

POST HARVEST PROFILE OF BANANA: 2015



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P R E F A C E

Banana (*Musa sapientum*) is an important fruit crop in India. Bananas are grown in more than 150 countries, producing 105 million tonnes of fruit per year. The global production of banana is around 102028.17 thousand tons of which India contributes 29.19%. Main banana growing states are Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh and Karnataka.

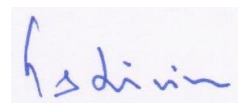
The Inter-Ministerial Task Force on Agricultural Marketing Reforms (May, 2002), suggested several measures for strengthening agricultural marketing system in the country for benefiting the farming community to enhance the share of farmers in the ultimate price of their produce as well as for various market functionaries in the new liberalized global market opportunities and to foster true competition among the market players. This profile has been prepared on the recommendation of the Inter-Ministerial Task Force with a view to enable the farming community to scientifically manage the post-harvest operations and to widening awareness for better marketing of the bananas. The profile covers almost all aspects of the marketing, such as post-harvest management, marketing practices, quality standards, grading, packaging, transportation, storage, SPS requirements, marketing problems, marketing information, etc.

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The Government of India should not be regarded as assuming responsibility for any of the statements contained in this profile.

Faridabad
Dated: 21.5.2015



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CHAPTER – I:

INTRODUCTION



Banana is the most popular fresh fruit all over the world and its name comes from the Arabic word 'banan', which means finger. The scientific name of Banana is *Musa acuminata* and *Musa balbisiana*. But the old scientific names of banana are *Musa sapientum* and *Musa paradisiacal*. Bananas are rich source carbohydrates and potassium. These are the first choice of athletes owing to its high energy potential.

Banana is a large perennial herb with leaf sheaths that form the trunk like pseudostem. Banana was first domesticated in the tropical regions of South East Asia. Banana is a nutritious gold mine. Its high Vitamin B6 content helps fight infection and is essential for the synthesis of 'heme', the iron containing pigment of hemoglobin. The fruit is also rich in potassium and a great source of fibre too. In recent years, considering the adverse impact of indiscriminate use of chemicals, new trend of organic banana production has been adopted worldwide. A novel name, i.e. "*Green Foods*" for this has been coined.

Buddhist texts of 600 BC for the first time in history mentioned banana as a highly nutritive food. Their chronicles describe a beverage made from banana which the monks were allowed to drink. Travelogues of 327 BC mention that Alexander the Great discovered the taste of banana in the valleys of India. In the year 200 AD, China had an organized banana plantation. Islamic conquerors brought banana to Palestine in 650 AD. The Arab merchants succeeded in spreading banana cultivation all over Africa. In 1502 AD, colonists started the first banana plantation in the Caribbean and in Central America. Thus banana consumption had been in vogue for thousands of years. Also, it is interwoven with national heritage and culture. It is one of the oldest fruits known to mankind. Banana is one of the world's most important food crops. In India, banana crop accounts for 2.8 per cent of agricultural GDP. It is an important crop for subsistence farmers, and ensures year-round security for food or income.

Bananas were redistributed and rediscovered for a second time around the Indian Ocean by the wave of Islam. Referenced in Islamic literature in the 11th century BCE, Muslim merchants traded banana along trade routes to and from various places in South Asia and the Middle East. By the 1200s, banana reached North Africa and Moorish-controlled Spain. It is also likely that Islamists carried banana from eastern to western Africa.

A third wave of banana diffusion occurred in both Asia and in Europe. By the 1200s,

Japanese cultivators harvested specific banana varieties for their fibers, to forge into textiles for clothes and other fabrics.

In Europe, the Moorish invasions had likely brought the banana for the first time into the continent. By the 15th and 16th century, Portuguese sailors were establishing the crop throughout Brazil, where it likely spread to the sugar plantation economies of the New World and the Caribbean.

Table No.1.1: Chemical Composition

<i>Ingredient</i>	<i>Percent</i>	<i>Ingredient</i>	<i>Percent</i>	<i>Ingredient</i>	<i>Percent</i>
Moisture contents	75	Histidine	11	Isoleucine	3
Sugar	12	Leucine	7	Proline	3
Glucose	48	Lysine	5	Tryptophane	1
Fructose	40	Phynalylaline	4	Custine	1
Maltose	Less than 1	Arginine	4	Tyrosine	1
Starch	5	Valine	4	Methionine	1
Fibre E 460	3	Alanine	4	Fatty Acid	1
Amino Acid	3	Sarine	4	Ash	6
Glutamic Acid	19	Glycine	3		
Aspartic Acid	16	Threonine	3		

Source: International Journal of Tropical Medicine and Public Health

1.1 ECONOMICAL IMPORTANCE:

Banana is a very popular fruit due to its low price and high nutritive value. It is consumed both in fresh and cooked form both as ripe and raw fruit.

Banana is a rich source of carbohydrate and is rich in vitamins particularly vitamin B. It is also a good source of potassium, phosphorus, calcium and magnesium. The fruit is easy to digest, free from fat and cholesterol. Banana powder is used as the first baby food. It helps in reducing the risk of heart diseases when used regularly and is recommended for patients suffering from high blood pressure, arthritis, ulcer, gastroenteritis and kidney disorders.

Processed products, such as chips, banana puree, jam, jelly, juice, wine and halwa can be made from the fruit. The tender stem, which bears the inflorescence is extracted by removing the leaf sheaths of the harvested pseudostem and used as vegetable. Plantains or cooking bananas are rich in starch and have a chemical composition similar to that of potato.

Banana fibre is used to make items like bags, pots and wall hangers. Rope and good quality paper can be prepared from banana waste. Banana leaves are used as healthy and hygienic eating plates

1.2 PLANT DESCRIPTION:

Banana plant can be found very easily in one's yard or gardens as they are very easy to cultivate and it is the largest herbaceous flowering plant. It can grow up to 6 to 6.7 meters (20 to 24.9 ft) tall and its leaves can grow up to 2.7 meters (8.9 ft) long and 60 cm (2.0 ft) wide.

The banana plant is a large perennial herb with leaf sheaths that form trunk-like pseudostems. The plant has 8 - 12 leaves that are up to 9 ft long and 2 ft wide. Root development may be extensive in loose soil in some cases up to 30 ft laterally. Other plant descriptions vary, it depends on the variety. Flower development gets initiated from the true stem underground (corm) 9 - 12 months after planting. The inflorescence (flower stalk) grows through the center of the pseudostem. Flowers develop in clusters and spiral around the main axis. In most cultivars, the female flowers are followed by a few "hands" of neuter flowers that have aborted ovaries and stamens. The neuter flowers are followed at the terminal ends by male flowers enclosed in bracts. The male flowers have functional stamens but aborted ovaries.

Fruits mature in about 60 - 90 days after flowers first appear. Each bunch of fruits consists of variable numbers of "hands" along a central stem. Each "hand" consists of two transverse rows of fruits ("fingers").

The fruit quality is determined by size (finger length and thickness), evenness of ripening, freedom from blemishes and defects, and the arrangement of the clusters. Quality standards may differ in various markets.

1.3 NUTRITIONAL VALUE:

Bananas are one of the FDA's top twenty fruits. An excellent source of vitamin A, vitamin C, vitamin B-6, and potassium, they provide fiber, are low in fat, cholesterol-free and low in sodium. A regular sized banana has about 95 calories. Some medications for controlling blood pressure deplete the body's storage of potassium. One banana eaten each day restores the balance of potassium. Recognized as an important part of the diet and to lower the chances of cancer, at least five servings daily of either fruits or vegetables are recommended. A recent study found that eating nine or ten daily servings of fruits and vegetables, combined with three servings of low-fat dairy products, were effective in lowering blood pressure.

CHAPTER – II:

AREA AND PRODUCTION

2.1 WORLD SCENARIO:

2.1.1 Area, Production and Productivity:

Banana plants reproduce asexually by shooting suckers from a subterranean stem. The shoots have a vigorous growth and can produce a ready-for-harvest bunch in less than one year. Suckers continue to emerge from a single mat year after year, making banana a perennial crop.

Banana is a perennial crop that grows quickly and can be harvested all year round. During 2012-13, the world acreage of banana was 5007520 hectares, while the world production 103632349 Metric Tones and productivity was 20.7 Metric Tone/Hectare. The country-wise area, production and productivity under Banana is given in table no 2.1.

Table No.2.1

MAJOR BANANA PRODUCING COUNTRIES IN THE WORLD (2012-13)

Country	Area in Hect.	Production in MT	Productivity MT/HA
	775995 (15.50)	26509096 (25.58)	34.2
China	400000 (7.99)	10550000 (10.18)	26.4
Philippines	454179 (9.07)	9225998 (8.90)	20.3
Ecuador	210894 (4.21)	7012244 (6.77)	33.3
Brazil	481116 (9.61)	6902184 (6.66)	14.3
Indonesia	105000 (2.10)	6189052 (5.97)	58.9
Angola	115749 (2.31)	2991454 (2.89)	25.8
Guatemala	66000 (1.32)	2700000 (2.61)	40.9
Tanzania	442190 (8.83)	2524740 (2.44)	5.7
Mexico	72617 (1.45)	2203861 (2.13)	30.3
Others	1883780 (37.61)	26823720 (25.87)	14.2
World (Total)	5007520	103632349	20.7

Figures in parenthesis are percentage to the total
Source: NHB

Fig No. 2.1 :Country-wise Area Under Banana production

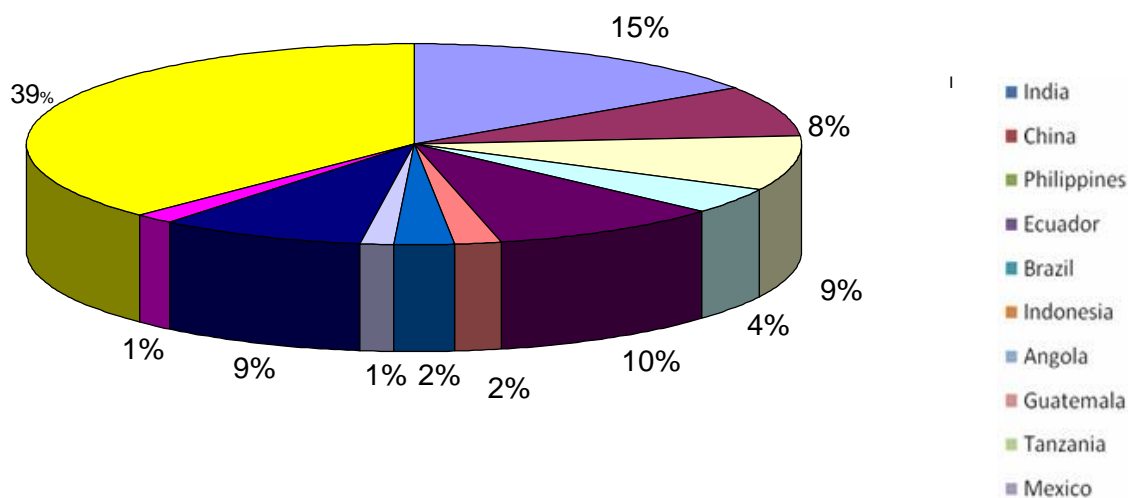
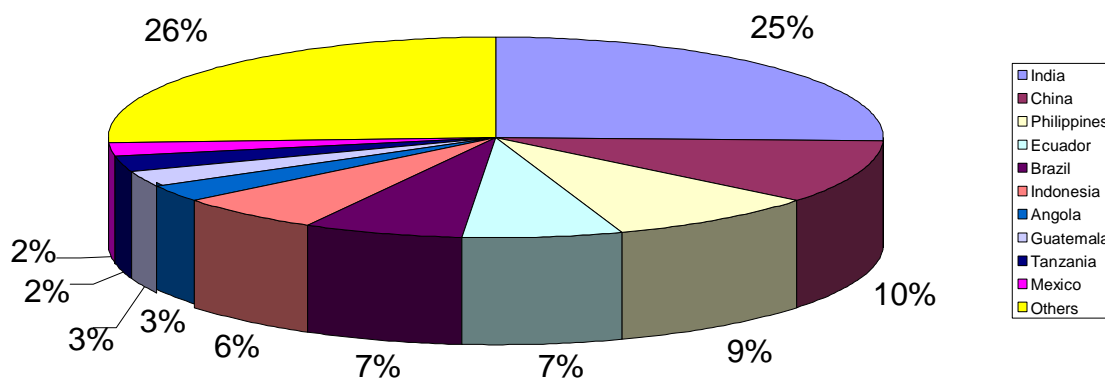


Fig No. 2.2: Country-wise Production under Banana production



From the table no. 2.1 it may be seen that area under Banana was maximum in India i.e., 775995 hectares (15.50 %), followed by Philippines i.e., 454179 hectares (9.07%), Brazil 481116 hectares (9.61%), Tanzania 442190 hectares (8.83%) and China 400000 hectares (7.99%). These five countries cover 51 percentage of the world acreage under Banana.

In case of production under Banana, it was also maximum in India i.e., 26509096 Metric Tones (25.58%), followed by China 10550000 Metric Tones (10.18%), Philippines 9225998 Metric Tones (8.90) and Ecuador 7012244 Metric Tones (6.77). These four countries produce more than 51 percent of world production of Banana.

The productivity of Banana is maximum in Indonesia i.e., 58.9 MT/Ha., followed by Guatemala 40.9 MT/Ha., India 34.2 MT/Ha, China 26.4 MT/Ha.

2.2 NATIONAL SCENARIO :

2.2.1 Major producing states in India:

Maharashtra, Tamil Nadu, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, and Assam are main Banana producing states in India.

The important state-wise information along with important districts where Banana is produced, is given in table no 2.2 below.

Table No 2.2: Important Banana Producing States and Districts

Sl.No.	State	Districts
1	Maharashtra	Jaigaon, Dhule, Buldhana
2	Tamil Nadu	Thiruchirapalli, Coimbatore, Pudukottai, North Arcot, Ambedkar, Theni, Periyar, Karur, Dindigul Anna, Thanjavur, Nammakal, Madurai
3	Gujarat	Surat, Anand, Bharuch, Narmada, Vadodara
4	Madhya Pradesh	Khandwa, Badwani, Khargone, Dhar
5	Andhra Pradesh	Cudappa, Guntur, East Godavari, West Godavari, Vijayanagram, Vishakhapatnam, Karnool, Krishna, Prakasham.
6	Karnataka	Shimoga, Dakshin Kannada, Tumkur, Bangalore, Udupi, Uttara Kannada, Belgaum, Chickmangalur, Hassan, Mandya.
7	Assam	Barpeta, Kamrup, Nalbari. Nagaon, Sonitpur.
8	West Bengal	Nadia, North 24 Pragana, Hoogly, Murshidabad, Jalpaiguri, and Midnapur

2.2.1.1. Year-wise Area, Production and Productivity:

The year-wise trend of area, production and production in India is given in Table No.2.3.

