk	It minimises the price risk.	It minimises risk of raw material supply.
Price	Price stability, ensuring fair price.	Price stability as per pre-agreed contract.
Quality	Use of quality seed and inputs.	Get good quality produce and control on quality.
Payment	Assured and regular payments through bank tie up.	Easy handling and better control on payment.
Post-harvest handling	Minimises risk and cost of handling.	Control and efficient handling.
New technology	Facilitates in farm management and practices.	For better and desired produce to meet consumer needs.
Fair trade practices	Minimises malpractices and no involvement of middle man.	Better control on trade practices.
Crop insurance	Reduces risk.	Reduces risk.
Mutual relationship	Strengthens.	Strengthens.
Profit	Increases.	Increases.

7.3 Cooperative marketing :

“Cooperative marketing” is the system of marketing in which a group of producers join together and register them under respective State Cooperative Societies Act to market their produce jointly. The members also deal in a number of cooperative marketing activities i.e. processing of produce, grading, packing, storage, transport, finance, etc. The cooperative marketing means selling of the member’s produce directly in the market, which fetches best prices. It helps the member to produce better quality of maize, which has good demand in the market. It also provides clean handling, fair trade practices and protect against manipulations / malpractices. The main objectives of cooperative marketing are to ensure remunerative prices to the producers, reduction in the cost of marketing, reduces the monopoly of traders and improve the marketing system. The cooperative marketing structure in the different states consists of;

1. **PMS** (Primary Marketing Society) at the Mandi level
2. **SCMF** (State Cooperative Marketing Federation) at the State level
3. **NAFED** (National Agricultural Cooperative Marketing Federation of India Ltd.) at the National Level.

There are many Cooperative Marketing Societies dealing with marketing of maize. National Cooperative Development Corporation (NCDC) and State Governments are providing financial assistance and other facilities to such Cooperative Marketing Societies.

Benefits :

- ★ Remunerative price to producers.
- ★ Reduction in cost of marketing.
- ★ Reduction in commission charges.
- ★ Effective use of infra-structure.
- ★ Credit facilities.
- ★ Collective processing.
- ★ Easy transportation.
- ★ Reduces malpractices.
- ★ Supply of agricultural inputs.
- ★ Marketing information.

7.4 Forward and future markets :

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

Forward contracts are broadly of two types. i.e. (a) Specific delivery contracts; and (b) Other than specific delivery contracts.

(a) Specific delivery contracts: Specific delivery contracts are essentially merchandising contracts, which enable producers and consumers of commodities to market their produce and cover their requirements respectively. These contracts are generally negotiated directly between parties depending on availability and requirement of produce. During negotiation, terms of quality, quantity, price, period of delivery, place of delivery, payment terms etc. are incorporated in the contracts. Specific delivery contracts are again of two types:

- i) Transferable specific delivery contracts (T.S.D.).
- ii) Non-transferable specific delivery contracts (NTSD).

In the TSD Contracts, transfer of the rights or obligations under the contract is permitted, while in NTSD, it is not permitted.

(b) Other than specific delivery contracts: Though this contract has not been specifically defined under the act but these are called as 'future contracts'. Futures contracts are forward contracts other than specific delivery contracts. These contracts are usually entered under the auspices of an Exchange or Association. In the future contracts, the quality and quantity of commodity, the time of maturity of contract, place of delivery etc. are standardised and contracting parties have to negotiate only the rate at which contract is entered into.

Benefits :

Future contracts perform two important functions i) Price discovery and ii) Price risk management. It is useful to all segments of economy.

Producers : It is useful for producers because they can get idea of price likely to prevail at a future point of time and, therefore help to decide time and planning of production that suits them.

Traders/Exporters : The futures trading is very useful to the traders/exporters as it provides an advance indication of the price likely to prevail. This helps the traders/exporters in quoting a realistic price and, thereby, secure trading/export contract in a competitive market.

Millers/Consumers : Futures trading enables the millers/consumers to get an idea of the price at which the commodity would be available at a future point of time.

The other benefits of future trading are-

Price stabilization: In times of violent fluctuations, futures trading reduce the price variations.

Competition: Futures trading encourages competition and provides competitive price to farmers, millers or traders.

Supply and demand: It ensures a balance in demand and supply position throughout the year.

Integration of price: Future trading promotes an integrated price structure throughout the country.