Table No 2.3
Area, Production and Productivity of Banana (India)

YEAR	AREA(in 000 hectare)	PRODUCTION (in 000 MT)	PRODUCTIVITY(In MT/Hect.)
1991-92	383.9	7790.0	20.3
2001-02	466.2	14209.9	30.5
2002-03	475.3	13304.4	28.0
2003-04	498.6	13856.6	27.8
2004-05	589.6	16744.5	28.4
2005-06	569.5	18887.8	33.2
2006-07	604.0	20998.0	34.8
2007-08	658.0	23823.0	36.2
2008-09	709.0	26217.0	37.0
2009-10	770.3	26469.5	34.4
2010-11	830.0	29780.0	35.7
2011-12	796.5	27140.0	34.1
2012-13	776.0	26509.1	34.2

Source : NHB

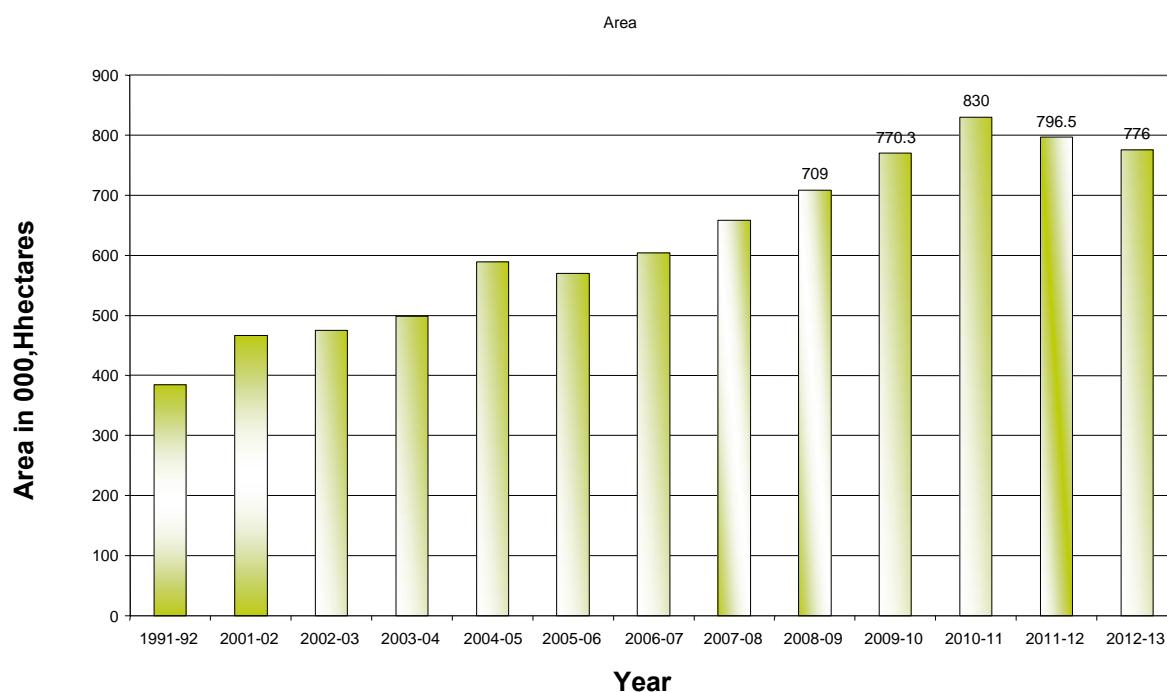


Fig No. 2.3 :Bar Graph showing year-wise area under Banana production in the country

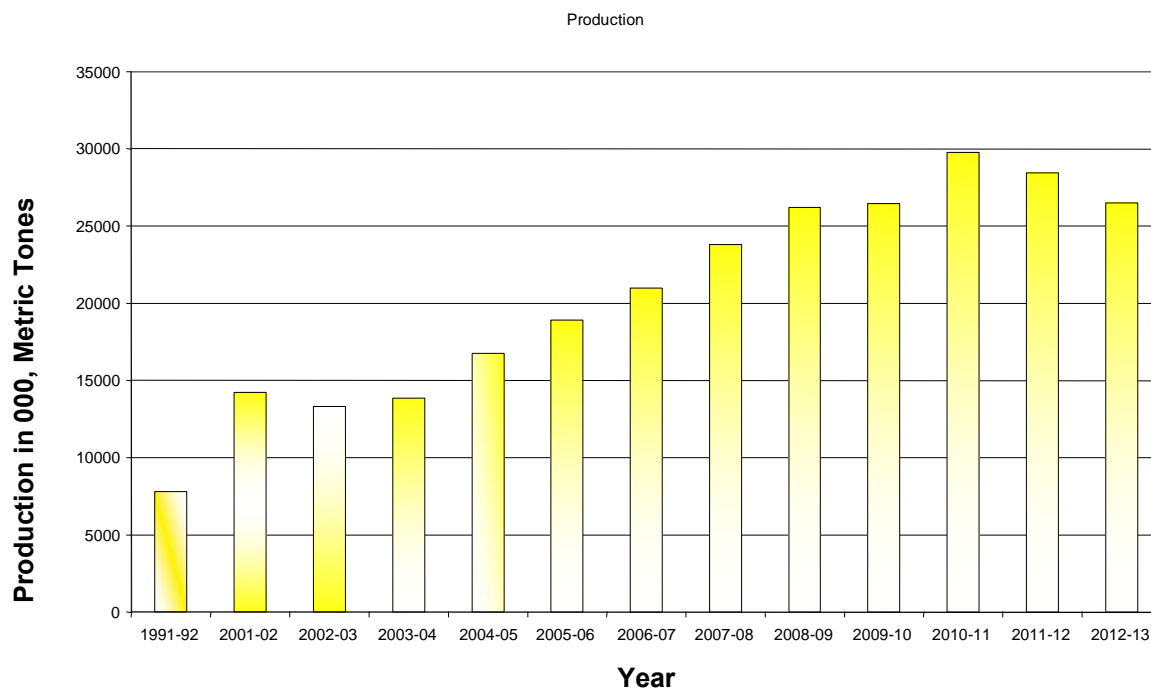


Fig No. 2.4: Bar Graph showing year-wise Banana production in the country

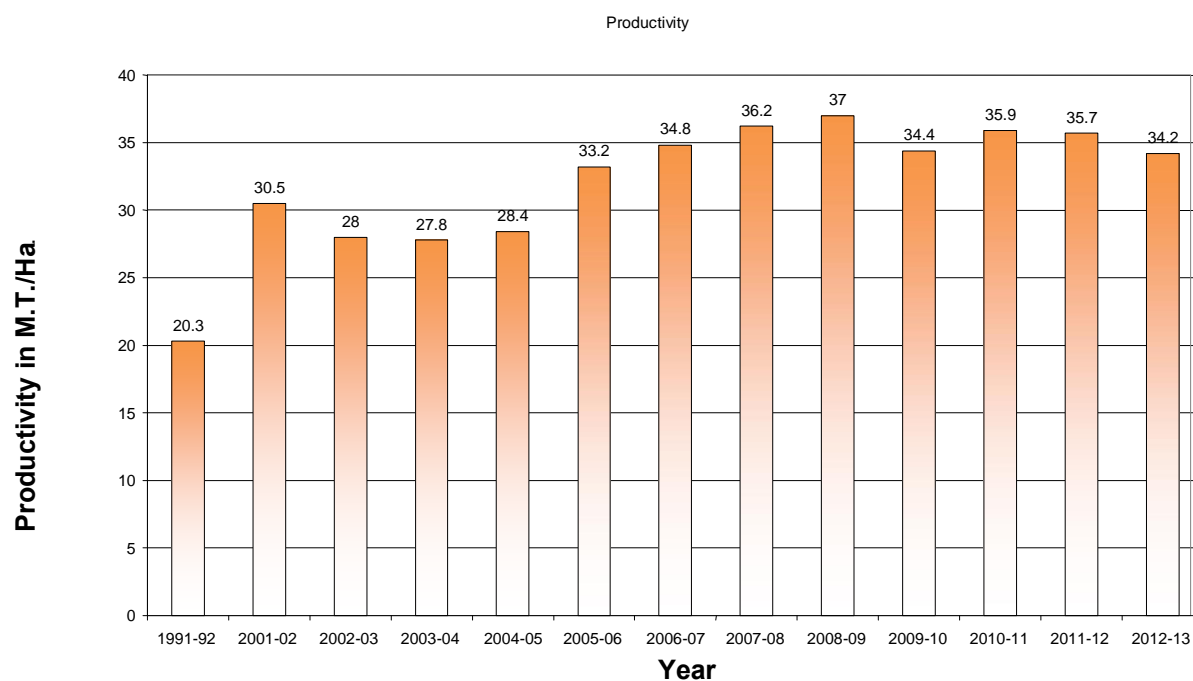


Fig No. 2.5 : Bar Graph showing year-wise Banana productivity in the country

2.2.2.2 State-wise Area, Production and Productivity:

AREA:

Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu and West Bengal are the main Banana producing states in India. Total area under Banana during 2010-11, 2011-12 and 2012-13 was 830.50 thousand hectares, 796.50 thousand hectares and 776.00 thousand hectares respectively. During 2012-13, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra and Gujarat covered more than 58 percent of the area under Banana.

The state-wise area under Banana for the years is given in Table No.2.4

Table No2.4

Table Showing the Area under Banana for the years 2010-11 to 2012-13

Area in '000 HA,

States	2010-11		2011-12		2012-13	
	Area	% to total	Area	% to total	Area	% to total
Tamil Nadu	125.4	15.1	130.4	16.37	111.36	14.35
Karnataka	111.8	13.46	91.6	11.50	97.40	12.55
Andhra Pradesh	79.3	9.55	82.8	10.40	92.65	11.94
Maharashtra	82.0	9.87	82.00	10.30	82.0	10.57
Gujarat	64.7	7.79	65.0	8.16	70.58	9.10
Assam	47.6	5.73	49.1	6.16	51.51	6.64
Bihar	31.9	3.84	32.1	4.03	33.06	4.26
West Bengal	42.0	5.06	43.7	5.49	44.70	5.76
Odisha	26.9	3.24	27.5	3.45	27.49	3.54
Madhya Pradesh	38.1	4.59	24.8	3.11	25.76	3.32
Others	180.9	21.77	167.5	21.03	139.49	17.97
TOTAL	830.0	100.00	796.5	100.00	776.0	100.00

Source: NHB

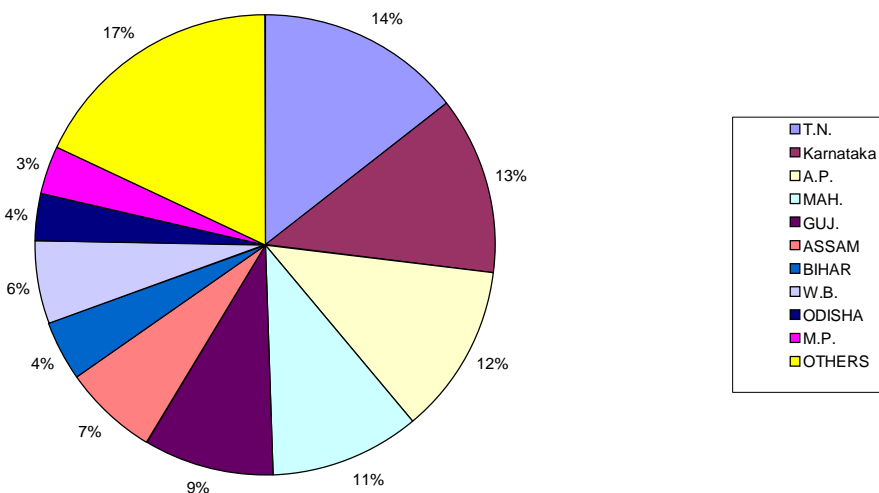


Fig No. 2.6 : Pie diagram showing area under Banana 2012-13

PRODUCTION:

The state-wise production under Banana for the years 2010-11, 2011-12 and 2012-2013 is given in Table No.2.5.

Table No. 2.5: Table Showing Production of Banana for the years 2010-11 to 2012-13

States	2010-11		2011-12		2012-13	
	Production ('000 MT)	% to total	Production	% to total	Production	% to total
Tamil Nadu	8253.0	27.71	6736.4	23.67	5136.20	19.38
Gujarat	3978.0	13.36	4047.8	14.23	4523.49	17.06
Maharashtra	4303.0	14.45	4315.0	15.16	3600.00	13.58
Andhra Pradesh	2774.8	9.32	82.8	10.19	3242.80	12.23
Karnataka	2281.6	7.66	2351.5	8.26	2529.60	9.54
Bihar	1517.1	5.09	1580.5	5.55	1702.41	6.42
Madhya Pradesh	1719.6	5.77	1379.2	4.85	1701.00	6.42
West Bengal	1010.1	3.39	1054.0	3.70	1077.80	4.07
Assam	723.6	2.43	745.3	2.62	837.02	3.16
Odisha	488.7	1.64	506.2	1.78	521.31	1.97
Others	2730.5	9.18	2839.5	9.99	1637.47	6.17
TOTAL	29779.9	100.00	28455.1	100.00	26509.1	100.00

Source: NHB

From the Table No.2.5 , it may be seen that during 2012-13, the production Banana was the highest in Tamil Nadu i.e., 5136.20 thousand tones (19.38%), followed by Gujarat 4523.49 thousand tones (12.23%), Karnataka 2529.60 thousand tones (9.54%), Bihar 1702.41 thousand tones (6.42%) and Madhya Pradesh 1701.00 thousand tones (6.42%). Total production of Banana in these five states was more than 84 percent.

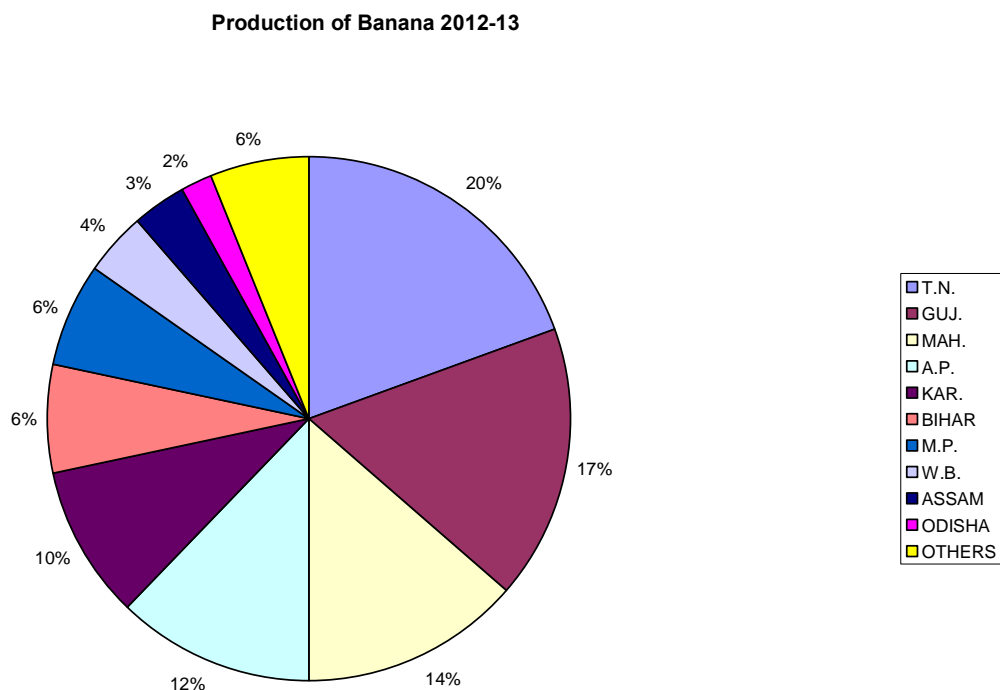


Fig No. 2.7 : Pie diagram showing Production of Banana in different states of India
In the year 2012-13

PRODUCTIVITY:

During 2012-13, the all India average of the productivity of Banana was 34.2 tonnes / hectare. States, having productivity more than national average were Madhya Pradesh i.e., 66.0 tones/hectare, which was found highest, followed by Gujarat 64.1 tones/hectare and Bihar 51.5 tones/hectare, Tamil Nadu 46.1 tones/hectare, Maharashtra 43.9 tones/hectare and Andhra Pradesh 35.0 tones/hectare.

The state-wise productivity of Banana, during 2010-11 to 2012-13 is as follows:-

Table No.2.6

Table Showing productivity of Banana during 2010-11 to 2012-13

Productivity = MT/HA

States	2010-11	2011-12	2012-13
Tamil Nadu	65.8	51.7	46.1
Gujarat	61.5	62.3	64.1
Maharashtra	52.5	52.6	43.9
Andhra Pradesh	35.0	2899.6	35.0
Karnataka	20.4	25.7	26.0
Bihar	47.6	49.2	51.5
Madhya Pradesh	45.2	55.6	66.0
West Bengal	24.0	24.1	24.1
Assam	15.2	15.2	16.2
Odisha	18.2	18.4	19.0
OTHERS	15.1	17.0	11.7
TOTAL	35.9	35.7	34.2

Source: NHB

2.3 VARIETY:

Commercially, bananas are classified as dessert types and culinary types. The culinary types have starchy fruits and are used in the mature unripe form as vegetables. Important cultivars include Dwarf Cavendish, Robusta, Monthan, Poovan, Nendran, Red banana, Nyali, Safed Velchi, Basrai, Ardhapuri, Rasthali, Karpurvalli, Karthali and Grand Naine etc.

Grand Naine, an imported variety from Israel is gaining popularity and may soon become the most preferred variety due to its tolerance to abiotic stresses and good quality bunches. Fruit develops attractive uniform yellow colour with better shelf life & quality than other cultivars.

The state-wise and variety-wise information of Banana is given in Table No.2.7.

Table No 2.7

Table Showing State-wise, Variety-wise Information.

State	Varieties grown
Andhra Pradesh	Dwarf Cavendish, Robusta, Rasthali, Amritpant, Thellachakrakeli, Karpooora Poovan, Chakrakeli, Monthan and Yenagu Bontha
Assam	Jahaji (Dwarf Cavendish), Chini Champa, Malbhog, Borjahaji (Robusta), Honda, Manjahaji, Chinia (Manohar), Kanchkol, Bhimkol, Jatikol, Digjowa, Kulpait, Bharat Moni
Bihar	Dwarf Cavendish, Alpon, Chinia , Chini Champa, Malbhig, Muthia, Kothia , Gauria
Gujarat	Dwarf Cavendish, Lacatan, Harichal (Lokhandi), Gandeви Selection, Basrai, Robusta, G-9, Harichal, Shrimati
Jharkhand	Basrai, Singapuri
Karnataka	Dwarf Cavendish, Robusta, Rasthali, Poovan, Monthan, Elakkibale
Kerala	Nendran (Plantain), Palayankodan (Poovan), Rasthali, Monthan, Red Banana, Robusta
Madhya Pradesh	Basrai
Maharashtra	Dwarf Cavendish, Basrai, Robusta, Lal Velchi, Safed Velchi, Rajeli Nendran, Grand Naine, Shreemanti, Red Banana
Odisha	Dwarf Cavendish, Robusta, Champa, Patkapura (Rasthali)
Tamil Nadu	Robusta, Rasthali, Poovan, Nendra, Red Banana, Ney Poovan, Monthan, Karpuavalli, Matti, Moris, Peyan and Hill Banana
West Bengal	Champa, Mortman , Dwarf Cavendish, Giant Governor, Kanthali, Singapuri, Amrut Sagar and Lacatan

2.3.1. Description of Commercial Banana Varieties:

The varietal characteristics of commercially grown Banana are given below :

Variety	Characteristics
Grand Naine	It is the popular international variety. It is a tall statured plant and a heavy yielder with long cylindrical bunch. On an average it produces a bunch weighing 25 kg and may go up to 32-35 kg, with 8-10 hands with 200-220 fruits/bunch. The length of the fruit is 15-21 cm and girth is 12-13 cm.
Robusta	It is normal statured with black brown blotches on the stem, bunches weigh around 20 kg having 8-10 hands/bunch. The length of the fruit is in the range of 15-20 cm and girth is about 12 cm with thick fruit skin.
Dwarf Cavendish	The plant stature is dwarf. Dark black brown blotches appear all along the stem. Bunches are large with compactly arranged 8-10 hands weighing about 20kg. Length of fruit is about 13-14 cm and girth is about 8-10 cm. Skin is thick and the fruit gradually tapers towards the tip. It is not fit for export.
Red Banana	The plant is tall and robust statured. The colour of the fruit, pseudostem, petiole and midrib is purplish red. The bunch weight is around 20-25 kg with 6-7 hands and 80 fruits/bunch. The length of the fruit is around 16-18 cm.
Nendran	There is a considerable diversity in plant stature. Bunch has 5-6 hands weighing about 6-12 kg. Fruits have a distinct neck with thick green skin turning buff yellow on ripening. Fruits remain starchy even on ripening.

CHAPTER – III:

POST HARVEST MANAGEMENT

Post harvest management is the technology of handling an agricultural produce after harvesting to prolong its shelf life, freshness and retain its attractive appearance. Nearly, 20-25 per cent of fruits are wasted due to inadequate Post-harvest management during harvesting, packaging, storage, grading and transportation etc. Proper scientific methods of post-harvest management can minimize losses. Besides post-harvest management, suitable pre-harvest steps such as use of proper harvesting tools and assessment of maturity also improve the shelf life of the fruits and reduce the post-harvest losses to a great extent.

3.1. PRE-HARVEST FACTORS INFLUENCING THE POST-HARVEST MANAGEMENT:

Once the fruits are harvested, the overall quality of fresh fruits can hardly be improved. The final market value of the produce depends on the grower's ability to apply best available pre-harvest technology followed by subsequent harvesting and then use of efficient post-harvest technology.

The pre-harvest technology, like use of fertilizers, pest control, growth regulators, climatic conditions like wet and windy weather and tree conditions, influences the fruit potentiality for storage by modifying physiology, chemical composition and morphology of fruits.

3.1.1 Maturity Indices

Plantain requires about three months from the beginning of flowering till harvest. Multiple fruits are produced on a large bunch, weighing between 50-200kg (Ogazi, 1996). Within the bunch are clusters of double rows of fruit called “hands” and individual fruit called “fingers”. (Ogazi, 1996).

Maturity standards for plantains are less precise than they are for bananas. Several different external and internal fruit characteristics can be used to determine plantain maturity. These include fruit diameter, age of the bunch, angularity of the fruit, length of the fruit, and peel color (Johnson et al., 1998). The stage of maturity for harvest depends on the intended market destination (Johnson et al., 1998). Locally marketed plantains can be harvested at a more advanced maturity stage compared to the fruits which are to be exported. Fruits which are meant for export should be harvested the day before or the same day of shipment (Ogazi, 1996). Plantain maturity is related to the diameter of the fingers. This is determined by measuring the diameter of the fruit at its midpoint with a pair of calipers (Ogazi, 1996). Another method for estimating plantain maturity is to record the age of the bunch. The time from when the fruit bunch first becomes visible (Shooting) is recorded. Bunches can be tagged with different colored ribbons at the time of shooting, and subsequently harvested after the appropriate time for the particular cultivar, based on the season of the year and experience of the cultivator. (Johnson et al., 1998). The colour of the ribbons is changed weekly to coincide with the time of shooting and subsequently the age of the bunch. Plantain require

about three months from the beginning of flowering until harvest. Multiple fruits are produced on a large bunch, weighing between 50-200kg (Ogazi, 1996). Within the bunch are clusters of double rows of fruit called “hands” and individual fruit called “fingers”. (Ogazi, 1996).

A fourth way of estimating plantain bunch maturity is to measure the length of the edible pulp portion of the fruit from the fingers in the middle hand. The length should be a minimum of 15cm for the domestic market and 18cm for the export market (Johnson et al., 1998). Finally, peel colour is another frequently used method of assessing fruit maturity. The peel remains green throughout growth and development of the fruit until it reaches physiological maturity. It then changes to a yellow colour during ripening. However, plantain fruit should be harvested when the peel is green in colour to withstand the rigors of handling and distribution. Internal fruit composition changes dramatically during plantain fruit ripening. At physiological maturity, the fruit is fully developed in size, green in peel colour, and at its highest level of starch. The starch will progressively be converted to sugar as ripening progresses. The stage of harvest maturity of plantains will depend on the target market.

Plantains for local market are harvested at a more advanced stage of maturity than those for exportation. However, if the fruit is too mature at harvest, particularly following irrigation or rainfall, fruit splitting can occur during handling. Also, mature fruit may ripen prematurely during transport or storage

3.1.2 Harvesting:

Only top quality fruit gets the best returns. Rough handling during harvest will result in bruised and damaged fruit. Many of these marks will not show until the fruit is ripened. Fruit should be harvested early in the day in the summer to avoid handling fruit when it is too hot. In winter fruit that is too cold in the morning may bruise more easily, so one should not start harvesting too early in the morning in the middle of the winter.

The crop gets ready for harvest after 11-12 months of planting. Banana should be harvested when the fruit is slightly or fully mature depending on the market preferences. For long distance transportation, harvesting is done at 75-80 % maturity. The fruit is climacteric and can reach consumption stage after ripening operation.

Bunches attain maturity from 90-150 days after flowering depending upon variety, soil, weather condition and elevation. Bunch should be harvested when fingers of second hand from top are 3/4 rounded with the help of sharp sickle 30cm above the first hand. Harvest may be delayed upto 100-110 days after opening the first hand. Harvested bunch should generally be collected in well padded tray or basket and brought to the collection site.

Bunches should be kept out of light after harvest, since this hastens ripening and softening. For local consumption, hands are often left on stalks and sold to retailers.

The dwarf varieties are ready for harvesting within 11 to 14 months after planting while the tall varieties take about 14 to 16 months. After harvest of bunch, only leaves are to be cut and plant system is retained for ratoon crop development. This improves the food supply and about 15 % can be saved on irrigation.

3.1.2.1 Harvesting Technique:

- ➔ Nick the stem about $\frac{2}{3}$ up with knife.
- ➔ The stem should then bend over ready for harvest without snapping, but be wary as some stools may be brittle and snap.
- ➔ A shoulder pad is needed to reduce damage to the fruit – cut the bunch directly onto the shoulder. Do not allow the bunch to be placed on ground.
- ➔ Use vehicle with good clean padding on the frame, and have extra padding to go between bunches. Securely tie bunches to the frame. Anything less can undermine the quality of your packed fruit.
- ➔ Curtail the time fruit spends in the sun between cutting and unloading at the shade by:
 - parking in the shade while cutting and loading
 - covering the load with a pad whilst cutting more fruit at the shed,
 - park the vehicle in the shade while unloading
 - putting a tarp over the load is not a good option, as heat builds up under it. Using shade cloth over the load is recommended which will reduce heat built up.

3.2 POST-HARVEST OPERATIONS:

The adoption of best post-harvest management technique can extend shelf-life and quality of the fruits. Curing and washing, grading, packaging, storage, transportation and marketing etc., are the main post harvest operations.

3.2.1 Curing and washing:

During the curing, field heat of the fruit is brought down, this helps in stabilizing the metabolic process. The fruits are spread on the floor in orchard's yard, having the cushion of paddy straw and then washed to remove the dirt. By washing the original colour and lustre of the fruits is also recovered.

3.2.2 Ripening:

The fruits are generally harvested early in the season at a pre-mature stage to capture market. Ethylene application is the best method to hasten ripening without loss in fruit quality and flavour. Mature fruits are ripened with lower doses of Ethel for uniform colour development (slow ripening under controlled condition at 15⁰-18⁰ C).

3.2.3 Grading :

Grading is one of the most important procedures to be followed in post harvest handling, as it determines the quality, shelf life and price of the fruit. During grading, the produce is sorted according

to the fixed grade standard, taking into consideration various quality factors to make a homogenous lot.

Post-harvest grading of Banana is rarely practised at the producer's level. At the most, the fruits are sorted out, based on physical characteristics like size, colour, shape and extent of fruit damage. This type of grading is done manually in small operations.

Grading is mainly based on size, colour and maturity of the fruits. While grading, smaller fruits are separated from the larger ones in order to achieve uniform ripening. Immature, overripe, damaged and diseased fruits are discarded during the process of grading.

The state-wise grading parameters used for grading of Banana and percentage share graded by different agencies are given in Table No.9.