8.0 INSTITUTIONAL FACILITIES

8.1 Marketing related schemes of government and public sector :

Name of the scheme/implementing organisation	Facilities provided/salient features/objectives
<p>1. Agricultural Marketing Information Network</p> <p>Directorate of Marketing and Inspection, Head Office, N.H.-IV, Faridabad.</p>	<ul style="list-style-type: none"> ➤ To establish a nationwide information network for speedy collection and dissemination of market data for its efficient and timely utilization. ➤ To ensure flow of regular and reliable data to the producers, traders and consumers to derive maximum advantage out of their sales and purchases. ➤ To increase efficiency in marketing by effective improvement in the existing market information system. ➤ The scheme provides connectivity to 2784 nodes comprising the State Agricultural Marketing Department (SAMD) /Boards/ Markets. These concerned nodes have been provided with one computer and its peripherals. The SAMD/Boards/ Markets collect desired market information and pass on to respective state authorities and Head Office of the DMI for forward dissemination. The eligible markets will get 100 percent grant by Ministry of Agriculture.
<p>2. Gramin Bhandaran Yojana (Rural Godowns Scheme)</p> <p>Directorate of Marketing and Inspection, Head Office, N.H.-IV, Faridabad</p>	<ul style="list-style-type: none"> ➤ It is a capital investment subsidy scheme for construction/renovation/expansion of rural godowns. The scheme is implemented by DMI in collaboration with NABARD and NCDC. The objectives of the scheme are to create 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. ➤ To prevent distress sale immediately after harvest. ➤ To promote grading and quality control of agricultural produce to improve their marketability. ➤ To promote pledge financing and marketing credit to strengthen agricultural marketing in the country for the introduction of a national system of warehouse receipt in respect of agricultural commodities stored in such godowns. ➤ The entrepreneur will be free to construct godown at any place and of any size except for restrictions that it would be outside the limits of Municipal Corporation area and be of a minimum capacity of 100 MT and 50 MT in special case. ➤ The scheme provides credit linked back-ended capital investment subsidy @25 percent of the project cost with a ceiling of Rs. 37.50 lakh per project. For the projects in North-Eastern states and hilly areas with altitude of more than 1000 m above mean sea level and SC/ST

	<p>entrepreneurs, maximum subsidy admissible is @ 33 percent of the project cost, with a ceiling of Rs. 50.00 lakh.</p>
<p>3.Scheme for development/strengthening of agricultural marketing Infra-structure, grading & standardization Directorate of Marketing and Inspection, Head Office, N.H.-IV, Faridabad.</p>	<ul style="list-style-type: none"> ➤ To provide additional agricultural marketing infra-structure to cope up with the expected marketable surpluses of agricultural and allied commodities including dairy, poultry, fishery, livestock and minor forest produce. ➤ To promote competitive alternative agricultural marketing infrastructure by inducement of private and co-operative sector investments that sustain incentives for quality and enhanced productivity thereby improving farmers' income. ➤ To strengthen existing agricultural marketing infra-structure to enhance efficiency. ➤ To promote direct marketing so as to increase market efficiency through reduction in intermediaries and handling channels thus enhancing farmers' income. ➤ To provide infra-structure facilities for grading, standardization and quality certification of agricultural produce so as to ensure price to the farmers commensurate with the quality of the produce. ➤ To promote grading, standardization and quality certification system for giving a major thrust for promotion of pledge financing and marketing credit, introduction of negotiable warehousing receipt system and promotion of forward and future markets so as to stabilize market system and increase farmers' income. ➤ To promote direct integration of processing units with producers. ➤ To create general awareness and provide education and training to farmers, entrepreneurs and market functionaries on agricultural marketing including grading and quality certification.
<p>4.Agmark Grading and Standardisation Directorate of Marketing and Inspection, Head Office, N.H.-IV, Faridabad.</p>	<ul style="list-style-type: none"> ➤ Promotion of grading of agricultural and allied commodities under Agricultural Produce (Grading & Marking) Act.1937. ➤ Agmark specifications for agricultural commodities have been framed, based on their intrinsic quality. Food safety factors are being incorporated in the standards to compete in world trade. Standards are being harmonised with international standards keeping in view the WTO requirements. Certification of agricultural commodities is carried out for the benefit of consumers.

<p>5.Co-operative Marketing, Processing, Storage etc. Programmes in Comparatively under/least developed states.</p> <p>National Co-operative Development Corporation, Hauz Khas, New Delhi-110016</p>	<ul style="list-style-type: none"> ➤ To correct regional imbalances and to provide needed momentum to the pace of development of various programmes of cooperative agricultural marketing, processing, storage etc. in under/least developed states/UTs by providing financial assistance on liberal terms to augment the income of farmers and weaker sections of the community. ➤ The scheme provides for distribution of agricultural inputs, development of agro-processing including storage, marketing of foodgrains and plantation/horticulture crops, development of weaker and tribal sections, cooperatives, in dairy, poultry and fisheries.
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8.2 Institutional credit facilities :

Institutional credit is the vital factor in agricultural development. The main emphasis was laid down on adequate and timely credit support to the farmers, particularly small and marginal farmers for adoption of modern technology and improved agricultural practices.