Table No.3.1

Grading Parameters used for grading of Banana

Sl.No.	State	Parameters used for Grading
1.	Odisha	No grading, Only sorted according to size and colour.
2.	West Bengal	No grading, Only sorted according to size.
3.	Jharkhand	No grading, Only sorted according to size.
4.	Karnataka	No grading, Only sorted according to size.
5.	Madhya Pradesh	No grading, Only sorted according to size.
6.	Uttar Pradesh	No grading, Only sorted according to size.
7.	Tripura	No grading, Only sorted according to size.
8.	Tamil Nadu	No grading, Only sorted according to size.
	Kerala	No Grading. Only sorted according to maturity and size.

Source: DMI Survey

3.2.3.1 Advantages of Grading and standardization:

- i) Grading is beneficial to the farmers, traders as well as to the consumers, as it provides common standard to all.
- ii) Grading of the produce before sale enables farmers to get better price for their produce.
- iii) Grading assists the producers and other intermediaries in preparing fresh produce for market with appropriate labeling.

- iv) Grading helps the consumers to get standard quality produce at fair price.
- v) It facilitates the consumer to compare the prices of different qualities of a produce in the market.
- vi) It assures the quality of the produce and also reduces the cost of the marketing and transportation.
- vii) Produce of similar grade can be stored in bulk.
- viii) Market values are better understood.
- ix) Commodities can be bought and sold without inspection, through e-trading.
- x) Grading provides an authentic and scientific basis in promoting and managing the marketing system.
- xi) It serves as a realistic and common basis for market intelligence and reporting.
- xii) It facilitates the settlement of quality disputes between buyers and sellers.

3.2.3.2. Grading at producers' level :

Though there is no grading of Banana at producers level, but there is an increasing recognition to the fact that producers need to be assisted in grading their produce before sale so that they may get better price. For securing adequate returns to the producer/seller, the scheme of “Grading at Producers' Level” was introduced in 1962-63 by Directorate of Marketing and Inspection. The main objective of this scheme is to subject the produce to simple test and assign a grade before it is offered for sale. After grading, the producers get prices commensurate with the quality of the produce. The programme is being implemented by the States/Union Territories. At present, some fruits are graded at producer's level, mainly in the regulated markets like Rythu Bazaar in Andhra Pradesh and Krishak Bazaar in Odisha etc. Up to 31-03-2013, grading units have been set up in the country.

3.2.3.3 Benefits of Grading at producers' level :

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

Table No. 3.2 : STANDARDS FOR GRADING OF BANANAS :

According to Agmark standards Banana is classified into following classes :

<i>Grade designation</i>	<i>Grade requirements</i>	<i>Grade tolerances</i>
1. <i>Extra class</i>	2. Bananas shall be of superior quality. <i>They must be characteristics of the variety and/or commercial type.</i> The fingers must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, quality, the keeping quality and presentation in the package.	3. 5% of bananas (by count or by weight) not satisfying the requirements of the grade, but meeting those of Class grade or, exceptionally, coming within the tolerances for that class.
Class I	Bananas shall be of good quality. They must be characteristics of the variety and/or commercial type. The slight defects(as listed below) of the fingers, however, may be allowed, provided these do not affect the general appearance and quality of the produce in the package. - slight defects in shape and colour; - slight defects due to rubbing and other superficial defects not exceeding 2 sq.cm. of the total surface area The defects must not affect the flesh of the fruit.	10% of Bananas (by count or by weight) not satisfying the requirements of the grade but meeting those of Class II or, exceptionally, coming within the tolerances of that grade.
Class II	This includes bananas which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements. The following defects may be there provided the bananas retain their essential characteristics with respect to the quality and presentation. - defects in shape and colour provided the product remains the normal characteristics of bananas; - skin defects due to scrapping, scabs, rubbing, blemishes or other causes not exceeding 4 sq.cm. of the total surface area; The defects must not affect the flesh of the fruit.	10% of Bananas (by count or by weight) not satisfying the requirements of the grade, but meeting the minimum requirements.

Table No. 3.3 : Export Specification for Banana (NHB)

<i>Countries</i>	<i>Middle East</i>
<i>Variety</i>	Grand Naine Cavendish
<i>Colour:</i>	Green
<i>Weight of Bunch:</i>	205 Kg
<i>Packing</i>	13 Kg.
<i>Storage:</i>	13-14 C
<i>Transport</i>	By Sea

3.2.4 Packaging:

The packaging of fruits is required for efficient handling and marketing, better eye appeal and better shelf life. The proper packaging protects the fruits from pilferage, dirt, physiological and pathological deterioration during further handling. Efficient packaging of horticultural produce in uniform size reduces the need for repeated weighing and can facilitate handling, stacking, loading, unloading, better storage, long transportation, transshipment and marketing.

Wooden or cardboard boxes, rectangular in shape and bamboo baskets are used for packaging and transportation of fruits. In some cases banana bunches are packed in old gunny bags wrapped with banana leaves. Due to poor packing quality the bananas deteriorate and fetch low price.

High quality bananas are generally exported. Firstly, fingers are removed from the bunch and washed in water. Then they are washed in dilute sodium hydrochloride solution to remove the latex, dipped in 0.1 % of carbendazime solution and finally air dried. These fingers are graded on the basis of their length & girth and packed in plastic corrugated fibre board (CFB) cartons having capacity of about 13 to 14.5 Kg. A suitable packing material like foam etc. may be used. These boxes are kept at 13-15° C temperature and at 80-90% humidity in the cold storage. Bananas can be stored in such controlled atmosphere in a cooling chamber for a period of 20-25 days. The bananas are to be exported via cold chain of shipment at 13° C and refrigerated vans in the country.

3.2.4.1 Packed clean dry fruit :

Let fruit drain until there is no obvious water on the skin and apply stickers if required. Aim to have the same quality standards all year round. It is advisable to have a range of packing options to suit the differences in fruit size and quality at different times of the year, such as packing in hands or clusters.

3.2.4.2 Use strong cartons :

Do not use cheap, poor quality cartons. Use high quality cartons so the cartons can support the weight of the fruit. The carton must remain strong and should not collapse in the high humid conditions maintained at modern ripening rooms.

3.2.4.3 Pack to avoid marks on fruit :

When packing is done try to prevent the wood of the cluster from coming in contact with the skin of other fruit. Above all aim to meet the merchant's preferences regarding packing methods and plastic sheets and absorption pads should be inserted while packing. Regular communication should be maintained with the merchants to get requisite feedback.

3.2.4.4 During packing do not :

- ☛ mix stale fruit with fresh glossy fruit on the cluster.
- ☛ pack curly hands with straight hands
- ☛ mix grades in the same carton
- ☛ mix fruit of different maturity in the same carton market.
- ☛ mix fruit of different ages in the same carton

During the survey it is found that there are no standard parameters of packaging and the methods and techniques may differ from place to place. Usually, the fruits are placed in layers one above the other.

The producers generally sell the orchards to pre-harvest contractors. The producers, who do not sell the produce to pre-harvest contractors, transport Banana in loose to the nearby markets. The packaging material like Gunny bags, Polywoven bags Plastic crates, Cartons and Corrugated fiber board boxes etc and sometimes wooden boxes are used in carrying the produce to the markets by the wholesalers and commission agents.

3.2.4.5 Qualities of packaging material:

Since, a package as a container offers accommodation to the contents for storage and transportation, therefore the packages must have the following basic qualities.

- I. It must protect quality and quantity.
- II. It must prevent spoilage during transit and storage.
- III. Labeling of package must indicate quality, variety, date of packing, traceability, weight, price etc.
- IV. It must be convenient in handling operations.
- V. It must be convenient to stack.
- VI. It must be cheap, clean, hygienic and attractive.
- VII. It must be biodegradable

- VIII. It must be free from adverse chemicals.
- IX. It should be reusable.
- X. It should immobilize the fruits placed inside.
- XI. Quality and hygienic cushioning material must be used to protect fruits from impact, injury and compression.
- XII. It should offer good ambient conditions to the fruits which are congenial for storage and transportation.
- XIII. It should meet optimum requirements of ventilation vis-à-vis temperature and relative humidity management.

3.2.4.6 Precautions to be taken before packaging:

- i) Banana should be plucked at appropriate maturity, keeping in view the time span of the market.
- ii) Banana should be sorted and graded as per accepted quality standards, before packing. Only sound fruits should be packed.
- iii) Before packing, post-harvest treatment with wax and fungicides should be resorted to as a prophylactic measure against pathogenic invasion in transit.
- iv) For prevention of bruising/abrasion injuries, paper liners, pads, trays or tissue wraps may be used. As an alternative, cushioning with easily available paddy straw keeps the packing cost minimum. It will maintain a level of R.H. because of moisture absorbing tendency of the paddy straw and keep the temperature down.
- v) Careful placement of Banana in the cartons is necessary to avoid bruising. The use of telescopic boxes can overcome this problem very well.
- vi) For securing packages, use of adhesive tape (3 to 4 cm) may be used. The packages can also be secured with thin rope of coconut fiber, or polythene sutli, as alternatives.

3.2.4.7 Precautions during packing:

During packing, fruits should never be packed loosely in order to avoid displacement of fruits which leads to friction among fruits' surface and thereby causing damage. In cartons, fastening should be done with little pressure so that during transit period when the volume of the fruits gets reduced owing to dehydration and adjustment of space due to jerks in transit, the packing does not get unfastened.

It is also observed that during the packaging, sharp edges of the packing material damage the fruits. Therefore, care should be taken so that they do not come out of the containers, resulting in bruising, puncturing and damaging the fruits.

Similarly, there should not be too much ventilation which can affect the quality of fruits due to shrinkage, loss in weight, colour, etc.

3.2.4.8 Parameters of packaging material:

The size, type and capacity of the packaging material depend mostly upon the locally available raw material, distance of the markets and type of transport to be used. Generally, the packing material of different size made of corrugated fiber boxes, telescopic boxes, wooden boxes and plastic crates are used for packing of Banana.

The state-wise information on packaging is as under :

Tamil Nadu	Banana is marketed in bunches. No special type of container, packaging material etc., is used.
Odisha	The Bananas are consumed at local level. Hence, packaging of the fruits is not done. However, at retailer level, the polythene bags are provided to the consumers to carry the fruits.
Kerala	No proper packaging is done. At the time of transporting in trucks, the leaves are spread on the platform and also in between the layers of Bananas to minimize the damage due to injuries.

Source: DMI survey.

3.2.5 Storage:

The production of the fruit is seasonal, but its demand remains for a longer period. Therefore, storage is very essential for extending the consumption period of fruits, as well as for regulating their supply to the markets. The principal aim of storage is to ensure better returns to the growers.

The storage practices of Banana in different state are as under :

Tamil Nadu	Banana is a perishable commodity. Therefore fruits are disposed off within 7 to 10 days of harvesting. However, during the peak season, when markets are flooded with Bananas, the bunches are stored in cold storages.
Odisha	Due to perishable nature of the fruit, it is sold/ dispatched to the retailers within 24 hrs. There is practice of storing of Banana.

Source: DMI survey

3.2.5.1 Requirements for safe storage:

The following are the requirements for safe storage of Bananas:

1) Selection of site (location):

- a. The storage structure should be positioned on a raised well-drained place.
- b. It should be easily accessible.
- c. The structure should be protected from excessive humidity, exorbitant heat, direct sunrays, and pests.
- d. It should be constructed on a well-built platform at a height of not less than 1 foot from ground level to prevent dampness.

2) Cleaning of storage structures:

- a. The storage structures should be properly cleaned before storing fruits.
- b. There should be no left over, cracks, holes and crevices in the structure, which may harbour insects.
- c. Before storage, the storage structure should be cleaned and fumigated.

3) Cleaning and Drying of fruits:

- a. Before storage, the Bananas should be properly cleaned and dried.
- b. The damaged fruits should be discarded to avoid quality deterioration and pest infestation.

4) Separate storage of new and old stock:

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

5) Cleaning of vehicles:

The vehicles used for transporting the fruits should be properly cleaned with pesticides.

6) Proper aeration:

There should be proper ventilation and air circulation to avoid accumulation of gases such as CO₂, Ethylene etc.

7) Regular inspection:

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

3.2.5.2. Tips to store banana at Home:

- ★ Select green firm fruit without dark spots or abrasions on the peel.
- ★ Avoid bananas that have a gray tint and look dull in color.
- ★ Never store bananas in plastic bags, which hold too much moisture and could cause the fruit to rot.
- ★ Store green bananas at room temperature.
- ★ Put green bananas into a brown paper bag to speed up the ripening process.
- ★ Add an apple or a tomato to the bag to ripen the bananas in less than 1 day.
- ★ Another way to speed up the ripening process is to place the bananas near other ripe fruit in a bowl, such as other ripe bananas.
- ★ Leave yellow-green ripening bananas exposed to air at room temperature for a few days.
- ★ Hang the bananas on a banana tree. Banana trees and hangers allow air to circulate and avoid "resting bruises" on the fruit.
- ★ Keep ripe bananas at room temperature if it is to be consumed within a few days. Eat or refrigerate the bananas as spots develop on the skin and before they are overripe.
- ★ Keep sliced bananas fresh. Cover the slices in a bit of lemon juice, pineapple juice, or vinegar, all of which will keep it fresher for longer

3.2.5.3 Storing of Ripe Banana:

- Pull the bananas apart from the bunch. If bananas are already pretty ripe, then keep them fresh and yellow for longer by pulling each banana away from the bunch. This will keep each banana fresher for longer.
- Store the ripe bananas with unripe fruit. Take an unripe pear or avocado and place it near the bananas, and it will slow down the ripening process of the bananas, while ripening faster itself.

- Wrap the stems of the bananas in plastic wrap. This will prevent ethylene gas, which is produced naturally during the ripening process, from reaching other parts of the fruit

and making it ripen too fast. Place some tape over the plastic wrap for some extra security. Rewrap it carefully every time after removing a banana from the bunch,. Alternately, separate the bananas from the bunch and then wrap the stem of each one individually.
- Put the bananas in the produce drawer of your refrigerator after they are fully ripe. Refrigeration slows the ripening process considerably, but does not stop it. The peel will continue to turn brown, but the fruit will stay fresh and firm for 1 to 2 weeks. Accordingly, storing ripe bananas in the refrigerator will preserve their delicious taste for longer, even though their peels may turn black.
- Store bananas in the freezer for several months. Peel bananas and cut them into chunks or mash them before freezing. Portion the banana into the amounts you need to make a recipe. Put portioned bananas into zipper freezer bags or plastic containers and store them in the freezer.

3.2.6 Transportation:

Transportation is considered as the backbone and lifeline of agricultural marketing. Transportation starts right from the field till produce reaches the consumer. It is a vital requirement for bulk movement, distribution and marketing of fresh and processed products.

Fresh produce is transported by many other means, from head-loads to air-freighting. In all cases, the same conditions should be observed. Produce must be:

- ⇒ kept as cool as possible;
- ⇒ kept dry;
- ⇒ moved to market as quickly as possible.

3.2.6.1 Modes of Transport:

1. Surface Transport:

Road transport by trucks/lorries is the most popular mode of transportation owing to its easy/simple approach from orchards to the market. For distant markets rail wagons are used. Insulated and/or refrigerated trucks with elaborated intake capacity are ideal for long distance road transport.

2. Rail Transport:

Rail transport has certain advantages over road transport. In rail transport, the damage to the produce is less when compared to that of transporting on rough roads. The transportation cost is also much less in this mode of transportation.

Advantages:

The advantages are:

- ▶ damage to produce during transportation is meager as compared to that from haulage over rough roads;
- ▶ costs are lower than transportation by road.

Rail transport, however, requires extra handling because from the railway station the produce is to be again transported by road to bring it to the market; transport by road alone usually is a door-to-door service.

3. Water transport:

Inland:

Waterway transport is used in some countries to move produce to markets. Much of the produce carried in this way are packed in locally made crates or sacks. The vessels employed are often mixed passenger-cargo craft, and no special handling is provided for fresh produce.

In-land, waterways can be used as an effective means of transport for fresh fruits and vegetables in the North east states.

Sea:

Ships often accommodate passengers and general cargo, and no special provision is made for fresh produce, which may be stowed in unventilated holds. Losses are high, owing to rough handling by porters, inadequate packaging and overheating in unventilated holds or near engine rooms.

Although marine transport is time consuming in comparison to other means of transportation to cover long destinations, but for inter-continental transportation, the water transportation is the cheapest. To survive long distance transportation in waterways, most of the produce requires low temperature environment with enough ventilation to minimize carbon dioxide and ethylene accumulation. Refrigerated modular containers should be used for the purpose, which can be loaded at the packing house/centre and transported on trucks to the port, for onward transportation.

4. Air freight:

As with shipping, the international trade in the air-freighting of high-value exotic crops is generally well organized. In case of poor road links, produce is carried by air from production areas to urban markets. Costs are high and losses often heavy because of:

- ⇒ poor, non-standard packages;
- ⇒ careless handling and exposure to the elements at airports;

- ⇒ consignments left behind in favour of passengers;
- ⇒ flight delays owing to bad weather or breakdowns;
- ⇒ intermittent refrigeration followed by exposure to high temperatures;
- ⇒ relatively small produce shipments.

Air transportation is the fastest but most expensive mode of transport. However, this is essential for high-value short-life commodities. Generally, refrigeration facilities are not available and, on the contrary, low pressure environment with low RH is encountered at high altitude. This increases the rate of water loss of the produce. For air transportation, providing polyethylene Film liner with perforation within the box or over-wrapping of unit load is necessary. The packed produce, coming in for air transportation has to be pre-cooled sufficiently to counterpoise the lack of refrigeration facility. As there are no cold storage facilities at most of the airports in India, it is necessary to transport the pre-cooled produce in insulated or refrigerated trucks or vans to the airport to obviate possible delays in loading due to late arrivals or non-availability of required space on a particular flight. Perishable cargo handling centre at airports are required for transportation of perishable horticultural produce.

3.2.6.2 Handling and Stowing Practices:

Although the shape and condition of trucks are important factors in fresh produce transportation, the loading and stowing methods in vehicles are pertinent to damage and loss:

- ➔ the best loading factor must be achieved, that is the maximum load that can be carried economically under satisfactory technical conditions: a stable and well-ventilated load;
- ➔ the size and design of packages should give adequate levels of ventilation of contents with minimum wasted space, and the packages should be strong enough to protect the contents;
- ➔ loading and unloading of vehicles should be properly supervised to prevent careless handling of packages; loading aids such as trolleys, roller conveyors, pallet or forklift trucks should be used where possible to reduce the handling of individual packages;
- ➔ stowage should be carefully done to avoid collapse of the stow during transport; packages should not be stacked higher than the maximum recommended by the maker, otherwise the bottom layers may collapse under the weight of those above;
- ➔ packed produce should be protected from sun and rain at all times especially during loading and unloading ;
- ➔ packages should be loaded on dunnage (pieces of lumber or slatted racks) on the beds of vehicles, or on pallets in order to allow the circulation of air around stacks during transport;
- ➔ if the load is to be distributed to several locations, packages should be loaded in reverse order to that in which they will be unloaded, i.e. last on, first off; at the same time the load should be distributed evenly on the vehicle.

Although every care may be taken to observe all the above precautions, the standards of driving remain a difficult problem to overcome. In many cases, drivers are induced to speed in order to make more money for themselves or their employers. Whenever possible, only experienced and responsible drivers should be employed.

3.2.6.3 Reduction of losses during transport :

The risk of deterioration of the quality of the produce during transportation can be reduced in several ways. Trucks are used to transport fresh produce. Most fresh produce is now moved in road vehicles, lesser amounts are being transported by sea, air or inland waterways. The vehicles in most common use are open pick-ups or bigger trucks, either open or covered. The use of road vehicles is likely to increase, so users should give attention to the following:

- closed vehicles without refrigeration should not be used to carry fresh produce except on very short journeys, such as local deliveries from farmers or wholesalers to nearby retailers;
- open-sided or half-boarded trucks can be fitted with a roof on a frame. The open sides can be fitted with canvas curtains which can be rolled up or moved aside in sections to allow loading or unloading at any point around the vehicle. Such curtains can protect the produce from the elements but still allow for ventilation. Where pilfering is a problem, the sides and rear of the truck must be enclosed in wire mesh;
- a second, white-painted roof can be fixed as a radiation shield 8 or 10 cm above the main roof; this will reflect the sun's heat and help to keep the produce cool;
- for the ventilation of long-distance vehicles, more elaborate air intakes can be fitted in conjunction with louvres, to ensure a positive air flow through the load;
- refrigerated trucks or road, rail or sea containers may be used for long journeys, but the cost of such transport makes it uneconomical for small-scale operations.

3.2.6.4 Selection of Mode of Transportation:

Since, the body of the vehicle is also a container, therefore following points should be considered while selecting the mode of transportation:

- a) The mode of transportation should be cheapest amongst the available alternatives.
- b) It should immobilize the packages placed inside.
- c) It should not cause damage to packages, because of uneven surface or protrusions in the body due to nuts and bolts.

- d) It should work as a safe carrier of the packages placed inside.
- e) It should be convenient during loading and unloading.
- f) It must protect the Bananas during transportation from adverse weather conditions.
- g) It should be safe from pilferage, etc.
- h) It should deliver the fruits to consignee in stipulated period.
- i) It should be easily available, particularly during post harvest period.
- j) Distance of the market should be considered for selecting the mode of transportation.

3.2.6.5 Precautions to be taken while loading:

It is observed that the workers, engaged in loading the trucks place the packages without taking proper care. The packages are roughly handled. It is also seen that the wooden boxes are forcibly placed in trucks to fix them in the stack. Such practice is likely to damage the box, so also the adjoining boxes. Therefore, such practices should be avoided. The following precautions should be taken while loading the trucks with produce.

1. The workers, engaged in loading of Banana, should be sensitized through informal training to handle the packages carefully so that the resultant mechanical injury at the time of loading/unloading is minimal.
2. The stacking should be done in such a manner that the packages get locked with each other in a stack. This will help to immobilize the packages within the truck.
3. Provide cushioning with clean paddy straw on all sides to the extent possible, so that there is no damage to the packages because of the protrusions of nuts/bolts, angles, etc., in the body of the trucks at various places.
4. Instead of dark coloured tarpaulin used for securing packages, white tarpaulin should be used. This will help to keep the packages cool to some extent because of heat reflection.

3.2.6.6 State-wise Transportation Practices of Banana:

Odisha:

Trucks and Lorries are the most popular mode of transportation, to carry the fruits from farm to market both over long and short distances

Cool Chain:

Cool chain is essential during the transport of quality Banana all the way from the farm to the customer. This helps in maintaining the temperature inside the box at the same low level as in the cold storage.

The various stages of the cool chain are:

1. Pre- cooling and cold storage facilities maintained at the farm.
2. Refrigerated trucks from farm to the airport.
3. Cold storage facilities at the airport.
4. Building up of the pallet in a cold store at the airport.
5. Loading the aircrafts directly from the cold store in a short time.
6. Cargo aircraft maintains cold store temperature in transit.
7. Off loading directly into a cold storage facility at the receiving point.
8. Refrigerated trucks to the air conditioned departmental stores.

Preparation for the Market:

While conducting many surveys, it was observed that producers do not carry out any special preparation for bringing Banana to the markets. At the most, Bananas are washed and cleaned before carrying them to the markets. Chemical treatment is given for ripening of the fruits, as is done in case of mangoes.

3.2.7 Post Harvest Losses:

Nature and Causes of Post-Harvest Losses:

Post-harvest losses of banana may occur due to a variety of reasons. Some of the common reasons for post-harvest losses are as under.

- i) Mechanical injury:
- ii) Injuries due to thermal shock;
- iii) Disease and pest attack;
- iv) Microbial attack; and
- v) Physio-biochemical reasons.

Fresh fruits are inherently perishable. During the process of distribution and marketing, substantial losses are recorded which range from a slight loss of quality to total spoilage. Post harvest losses may occur at any point in the marketing process, from the initial harvesting, grading, packaging, transportation from the field to storage, storage to assembly point, during storage and distribution to the final consumer.

A large number of intermediaries play important roles in the system between farmer and the retailer like local retailer, transporter, wholesalers and distributor, etc, and at every step significant waste is noticed.

Table No.3.4
State-wise Losses

State	Category	Loss %
Odisha	Transportation	3
	Wholesale	2
	Retailer	12
Tamil Nadu	Ripening	10-12
Kerala	Harvesting & Transportation	4-5
	Retailer's Level	6-8

3.2.7.1 Main Causes of Post Harvest Losses:

The post harvest losses at different stages and their reasons are as under:

A) During Harvesting:

- i) Harvesting of immature fruits.
- ii) Harvesting not done properly.
- iii) Harvesting equipments is not clean.
- iv) Harvesting during warmest part of the day.
- v) Exposures to unnecessary high temperature.

B) Transportation:

- i) Careless Driving.
- ii) Too high loading/stacking.
- iii) Poor roads.
- iv) Unsuitable transport containers.
- v) Overloading with other fruits and vegetables (in some cases people even sit on top of the load)
- vi) Lack of link roads, leading to highways or collection centers.
- vii) Heat accumulation or very poor ventilation within the transport vehicles.
- viii) Virtual absence of refrigerated and insulated trucks.

C) Grading / Packing:

- i) Lack of quality standards of minimum requirement.
- ii) Rough handling.
- iii) Unsuitable packaging material.
- iv) Overfilling of containers.

D) Assembling:

Assembly points are not properly/ adequately prepared.

E) Loading / Unloading:

- i) Rough handling.
- ii) Loading too high.
- iii) Bad stacking.
- iv) Improper cushioning of carrier.

F) Storage:

- i) Inadequate ventilation in packages and carrier used.
- ii) Storage temperature is too high.
- iii) Rough handling.
- iv) Too high heaps or stacks.

G) Ripening:

- i) Lack of uniformity and homogeneity of the produce.
- ii) Inadequate equipment and ripening method.
- iii) Rough handling.

3.2.7.2 Technology for reducing post-harvest losses:

Post-harvest losses can be minimized by adopting certain pre-harvest strategy and post-harvest management/technology. The principal pre-harvest strategy and post-harvest technology for reducing the post-harvest losses are as under :

- i) Pre-harvest treatment;
- ii) Correct stage of harvesting;
- iii) Proper harvesting method ;
- iv) Proper curing;
- v) Washing, cleaning and grading;
- vi) Scientific packing ;
- vii) Pre-cooling;

- viii) Cold storage ;
- ix) Suitable means of transport and
- x) Efficient marketing.

Brief description of the principles and methodologies of pre-harvest strategy and post-harvest management of horticultural produce are as follows.

Pre-Harvest Treatment:

Use of fertilizers, pest control, growth regulators, climatic conditions like wet and windy weather and tree conditions influence the shelf life of the Banana by regulating physiology and chemical composition of fruits.

In pre-harvest treatment, if the spray (10 ppm) of Gibberellic acid is done at colour break stage, it delays colour development, maintain firmness thereby allows delayed harvesting i.e., tree storage. Similarly the use of potassium fertilizers extends the shelf life of the fruits. These chemicals can curtail storing cost due to uniform ripening and prolong the shelf-life.

Post-harvest Treatment

Washing and cleaning:

Washing and air-drying improve the appearance of the fruits and avoid wilting. During washing, the rotten, diseased insect damaged, discoloured and deformed fruits should be sorted out carefully.

Fruits are cleaned manually by hand rubbing individual fruit dumped in a tank of sanitized water. The water used for washing should be properly sanitized.

Gentle handling:

In order to reduce the post harvest losses, the fruits should be handled gently to minimize bruising and breaking of the skin. The breaking of the skin stimulates dehydration of the fruits and make site for microbial attack. By reduction of number of handling of commodity, the mechanical damage can be reduced significantly.

Temperature control:

The temperature control (Pre-cooling) is very much necessary to remove field heat and to retard the ripening of the fruit after harvesting, particularly when harvesting is undertaken in hot weather. It minimizes the storage losses considerably. The low pressure vacuum cooling technique is another option for temperature control. Cooling of the fruit, not only extends storage life by reducing the rate of physiological change, but also retards the microbial growth. Even low-cost cooling or refreshing the product is better than no cooling at all.

Storing at high temperature causes rapid moisture loss, flavour deterioration, resulting in decay of the fruits. It is preferable to store fruits at their optimum relative humidity (RH) of 90% to 95%. At a low RH, the peel becomes thin, dry, and shriveled.

There are several ways of reducing the storage temperature of fruits.