Short term and medium term loans:

Name of scheme	Eligibility	Objective/Facilities
1. Crop Loan	All categories of farmers.	<ul style="list-style-type: none"> ➤ To meet cultivation expenses for various crops as short-term loan. ➤ This loan is extended in the form of direct finance to farmers with a repayment period not exceeding 18 months.
2. Produce Marketing Loan	All categories of farmers.	<ul style="list-style-type: none"> ➤ This loan is given to help farmers to store produce on their own to avoid distress sale. ➤ This loan also facilitates immediate renewal of crop loans for next crop. ➤ The repayment period of the loan does not exceed 6 months.
3. Kisan Credit Card Scheme (KCCS)	All agriculture clients having good track record for the last two years.	<ul style="list-style-type: none"> ➤ This card provides running account facilities to farmers to meet their production credit and contingency needs. ➤ The scheme follows simplified procedures to enable the farmers to avail the crop loans as and when they need. ➤ Minimum credit limit is Rs. 3000/-. Credit limit is based on operational land holding, cropping pattern and scale of finance. ➤ Withdrawals can be made by using easy and convenient withdrawal slips. The Kisan Credit Card is valid for 3 years subject to annual review. ➤ It also covers personal insurance against death or permanent disability for maximum amount of Rs. 50,000 and Rs. 25,000 respectively.

<p>4. National Agricultural Insurance Scheme (NAIS)</p>	<p>Scheme is available to all farmers – loanee and non-loanee both- irrespective of the size of their holding.</p>	<ul style="list-style-type: none"> ➤ To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases attack. ➤ To encourage the farmers to adopt progressive farming practices, high value in-puts and high technology in agriculture. ➤ To help to stabilize farm incomes, particularly in disaster years. ➤ General Insurance Corporation of India (GIC) is the Implementing Agency. ➤ Sum insured may extend to the value of threshold yield of the area insured. ➤ Covers all food crops (cereals, millets and pulses), oilseeds and annual commercial/horticultural crops. ➤ Provides subsidy of 50 percent in premium of small and marginal farmers. The subsidy will be phased out over a period of 5 years on sunset basis.
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Long term loan

Name of Scheme	Eligibility	Objective/Facilities
<p>Agricultural Term Loan</p>	<p>All categories of farmers (small/medium and agricultural labourers) are eligible, provided they have necessary experience in the activity and required area.</p>	<ul style="list-style-type: none"> ➤ The banks extend this loan to farmers to create assets facilitating crop production/income generation. ➤ Activities covered under this scheme are land development, minor irrigation, farm mechanization, plantation and horticulture, dairying, poultry, sericulture, dry land / waste land development schemes etc. ➤ This loan is offered in the form of direct finance to farmers with a repayment span not less than 3 years and not exceeding 15 years.

8.3 Organisations providing marketing services :

Name of the organisation	Services provided
<p>1. Directorate of Marketing and Inspection (DMI) NH-4, CGO Complex Faridabad- Website: www.agmarknet.nic.in</p>	<ul style="list-style-type: none"> ➤ 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. ➤ Administration of Meat Food Products Order (1973); ➤ Promotion of cold storage. ➤ Liaison between the Central and State Governments through its regional offices (11) and sub-offices (26) spread all over the country.