- a) Protect the fruits from direct sun rays.
- b) Cool promptly after harvest.
- c) Use of natural cooling, e.g., harvesting during the cool early morning hours, open stores for ventilation during the night,
- d) Evaporative cooling, obtained by drawing dry air over a moist surface.
- e) Mechanical refrigeration

Precaution during storing in cold storage:

There are four basic principles which must be correctly applied for successful refrigeration of perishable crops like Banana:

- i) **Select only healthy Bananas:** Refrigeration does not destroy pathogens responsible for deterioration, but only slows down their activity. It also does not improve produce quality, only maintains it. A damaged fruit will deteriorate more quickly than a healthy one even in refrigerated storage. Hence, store only sound produce in refrigeration.
- ii) **Timely cooling:** Refrigeration slows the development of micro-organisms and physiological changes, which are responsible for deterioration of the fruits. Allow the produce to cool, soon after harvesting.
- iii) **Optimal temperature and humidity:** Adhere closely to optimal conditions of temperature and relative humidity.
- iv) **Uninterrupted cooling:** Refrigeration should be applied from the point of harvest to the point of consumption.
- v) **High humidity:** High humidity retards loss of moisture and maintains the crop in better condition. Horticultural produce can be stored best in an atmosphere that has a relative humidity of 90 per cent.
- vi) **Controlled atmosphere storage:** In the Controlled atmosphere storage, the fruit is placed in the gas-tight refrigerated chamber allowing the natural respiration of the fruit. This decreases the oxygen content and increases the percentage of carbon dioxide in the chamber. This controlled atmospheric storage extends the storage life of the fruit.

Shorten the time between harvest and consumption

The losses of the fruits can also be reduced to a large extent by reducing the marketing channel. Shorter the marketing channel, lesser will be the losses during the process of marketing.

Sanitation:

Proper sanitary conditions must be maintained during the operations like handling, storage, cleaning and washing the equipments used for the fruits so as to minimize the risk of spreading microbial growth. Diseased or damaged fruits should be sorted out and properly disposed off to prevent the likely the growth of fungi and bacteria on sound fruits. Insects infesting culled fruits may migrate to good fruits and introduce pathogenic organisms and increase losses.

Water used for washing should also be changed at regular intervals before it becomes contaminated with fungi and bacteria, which spreads infection. The chlorinated water or chemically treated water reduces the count of viable organisms.

CHAPTER – IV:

POST HARVEST DISEASES AND DISORDERS

Post-harvest diseases and disorders generally develop due to infestations before harvest. Losses from post-harvest diseases in fresh fruits can be both quantitative and qualitative. These diseases are mainly caused by fungi and bacteria. Initially, only a few pathogens may invade and break down the tissue systems, followed by subsequent attack of weak pathogens. High temperature and humidity accelerate the process of post harvest decay by microorganisms.

The severity of infection and degree of damage, however differ, depending upon the region of cultivation, season and even the root stock used for grafting. The fruits dropped on the ground due to physiological disorders are infected by pathogenic organisms and have poor storability.

Harvest injury, defective handling, inappropriate temperature and humidity affect the storage life of the fruits. The presence of blemished fruits with sound ones also contributes to decay and damage.

4. Post Harvest Diseases: Banana

1. Anthracnose- *Colletotrichum musae*
2. Fluffy white rot – *Fusarium moniliforme*
3. Crown rot – *Botryodiplodia theobromae*
4. Cigar-end rot – *Verticillium theobroma*

4.1. Anthracnose - *Colletotrichum musae*:

Symptoms:

- ➔ Small, black, circular specks on the skin- sunken & coalesce to form large spots.
- ➔ Bright salmon-coloured conidial mass appears on the spots.
- ➔ Severely infected fruits become dark due to blemishes.
- ➔ Acervuli also develop on the skin and the pulp becomes partially soft.



Fig No. 4.1: Figure showing small black circular specks on the skin of the fruit

- ➔ Non-latent infection usually starts during or after the harvest of bunches in small peel wounds and it continues to develop without a dormant period.
- ➔ Many latent infections at the time of harvest show large number of appressoria on the surface of the peel.
- ➔ The spread of the disease is by air-borne conidia and numerous insects which frequently visit banana flowers also spread the disease.
- ➔ Temp. 30 to 35°C and RH- 85.7 -100 %.

Management:

- ➔ Post harvest dipping of fruits in Carbendazim 400 ppm, or Benomyl 1000 ppm, or Aureofunginsol 100 ppm.

4.2. Fluffy white rot : *Fusarium moniliforme*

Symptoms:

- ➔ Small, olive brown spots appear on the tip of fruit.
- ➔ Large clove brown to mummy brown patches.
- ➔ Infection becomes deep – seated – pulp – leaking of juice of foul odour and a fungal growth.
- ➔ Spread through diseased propagation materials.
- ➔ Temp. 25-35°C and more than 50% RH favourable for the development of disease.

Management :

- ➔ Post harvest dipping of fruits in Carbendazim 400 ppm, or Benomyl 1000 ppm, or Aureofunginsol 100 ppm.

4.3. Crown rot : *Fusarium roseum*, *Lasiodiplodia theobromae*, *Deightonialla torulosa*

Symptoms:

- ➔ Darkening of the hand and the adjacent peduncle. The discoloured area covers almost one fourth of the fruit if the conditions are favourable. Loss of ability of hand to support fruit.
- ➔ The conidia are usually 3 to 5 septate. The conidia are spread by air.



- ➔ Occurrence of black tip – fruit piercing moth. Infection – direct penetration – fungus. Temp. 23.90°C
- ➔ Wind blown bunches – develop severe spotting on the fingers- rainy showing small black circular specks on the skin of the fruit. Fig No. 4.1: Figure

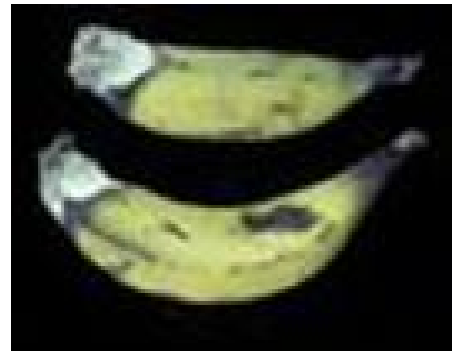
Management:

- ➔ Control of crown rot starts in the field with the regular removal of leaf trash.
- ➔ Proper field sanitation can greatly reduce the number of crown rot fungi spores present.
- ➔ Do not keep rotting fruits or plant waste materials near the packing station.
- ➔ Maintain clean washing water in the delatexing baths and change the water frequently to stop it becoming heavily contaminated with spores.
- ➔ Dehanding should be done carefully with a sharp knife so as to avoid leaving a ragged cut. Finally, post-harvest treatment of fruits with an effective fungicide is essential.

4.4. Cigar-end rot: *Verticillium theobromae*

Symptoms:

- ➔ Tip of immature fruit and spreads upward.
- ➔ Ashy conidia and conidiophores cover the rotted portion.
- ➔ Imparting burnt ashy cigar-end appearance with a dark border.
- ➔ Decay may extend up to one-third of the fruit but internal tissues develop a dry rot.
- ➔ Conidia are hyaline, oblong to cylindrical, borne at the ends of tapering phialides, aggregated into rounded, mucilaginous translucent heads.
- ➔ The fungus – plant debris – microsclerotia.
- ➔ Infected plant parts – irrigation water – implements



Management:

- The principal method of control is frequent manual removal and burning of dead flower parts and infected fruits.
- Use of fungicide to control the disease is also recommended.
- In the pack house, care should be taken to cull infected fruits to avoid contaminating the washing water with spores.

Cigar-end rot is effectively controlled by covering the flower (immediately after emergence) with a polyethylene bag before the hands emerge.

CHAPTER – V:

MARKETING

Marketing is the key to the development of horticultural produce . The absence of a proper marketing plan and organizational arrangements, agro processing facilities, which otherwise have high potential for indigenous production to the extent of self-sustainability is a cause of great concern and is a disincentive to the local growers.

Efficient marketing system plays a crucial role in getting the remunerative prices to the producers. In the present scenario, it is observed that the producers do not pay proper attention to the various components of marketing. The producers usually spend the entire year on production and part with the produce to the pre-harvest contractors, that results in low share in consumer's price.

Banana is sold to pre-harvest contractors as well as to the wholesalers in the market yards or the produce is directly sent to different cities. The main reasons for sale of produce to the pre-harvest contractors are as under:-

- i) High risk of spoilage of fruits from natural calamity.
- ii) No assurance of higher prices in markets.
- iii) Delay in getting payment of produce.
- iv) Pressing need of money for immediate payments.
- v) Higher transportation cost.
- vi) Lack of the market information.

Sometimes it is observed that sale of produce to the pre-harvest contractors causes the following inconveniences to the producers.

- i) Delayed harvesting of the fruits.
- ii) Delayed payment to the producers by the pre-harvest contractors.
- iii) Pre harvest contract may not be always guaranteed.
- iv) In the event of loss of fruits, due to dropping a certain percentage of payment are deducted accordingly by the pre-harvest contractors,.
- v) Financial losses to the producers due to wrong estimates by the pre-harvest contractors.

The main reasons for sale of fruits in the market premises are as under:

- i) Higher net prices expected in the markets.
- ii) No contract could have been settled with pre-harvest contractors.

- iii) There is no other alternative except to sell in the market.
- iv) Small quantities of produce.

Similarly, the following problems are being faced by the producers to sell the fruits in the market premises.:-

- i) High commission, transportation, loading / unloading and other charges.
- ii) No assurance of remunerative prices.
- iii) Sometimes delayed payment by commission agents.
- iv) Sometimes unauthorised deduction by the commission agents.

Due to high degree of perishability, producers sell the produce as early as possible. But, it would better if the produce be sold in the markets having better accessibility, supported by efficient transport and communication facilities.

In marketing of Banana, not only the producers face the problems, the pre-harvest contractors, wholesalers, pack house owners and retailers also face similar problems , as given below.

5.1 Pre-harvest contractors:

- i) Mismanagement of gardens, resulting in deterioration of quality and yield of fruits.
- ii) Risk of losses due to natural calamity like storms, rains, pest, etc.
- iii) Improper storage and transportation, lack of skilled labourer, absence of mechanical grading facilities, etc.

5.2 Wholesalers:

- i) Costly, improper and inadequate road transportation facilities.
- ii) Labor problems
- iii) Costly packing material
- iv) Lack of infrastructural facilities

5.3 Packing center owners:

- i) Costly packing materials
- ii) Lack of skilled workers
- iii) Non availability of proper storage.

5.4 Retailers:

- a) Losses due to spoilage of fruits
- b) Costly transportation
- c) Lack of proper air cooled shops in the local markets

5.5 Marketing Channels:

The main channels followed for marketing of Banana are as under:

1. Growers ➔ Pre-harvest contractors ➔ Commission Agents ➔ Retailers ➔ Consumers.
2. Growers ➔ Wholesalers ➔ Commission Agents ➔ Retailers ➔ Consumers.
3. Growers ➔ Commission Agents ➔ Processing Industries ➔ Retailers ➔ Consumers.
4. Growers ➔ Retailers ➔ Consumers.
5. Growers ➔ Exporters.

5.5.1 Criteria for selection of channels :

1. The channel, which ensures the higher share to producer and also provides cheaper price to consumer, is considered as the most efficient channel.
2. Shorter channel should be opted , to reduce marketing cost.
3. Longer channels with more intermediaries should be avoided, , which when opted could result higher marketing cost and reduced producer's share.
4. Select the channel which distributes the produce appropriately at low expense and secure the desired volume of disposal.

5.6 Strategy for efficient marketing:

The strategy for efficient marketing is as under:

- i) Producer's organisations and co-operative societies should be formed for marketing of Bananas fruit.
- ii) Fruits should be harvested at proper maturity only.
- iii) Precautions should be taken for avoiding injuries at the time of harvesting and transportation of fruits to the markets.
- iv) There is a need to develop alternative marketing channels involving co-operative societies to help the Banana growers.
- v) Steps should be taken to link production, marketing and processing of Bananas to avoid seasonal gluts in the markets.
- vi) Considering the fragileness of the fruit, careful harvesting and handling of harvested fruits are of critical importance to maintain their "Sales appeal" and delicate flavour.
- vii) Ways and means should be explored for providing cheap and locally available packing material and transport facilities.

viii) Advance marketing credit/loan facilities should be provided by the banks to the Bananas producers.

ix) In the absence of organised system of marketing and crop insurance policy, producers get poor returns. Therefore, the minimum support price of Banana fruits, during the productive years should be declared.

x) There is need to ensure remunerative price to the Banana producer, reduction in marketing cost and also to ensure supply of fruits at reasonable price to the consumer throughout the year.

5.7 Arrivals and Dispatches of Banana:

Table No.5.1 :Table Showing Arrivals and Dispatches of Banana

NA-Not Available

Sl. No.	State	Name of Market	Arrivals (tonnes)			Dispatches (Tonnes)			Major destinations where dispatched
			2010-11	2011-12	2012-13	2010-11	2011-12	2012-13	
1	Odisha	-	NA	NA	NA	NA	NA	NA	-
2	West Bengal	-	NA	NA	NA	NA	NA	NA	-
3	Jharkhand	Ranchi	18023	21428	33747	18023	21428	33947	Locally consumed
4	Karnataka	Binny Mill (F&V)	399	393.6	359.9	399	393.6	359.9	Bangalore Mysore Mangalore
		Channapatnam	1.33	1.33	952	1.3	1.3	0.9	
		Kanapura	4.4	5.1	4140	4.4	5.1	4.1	
		Udipi	1.481	2.5	2636	1.4	2.5	2.6	
		Yellapura	486.9	293.8	132.	486.9	293.8	132	
5	MadhyaPradesh	-	NA	NA	NA	NA	NA	NA	-
6	Uttar Pradesh	-	3205518	3107953	3635573	Nil	Nil	Nil	Locally consumed
7	Tripura	Nutanbazar	2.2	1.875	2.07	2.17	1.85	2.035	Agtartala
		Pabiacherra	8.1	8.28	8.2	8.02	8.13	8.08	Agtartala
		Panisagar	0.432	0.324	0.384	0	0	0	Locally consumed
		Melaghar	572	520	546	390	364	364	Agartala Udaipur
		Champaknagar	72	96	120	50	74	89	Agartala
		Teliaura	640	678	510	576	610	460	Agartala
		Jampuijala	24.96	27.04	31.2	22.6	25.4	28.74	Agartala

Sl. No.	State	Name of Market	Arrivals (tonnes)			Dispatches (Tonnes)			Major destinations where dispatched
			2010-11	2011-12	2012-13	2010-11	2011-12	2012-13	
8	Kerala	Trvandram	38000	39500	33000	6200	6800	6350	Suburban towns
		Ernakulam	41500	42300	40700	4350	3500	3000	Suburban towns
		Trichur	37000	38000	33000	12500	13000	10500	Suburban towns and Ernakulam
		Kanayakulam	72000	70500	74000	54000	52000	53500	Alleppy, Adoor, Kollam, and Pathanamthitta
		Calicut	92000	87000	85000	38000	32000	32500	Suburban towns
		Mananthwadi	21000	280000	22500	20500	27500	22300	Bombay, Bangalore, and Kerla
		Palakkad	51000	53000	55800	27000	29000	31000	Kochi and Calicut
		Manjery	26000	27000	24500	18000	19500	18500	Suburban towns and Gulf Countries
		Meenangadi	13800	16300	14100	13000	1500	13600	Calicut and Bombay

From the table no. 5.1, it may be seen that except Kerala the Banana is mostly consumed locally.