<p>2. Food Corporation of India (FCI), Barakhamba Lane, Cannaught Place, New Delhi-110001 Website: www.fciweb.nic.in</p>	<ul style="list-style-type: none"> ▶ Procurement of foodgrains for effective price support operations for safeguarding the interests of the farmers. ▶ Distribution of foodgrains throughout the country for Public Distribution System. ▶ Maintaining satisfactory level of operational/buffer stocks of foodgrains to ensure National Food Security.
<p>3. Central Warehousing Corporation (CWC), 4/1 Siri Institutional Area Opp. Siri Fort New Delhi- 110016 website: www.fieo.com/cwc/</p>	<ul style="list-style-type: none"> ▶ Provides scientific storage and handling facilities. ▶ Offers consultancy services/ training for the construction of warehousing infrastructure to different agencies. ▶ Import and export warehousing facilities. ▶ Provides disinfection services.
<p>4. Agricultural and Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area August Kranti Marg, New Delhi 110016 Website: www.apeda.com</p>	<ul style="list-style-type: none"> ▶ Development of scheduled agriculture products related industries for export. ▶ Provides financial assistance to these industries for conducting surveys, sensibility studies, relief and subsidy schemes. ▶ Registration of exporters for scheduled products. ▶ Adapting standards and specifications for the purpose of export of scheduled products. ▶ Carrying out inspection of meat and meat products for ensuring the quality of such products. ▶ Improving the packaging of the scheduled products. ▶ Promotion of export oriented production and development of scheduled products. ▶ Collection and publication of statistics for improving marketing of scheduled products. ▶ Training in the various aspects of industries related to the scheduled products.
<p>5. National Co-operative Development Corporation (NCDC), 4, Siri Institutional Area, New Delhi-110016 website: www.ncdc.nic.in</p>	<ul style="list-style-type: none"> ▶ Planning, promoting and financing programmes for production, processing, marketing, storage, export and import of agricultural produce. ▶ Financial support to primary, regional, State and National level co-operative marketing societies is provided towards; ▶ Margin money and working capital finance to augment business operations of agricultural produce. ▶ Strengthening the share capital base and ▶ Iii) Purchase of transport vehicles.
<p>6. Director General of Foreign Trade, (DGFT), Udyog Bhavan, New</p>	<ul style="list-style-type: none"> ▶ Provides guidelines / procedure of export and import of various commodities.

<p>Delhi. Website: www.nic.in/eximpol</p>	<ul style="list-style-type: none"> ▶ Allot import-export code number (IEC No) to the exporter of agricultural commodities.
<p>7.State Agricultural Marketing Boards (SAMBs),</p>	<ul style="list-style-type: none"> ▶ Implementation of the regulation of marketing in the state. ▶ Provide infra-structural facilities for the marketing of notified agricultural produce. ▶ Provide grading of agricultural produce in the markets. ▶ To co-ordinate all the market committees for information services. ▶ Provide aid to financially weak or needy market committees in the form of loans and grants. ▶ Eliminate malpractices in the marketing system. ▶ Arrange or organise seminars, workshops or exhibitions on subjects relating to agricultural marketing and farmers training programme on various aspects of agricultural marketing. ▶ Some of the SAMBs are also promoting agro-business.

9.0 UTILIZATION

9.1 Processing :

In India, maize is cultivated for various purposes like baby corn as vegetable and salad, green tender cobs for table purpose, pop-corn for snacks and other preparations, sweet corn for various recipes, starch preparation and corn oil, corn flour, corn flakes, cattle feed etc.

Processing depends upon the ultimate use. The maize (corn) which is sold as baby corn, sweet corn or as cobs for table purpose need no processing.

Quality protein maize is converted by the process of grinding, alkali processing, boiling, cooking and fermentation, into various products like baby food, health food (Beverages), nutraceuticals (nutritious food), special foods and emergency foods etc.

The flour mills convert the maize into corn flour and other products. Corn flakes are also prepared.

Various types of feeds are prepared from maize. They are

- i) Poultry feed
- ii) Cattle feed
- iii) Pig feed
- iv) Fish feed

Corn oil is obtained from the type of high oil corn. It is not an isolated event in any corn based refinery. Thus the process of oil extraction goes along with other processes like production of starch, corn sweeteners etc.



9.2 Uses:

Maize (corn) in India is used as for preparation of Bread (Roti), dalia (Soji), and other preparations. Starch is the major product which is derived for manufacture of glucose.



Baby corn : Baby corn is a popular vegetable. The demand for baby corn is rapidly increasing in urban areas in India. Baby corn is not a separate type of corn like sweet corn or pop corn and any type of corn can be used as baby corn. The shank with unpollinated silk is a baby corn. It can be effectively used as both a nutritious vegetable, salad and as an export crop to earn valuable foreign exchange. After harvest, the young plants can be used as fodder for cattle.

Quality protein maize: It is used for manufacturing I) Baby food, ii) Health food, iii) Beverage, iv) Nutritious for diet v) Special diet, vi) Protein rich food to remove mal nutrition, vii) poultry feed, viii) Cattle feed, ix) Pig feed and x) Fish feed.

Sweet corn : Various types of recipies and preparations are derived from sweet corn.

- i) Thai basil and sweet corn
- ii) Sauteed Green Beans with shallots and sweet corn.
- iii) Organic speedchef-pizza with with Garlicky Greens and sweet corn
- iv) Sweet Corn Cake.
- v) High Summer scallops with sweet corn and couscous
- vi) Sweet corn and tomato salad .