CHAPTER – VI

MARKETING COSTS AND MARGINS

Marketing Costs:

Marketing Costs are the actual expenses required in bringing goods and services from the producer to the consumers. The marketing cost normally includes

- i) Handling charges at farm level,
- ii) Assembling charges,
- iii) Transportation and storage costs,
- iv) Handling charges by wholesalers and retailers,
- v) Expenses on secondary services like financing, risk taking and market intelligence, and
- vi) Profit margins of different agencies.

The marketing cost incurred by farmers and traders at Regulated market includes i) Market fee, ii) Commission, iii) Taxes, and iv) Other miscellaneous charges.

i) **Market fee:** Market fee is collected by the market committee of the markets. 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 per cent to 2.0 per cent ad valorem.

ii) **Commission:** It is paid to the commission agent for assisting in carrying out the transactions, and may be payable either by seller or by the buyer or sometimes by both. The charge is usually made in cash and varies considerably.

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

iv) **Miscellaneous charges:** In addition to the above-mentioned charges, some other charges are levied in marketing of produce. These includes handling and weightment charges

(weighing, loading, unloading, cleaning etc.), and charity etc. These charges may be payable either by the sellers or by the buyers or by both.

6.1. Marketing cost borne by producers and other functionaries:

6.1.1 Producers:

The producers sell the fruits to pre-harvest contractors or sell themselves in the market premises. When farmers sell their produce to the pre-harvest contractors, they have to bear no cost on the marketing of fruits. The pre-harvest contractors make the payment for each post-harvest operation.

On contrary, if producers sell the produce themselves in the market premises or to a distant place, then they have to bear the expenses on labour for plucking of fruits, transportation, octroi, commission charges, heap making, and other miscellaneous activities.

6.1.2 Pre-harvest contractors:

Pre-harvest contractor makes the payment well in advance to the producers, therefore, they have to bear the expenditure on vigil and pre-harvest activities, in addition to post-harvest marketing activities.

The main post-harvest marketing cost borne by the pre-harvest contractors are like sorting and grading, packaging, transportation, octroi, loading and unloading, commission charges, heap making, market cess and other miscellaneous charges.

6.1.3 Wholesalers:

The wholesalers are the main purchasing agency in the markets. Generally, they have their own packing centres, located within the premises of the markets. They purchase the produce at their own or on behalf of other big traders. Sometimes, they also act as commission agents.

The wholesalers sell the produce outside of the market. The local sale of the fruits in the market premises is negligible. They have to incur expenditure on packing material, sorting & grading, transportation, octroi, loading / unloading, market cess, establishment and other miscellaneous items. The maximum expenditure of the wholesalers is on establishment and on other miscellaneous items.

6.1.4 Retailers:

Retailer is the last functionary of the marketing channel of sale and purchase of the Bananas. Retailers purchase the fruits from the wholesalers for the final sale to the consumers.

The expenditure of the retailers is found generally on transportation, commission charges, market cess, shop rents, baskets, shades, lighting, and maintenance of hand driven carts.

6.2 Marketing Margins:

Margin refers to the difference between the price paid and received by a specific marketing agency such as retailer or assemblers or by any combination of marketing agencies in the marketing system as a whole.

$$\text{Marketing Margin} = \text{Price Received by Agency} - \text{Price Paid by the Agency}$$

The marketing margin varies from market to market, channel to channel, time to time and place to place.

6.2 Market fees, Commission Charges:

The information on market fee, commission charges, taxes and miscellaneous charges are given at Annexure-I.

6.3 EXPORT OF BANANA:

Major problem for exports of fresh Banana from India is low productivity, prevalence of a low level of pre-harvest care, inadequate adoption of post-harvest technology and existence of distortion in marketing channels.

The Agri-Export Zones (AEZs) are in developing stage to meet the market requirements, especially to provide a specific thrust to the quality and supply chain requirements of the target markets.

Export:

India is the major exporter of Banana in the world, the country has exported 50004 MT of Banana worth Rs13064 Lacs during the year 2012-13. The major destinations of India's banana are UAE, Saudi Arabia, Iran, Kuwait and Bahrain respectively.

The export of Bananas during 2010-11, 2011-12, and 2012-13 are given in table No.12 .

Table No.6.1

VALUE IN LAKH AND QUANTITY IN MT

Country	2010-11		2011-12		2012-13	
	Qty.	Value	Qty.	Value	Qty.	Value
UAE	11674	2774	15134	3794	14802	5354
Saudi Arabia	8954	5140	5014	1246	4403	1516
Oman	1537	347	2228	485	3925	1056
Pakistan	0	0	0	0	5202	1037
Nepal	5929	332	9766	514	11206	935
Qatar	1802	450	2053	493	2809	906
Bahrain	10965	656	2437	584	2566	793
Kuwait	5474	1213	3196	718	2220	701
Iran	9352	1958	4126	951	790	208
Maldives	981	136	913	178	645	142
Others	872	226	716	192	1435	415
Total	57539	10232	45582	9155	50004	13064

Source : NHB

Export of Banana 2012-13

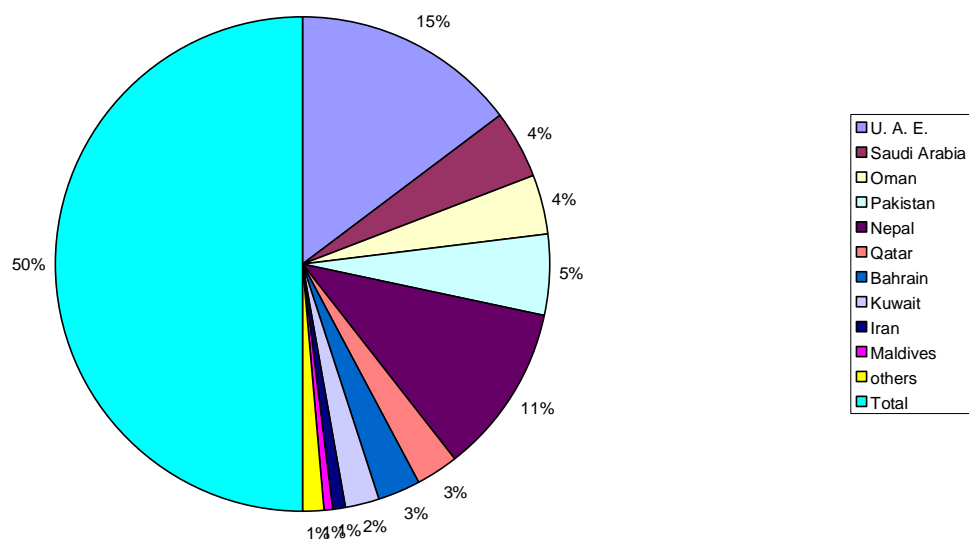


Fig No. 6.1 : Pie diagram showing export of Banana 2012-13

6.3.1 Domestic strength for exports of banana:

- ⇒ India is the largest producer of banana in the world.
- ⇒ More than 27% of total banana production takes place in Maharashtra and Gujarat states.
- ⇒ Rainfall and humidity are quite less particularly in Maharashtra and also to some extent in Gujarat state, resulting in lesser incidence of insects, pests and diseases compared to Central and South America and South East Asian countries.
- ⇒ A superior cultivar namely Grand Naine, well accepted in international market is being cultivated in sizeable area in Maharashtra and Gujarat states.
- ⇒ Red banana cultivar which is preferred in some countries can create a market for itself with support of display, campaign etc.
- ⇒ Banana is cultivated in sufficient acreage and in different agro-climatic conditions and thus is in a position to meet the large demands from importing countries on a continuous basis, provided planting and cultivation is well planned.
- ⇒ Transfer of technology is easy as growers have organized themselves by forming cooperatives/ associations and have branded their product as “Mahabanana”.
- ⇒ Agri Export Zone for promoting exports of banana has been established in Maharashtra in Jalgaon area.
- ⇒ Post harvest handling facilities are available at a small scale at Navsari and Borsad in Gujarat state.
- ⇒ Banana Export Facility Center with mechanical handling system has been set up at Saavada in Jalgaon and Basmanthnagar in district Hingoli in Maharashtra state
- ⇒ Geographically, India is better placed compared to South East Asian, Central and South American countries for exports to Gulf countries.
- ⇒ Special training programmes need to be conducted to give knowledge to farmers about production of export quality banana in Maharashtra.

6.3.2 Measures for Enhancing Competitiveness for Exports:

Countries like Philippines in South East Asia and Ecuador and Costa Rica in Central America are better organized and have large sized banana plantations owned by International companies. Therefore, to enhance competitiveness, following measures need to be taken for making available quality banana of international standard:

- ⇒ Production technology on modern lines needs to be demonstrated to the growers on a massive scale.
- ⇒ Farmers need to be educated about export requirements and international quality standards.
- ⇒ Protocol for post harvest handling of Grand Naine, Nendran and Red banana need to be perfected/ standardized for shipping to Gulf countries by sea.
- ⇒ Most modern packhouse facilities need to be created, to begin within Jalgaon area in Maharashtra and also in Gujarat.
- ⇒ Banana holdings in India are very small and it is not possible to install cable ways for transporting bunches from field to packhouses to avoid bruises. Under these circumstances, groups of farmers need to be encouraged to have system of make shift packhouses, to cut hands from bunches in the field itself and send these hands to central packhouse for further processing /treatment and packing.
- ⇒ It will be advisable to have some working arrangements for ripening of our banana arrivals in importing countries on a regular basis. In the long run, India needs to have its own ripening facilities in one or two countries to begin with.
- ⇒ It is suggested that training to pack house workers about post harvest handling technology and also about international quality standards must be imparted.

6.3.3 Agri-Export Zones:

With a view to promote agricultural exports from the country and providing remunerative returns to the farming community in a sustained manner, the concept of the agri-export zones (AEZ) was floated. These zones have been set up for ‘end to end’ development for export of specific products from a geographically contiguous area.

AEZ are identified by the State Government, and evolve a comprehensive package of services provided by all State Government agencies, State agriculture universities and all institutions, and agencies of the Union Government for intensive delivery in these zones. Corporate sector with proven credentials are encouraged to sponsor new agri-export zone or take over already notified agri-export zone or part of such zones for boosting agri-exports from the zones.

Services, which are managed and coordinated by State Government/corporate sector and include provision of pre/post harvest treatment and operations, plant protection, processing, packaging, storage and related research & development etc. APEDA supplements within its schemes and provisions the efforts of various stake holders. State Governments also make efforts for facilitating such exports.

Units in AEZ would be entitled for all the facilities available for exports of goods in terms of provisions of the respective schemes.

The list of the Agri Export Zones of Banana is as under:

State	Districts
Maharashtra	Jalgaon, Dhule, Nandurbar, Buldhana, Parbhani, Hindoli, Nanded and Wardha.

CHAPTER – VII:

PROCESSING AND USES

Processing:

Fruits normally have a poor shelf life and start deteriorating just after plucking. The quality of the fruits get further lowered during transshipment to the markets. Over and above over ripening is also a big problem. In order to overcome these problems, the processing of fruits should be encouraged. This will improve the market efficiency and income to the farmers on one hand and generate employment on the other hand.

The fruits and vegetables processing industry occupy a key position in the agro-industrial development plan of the country. In order to avoid spoilage and ensure availability during off-season and to earn higher income, the surplus quantities must be either preserved or processed. The processing of the fruits also provides a cushion to stabilize the price during the peak harvest period.

7.1 General sanitary standards during processing:

Quality, health standards and regulations must be strictly applied, otherwise the product will be exposed to contamination by bacteria, mould and yeasts, thus jeopardizing the expected development of an agro industrial enterprise. These measures must be adopted as early as in the production phase, and must continue in the post-harvest, transportation, storage, preparation and processing phases. Ensure that the fruit is in sound conditions for processing.

In line with these principles, the following sanitary standards must be fulfilled and applied by workers on the production premises:

- i) Workers hygiene-workers must wash their hands and clean their nails carefully before engaging in any process. They must keep their nails short, and if possible, use rubber gloves.
- ii) To enter the working area, workers must wear a clean smock, a hair net to protect the food from possible contamination by hair, and a mask to avoid microbial contamination.
- iii) The working utensils and equipment must be cleaned appropriately to remove any waste or residual organic material and sanitized.
- iv) The containers (glass jars and bottles) must be washed with hot water before being filled with food.

- v) The waste generated by the production process must be removed from the production area on daily basis.
- vi) Clean and dry the outer surface of the containers containing the product before sealing, labeling and storing.
- vii) The storage site of the finished product must be hygienic, clean and free from all possible contamination (it must have been previously fumigated). It must also be cool and dry.

7.2 Processing and Uses:

Banana without the peel is a good source of vitamin B6, potassium, and fiber. Banana fruit may be eaten raw or as a cooked vegetable. The fruit can also be processed for a number of food products. Ripe fruits can be pulped for puree for use in a variety of products including ice cream, yogurt, cake, bread, nectar, and baby food. Ripe bananas can be dried and eaten, or sliced, canned with syrup, and used in bakery products, fruit salads, and toppings. Green (unripened) bananas can be sliced and fried as chips. Whole green fruits can also be dried and ground into flour. Vinegar and alcoholic beverages can be made from fermented ripe bananas. Other parts of the banana plant are consumed besides the fruit. The heart of the growing pseudostem is eaten in India. In Southeast Asia, the male bud is eaten as a boiled vegetable. The banana leaves are not eaten but may be used for wrapping food in cooking. The banana foliage and pseudostems are used as cattle feed during dry periods in some banana producing areas. Culled bananas are used to feed cattle and hogs. Bananas are a good energy source but need to be supplemented with protein.

7.2.1 Processing:

Flour and Powder:

Flour can be made from green unripe banana, cooking banana or plantain. Fruits are hand-peeled and sliced or chopped into pieces about 5-10 mm thick. The slices will be dried in the sun by spreading out the slices on mats, on bamboo framework, on cement floors, or on a roof or sheets of corrugated iron or simply on a swept bare ground. Various designs of solar dryers can also be used, or they may be dried in ovens, over fires, in a cabinet dryer or tunnel dryer.