Popcorn:

- i) Popcorn is consumed as snacks with salt and selected spices
- ii) Apple pop corn brittle can be prepared with popped popcorn, apple juice, cinnamon flavoured cereal, peanuts etc.
- iii) Ball park pop corn crunch.
- iv) Beach party pop corn.
- v) Boston Tea Party pop corn
- vi) Caramel corn crunch.
- vii) Caramel-Nut Pop corn crunch.
- viii) Cherry -Almond Pop corn clusters
- ix) Chili corn
- x) Red Cinnamon Pop Corn.
- xi) Swiss – onion pop corn
- xii) Pina Colada Pop Corn, etc.

High Quality Corn :

Oil is extracted from type of High Oil Corn. Corn oil is used as Salad oil, cooking oil and in margarine. Main reason for higher acceptance of corn oil over other vegetable oils like soybean oil, cottonseed oil etc. is due to its flavour and stability during storage and cooking, without addition of synthetic antioxidants. Another reason for popularity of corn oil is its high content of unsaturated fatty acids, which reduces blood cholesterol levels.

10.0 DOS AND DON'TS

DOS	DON'TS
<ul style="list-style-type: none"> ✓ Harvest maize crop when husk has turned yellow and grains are dry enough having less than 30 percent moisture. 	<ul style="list-style-type: none"> ✗ Delay harvesting, or wait for stalks and leaves to dry because they remain green in most of the varieties
<ul style="list-style-type: none"> ✓ Harvest during conducive weather condition. 	<ul style="list-style-type: none"> ✗ Harvest during adverse weather condition as it will result in bad quality kernels and loss.
<ul style="list-style-type: none"> ✓ Remove the husk from the cobs and then dry them in sun for seven to eight days. 	<ul style="list-style-type: none"> ✗ Dry the cobs while husk is on.
<ul style="list-style-type: none"> ✓ Threshing and winnowing on cemented (pucca) floor. 	<ul style="list-style-type: none"> ✗ Perform threshing and winnowing on kucha floor, as it results in contamination of foreign matter and loss.
<ul style="list-style-type: none"> ✓ Market maize after grading to get higher return. 	<ul style="list-style-type: none"> ✗ Sell maize without grading, which fetches lower price.
<ul style="list-style-type: none"> ✓ Get the market information from www.agmarknet.nic.in and other available websites, newspapers, T.V., concerned APMC offices etc before marketing the produce. 	<ul style="list-style-type: none"> ✗ Market the produce without collecting information regarding price trend etc.
<ul style="list-style-type: none"> ✓ Avail the facility of future trading and forward contracts to avoid price risk. 	<ul style="list-style-type: none"> ✗ Sell the produce in glut situation.
<ul style="list-style-type: none"> ✓ Take the benefit of contract farming to ensure better price and ready market. 	<ul style="list-style-type: none"> ✗ Produce maize without assessing it's production, demand and price etc.
<ul style="list-style-type: none"> ✓ Use improved post harvest technology and processing techniques to avoid losses 	<ul style="list-style-type: none"> ✗ Use traditional and conventional techniques in post harvest operations and in processing as it cause quantitative and qualitative losses.
<ul style="list-style-type: none"> ✓ Store the maize when the prices are not favourable . 	<ul style="list-style-type: none"> ✗ Sell the produce when prices are not favourable.
<ul style="list-style-type: none"> ✓ Avail the facility of GRAMIN BHANDARAN YOJNA (Rural Godown Scheme) and store the maize in scientific way to avoid losses. 	<ul style="list-style-type: none"> ✗ Store maize in un-scientific way as it will result in growth of fungi and contamination of aflotoxins.

<ul style="list-style-type: none"> ✓ Select the cheapest and convenient mode of transportation. ✓ Select the shortest and efficient marketing channel to get higher share in consumer's price. ✓ Package properly to protect the quality and quantity of produce during transit and storage. ✓ Use bags for transporting maize to minimize losses. ✓ Avail the facility of price support scheme during glut situation. ✓ Follow the procedure of sanitary and phyto-sanitary measures during export. 	<ul style="list-style-type: none"> ✗ Select any mode of transport, which causes losses. ✗ Select the channel that results in less share of producer in consumer's price. ✗ Use improper package which causes losses during transit and storage. ✗ Transport maize in bulk which causes more losses. ✗ Sell maize to village merchants or itinerant traders during glut situation ✗ Export without sanitary and phyto-sanitary measures and face rejection.
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