Chips (Crisps):

Various methods of preparing banana or plantain chips have been in practice. Typically, unripe banana or plantain may be thinly sliced vertically or transversely (1.2-0.8 mm thick). The slices are immersed in a sodium or potassium metabisulphate solution (to improve the colour of the final product or to prevent discolouration) and fried in hydrogenated oil at 180-200°C. The fried slices are dusted with salt and antioxidant (e.g. butylatedhydroxytoluene to delay rancidity). Alternatively slices may be dried before frying and the antioxidant and salt are added with the oil. Fried chips should have moisture content of about 1.5 to 2.0%. The temperature at which the chips are fried and the frying time affects their oil content, appearance, texture and flavour. The chips must be packed in moisture proof bags to prevent them absorbing moisture and losing their crispness.



Jam and Jelly:

The various methods of preparing jam and jelly have been in practice. In one method for the preparation of jelly, fully ripe or over-ripe fruits are used. Fruits are hand-peeled and cut into 2 cm pieces or slices. The slices are boiled for 1 hr in 60° Brix sugar syrup at the rate of 1 lb of banana to 1 pint of syrup (454 g to 0.5681). This is then strained and the clear solution is boiled until it sets. The pH should be adjusted to 3.5. Pectin may be added to improve the set. A commercial formula for producing banana jam is as follows: 200 lbs of sugar, 10 gallons of water and 12 ounces of cream of tartar. These are heated to 110°C and then 2.5 gallons of lemon juice (lime juice or citric acid can be used to replace the lemon juice to reduce the pH of the jam to 3.5) are added. The mixture is heated to 107°C until the correct consistency is obtained.



Banana figs:

Fully ripe fruits with a sugar content of about 19.5% are used and are treated with sulphurous acid after peeling, then dried as soon as possible afterwards. Various drying systems have been described using temperatures between 50 and 82°C for 10 to 24 h to give a moisture content ranging from 8 to 18% and a yield of dried figs of 12 to 17% of the fresh banana on the stem.



One factory in Australia uses a solar heat collector on the roof to augment the heat used for drying bananas. Bananas can also be dried by osmotic dehydration, using a technique which involves drawing water from 1/4-in. thick banana by placing them in a sugar solution of 67 to 70 deg. Brix for 8 to 10 h. followed by vacuum-drying at 65 to 70°C, at a vacuum of 10 mm Hg for 5 h. The moisture content of the final products is 2.5% or less, much lower than that achieved by other methods.

Banana Slice:

Several methods for canning of banana slices in syrup are used. Best-quality slices are obtained from fruit at an early stage of ripeness. The slices are processed in a syrup of 25 deg. Brix with pH about 4.2, and in some processes calcium chloride (0.2%) or calcium lactate (0.5%) are added as firming agents.



A method for producing an intermediate-moisture banana product for sale in flexible laminate pouches has been developed. Banana slices are blanched and equilibrated in a solution containing glycerol (42.5%), sucrose (14.85%), potassium sorbate (0.45%), and potassium metabisulphite (0.2%) at 90 deg. C for 3 min. to give a moisture content of 30.2%.

Banana purée :

Banana purée is obtained by pulping peeled, ripe bananas and then preserving the pulp by one of three methods: canning aseptically, acidification followed by normal canning, or quick-freezing.

The bulk of the world's purée is processed by the aseptic canning technique. Peeled, ripe fruits are conveyed to a pump which forces them through a plate with 1/4-in. holes, then onto a homogeniser, followed by a centrifugal de-aerator, and into a receiving tank with 29in. vacuum, where the removal of air helps prevent discoloration by oxidation.



The purée is then passed through a series of scraped surface heat exchangers where it is sterilised by steam, partially cooled, and finally brought to filling temperature. The sterilised purée is then packed aseptically into steam-sterilised cans which are closed in a steam atmosphere.

Banana beverages:

In a typical process, peeled ripe fruit is cut into pieces, blanched for 2 min in steam, pulped and pectolytic enzyme added at a concentration of 2 g enzyme per 1 kg pulp, then held at 60 to 65° C and 2.7 to 5.5 pH for 30 min.

In a simpler method, lime is used to eliminate the pectin. Calcium oxide (0.5%) is added to the pulp and after standing for 15 min. this is neutralised giving a yield of up to 88% of a clear, attractive juice. In another process banana pulp is acidified, and steam-blanching in a 28-in Hg vacuum which ensures disintegration and enzyme inactivation. The pulp is then conveyed to a screw press, the resulting purée diluted in the ratio 1:3 with water, and the pH adjusted by further addition of citric acid to 4.2 to 4.3, which yields an attractive drink when this is centrifuged and sweetened.

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7.2.2 Uses:

Apart from being a very important food product, banana products and by-products have other many different uses and applications:

Banana fiber

It is used for handicraft and art in baskets, carpets and so on. The fiber is also used for the manufacturing of banana paper.

Animal feeding

Bananas which do not arrive to fulfill quality requirements for export and banana waste may be used for animal feeding.

Banana leaves

They are used for wrapping food when cooking in many countries.

Intercropping

In some cases, banana cultivation is used to give shade to other crops that need it, such are coffee or cocoa.

Tourism

Banana production areas can be shown for tourism interests.

Medicinal use

Bananas are considered to be good for the treatment of gastric ulcer and diarrhea. Because they contain vitamin A, bananas and plantains act as an aid to digestion. Due to their high content of B6 vitamin, they help to reduce stress and anxiety. They are also considered beneficial for cancer prevention and heart diseases. The high content of carbohydrates makes of them a very good source of energy, for example, for people practicing sports. Potassium helps to better brain functioning.

The change in consumer eating habits has given place to new preferences as consumers in developed countries have become more sophisticated and more exigent with the bananas they demand, as it has happened with produce and food consumption

In general at present consumers are interested in many additional issues. Consumers

are becoming increasingly aware of the health and nutritive benefits of eating more fresh fruit. They are also more interested in dietary issues, consuming more low fat and sugar food, which favours consumption of fruits. The campaign 5 a day launched by Produce for Better Health Foundation in USA, and extended later, all over the world, is trying to encourage the consumption of fruit on health grounds following this trend towards healthy products.

Banana can be used to avoid the following major diseases,

- ★ Anemia: Because of high iron content in banana, it is very useful for anemia sufferer.
- ★ Blood Pressure: Banana has high potassium and low salt content, helpful to hit blood pressure.
- ★ Memory loss: Recent research report shows that the potassium packed fruit can help to boost the memory. So Banana is very useful to students during their exams.
- ★ Depression: According to MIND survey amongst people who suffered from depression, many felt much recovered after eating a banana. This is because banana has tryptophan. The tryptophan is a protein converts your body into serotonin that make you relax, improve your mood and make you feel happier.
- ★ Hangovers: Drinking banana milkshake sweetened with honey is one of the easiest ways to cure a hangover. Normally the banana has the power to calm the stomach, honey builds up depleted blood sugar levels and milk soothes and re-hydrates your system.
- ★ Heartburn: Banana has a natural antacid which has the power to give relief from Heartburn.
- ★ Morning Sickness: Taking bananas between meals helpful to maintain blood sugar levels up and keep you away from morning sickness.
- ★ Mosquito bites: Rubbing with inner side of the banana skin has the power to reduce the swelling and irritation caused by mosquito.
- ★ Nerves: Because of high vitamin B, banana helps to calm the nervous system.
- ★ Seasonal Affective Disorder (SAD): Banana is very useful for SAD sufferers because they have the natural mood enhancer, tryptophan.
- ★ Strokes: According to the research "The New England Journal of Medicine", the banana cut the risk of death caused by strokes by as much as 40%.
- ★ Temperature control: Banana is very useful for pregnant women to ensure their baby is born with a cool temperature.

- ★ Ulcers: The banana can be used as the dietary food against intestinal disorders because of its soft texture and smoothness.
- ★ Warts: Take a part of banana skin and keep it on the wart area with the yellow side out.

7.2.3 OTHER USES:

Banana and plantain leaves are widely used as plates and for lining cooking pits and for wrapping food for cooking or storage. A section of leaf often serves as an eye-shade. In Latin America, it is a common practice during rains to hold plantain leaf by the petiole, upside-down, over one's back as an "umbrella" or "raincoat". The leaves of the banana are used for thatching, packing and cigarette wrappers. The pseudomonas has been fastened together as rafts. Seat ads for benches are made of strips of dried banana pseudostems in Ecuador. In West Africa, fiber from the pseudostem is values for fishing lines.

In the Philippines, it is woven into a thin, transparent fabric called "agna" which is the principal material in some regions for women's blouses and men's shirts. It is also used for making handkerchiefs. In Sri Lanka, it is fashioned into soles for inexpensive shoes and used for floor coverings. Plantain fibre is said to be superior to that from bananas. In the mid-19th Century, there was quite an active banana fiber industry in Jamaica. Improved processes have made it possible to utilize banana fiber for many purposes such as rope, table mats and handbags. A good quality paper is made by combining banana fiber with that of the betel nut husk. Dried banana peel, because of its 30 to 40% tannin content is used to blacken leather.

The ash from the dried peel of bananas and plantains is rich in potash and used for making soap. That of the burned peel of unripe fruits of certain varieties is used for dyeing **ANIMAL FEED** Rejected ripe bananas, supplemented with protein, vitamins and minerals, and are commonly fed to swine. Green bananas are also used for fattening hogs but, because of the dryness and astringency and bitter taste due to the tannin content, these animals do not care for them unless they are cooked, which makes the costs too high for most growers.

Therefore, dehydrated green banana meal has been developed and, though not equal to grain, can constitute up to 75% of the normal hog diet, 40% of the diet of gestating sows. It is not recommended for lactating sows, nor is ripe bananas even with a 40% protein supplement. Beef cattle are very fond of green bananas whether they are whole, chopped or sliced. Because of the fruit's deficiency in protein, urea is used at the rate of 8.8 lbs (4 kg) per ton, with a little molasses mixed in to mask the flavor.

But transportation is expensive unless the cattle ranch is located near the banana fields. A minor disadvantage is that the bananas are somewhat laxative and the cattle need to be washed down daily. With dairy cattle, it is recommended that bananas constitute no more than 20% of the feed. In the Philippines, it has been found that meal made from dehydrated reject bananas can form 14% of total broiler rations without adverse effects. Meal made from green and ripe plantain peels

has been experimentally fed to chicks in Nigeria. Flour from unpeeled plantains, developed for human consumption, was fed to chicks in a mixture of 2/3 flour and 1/3 commercial chick feed and the birds were maintained until they reached the size of fryers. They were found thinner and lighter than those on 100% chick feed and the gizzard lining peeled in shreds. It was assumed that these effects were the result of protein deficiency in the plantains, but they were more likely the result of the tannin content of the flour which interferes with the utilization of protein (Anon, 1999). Leaves, pseudostems, fruit stalks and peels after chopping, fermentation and drying, yield a meal somewhat more nutritious than alfalfa press cake. This waste material has been considered for use as organic fertilizer in Somalia. In Malaya, pigs fed the pseudostems are less prone to liver and kidney parasites than those on other diets.

CHAPTER – VIII:

MARKETING INFORMATION AND EXTENSION

8.1 Marketing Information:

Marketing information is indispensable in all the stages of marketing right from farm to ultimate consumption. Marketing information is essential for producers in planning and market led production. Recently, Government of India has launched Agricultural Marketing Research and Information Network Scheme through Directorate of Marketing & Inspection (DMI) to bring out improvement in the present market information system by linking all Agricultural produce wholesale markets in the States and Union Territories in a phased manner. The data received from markets is being displayed on the website *www.agmarknet.nic.in*.

8.2 Marketing Extension:

Market extension is a vital service for enlightening the farmers about proper marketing and improving their awareness on various aspects of post-harvest management for efficient and cost effective marketing. Extension service acts as bridge between farmers and various schemes sponsored by the Central, State Govts., Commodity Boards, etc.

8.2.1 Benefits:

Benefits of Market Extension are:-

- Provides the up-to-date information on the arrivals and prices of agricultural commodities of different markets.
- Helps the producers to take right decision, when, where and how much to market their produce.
- Educates the producers/traders about the post-harvest management i.e.
 - a) Harvesting care
 - b) Techniques to minimise losses during post-harvest period.
 - c) Value addition to the produce by proper cleaning, processing, packaging, storage and transportation.
- Orients the producers/traders/consumers about price trends, demand and supply situation etc.
- Orients the producer regarding the importance of grading, proper storage, co-operative/group marketing, direct marketing, contract farming, etc.
- Provides the information about the sources of credit availability, various Govt. schemes, policies, rules and regulations etc.

8.1.1 Sources of Marketing Information:

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

Source / Institution	Activities for marketing information and extension
1	2.
<p>1. Directorate of Marketing and Inspection (DMI), NH-IV, New CGO Complex, Faridabad.</p> <p><u>Website:</u> 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 consumers, producers, graders, etc. ➤ Marketing research and surveys. ➤ Publication of reports, pamphlets, leaflets, Agricultural Marketing journal, Agmark standards etc.
<p>2. Directorate of Economics and Statistics, Shastri Bhavan, New Delhi.</p> <p><u>Website:</u> www.agricoop.nic.in</p>	<ul style="list-style-type: none"> ➤ Compilation of agricultural data on area, production and yield for development and planning. ➤ Dissemination of market intelligence through publication and Internet.
<p>3. Directorate General of Commercial Intelligence and Statistics (DGCIS), 1, Council House Street, Kolkata-1</p> <p><u>Website:</u> www.dgciskol.nic.in</p>	<ul style="list-style-type: none"> ➤ Collection, compilation and dissemination of marketing related data i.e. export-import data, inter state movement of food grains etc.
<p>4. Central Warehousing Corporation (CWC), 4/1 Siri Institutional Area, Opp. Siri fort, New Delhi-110016</p> <p><u>Website:</u> www.fieo.com/cwc/</p>	<ul style="list-style-type: none"> ➤ Farmers Extension Service Scheme 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 food grains. iii) To assist farmers in getting pledge loans from the banks against warehouse receipt. iv) Demonstration of spraying and fumigation methods to control pests.

1	2.
9. Mass Media Support to Agriculture Extension	<p>(Madhya Pradesh), Sambhalpur (Odisha), Shillong (Meghalaya), Hissar (Haryana), Muzzafarpur (Bihar), Dibrugarh (Assam), Varanasi (Uttar Pradesh), Vijaywada (Andhra Pradesh), Gulbarga (Karnataka), Rajkot (Gujarat), Daltonganj (Jharkhand).</p> <p>iii) The third component is use of FM transmitter network of All India Radio (AIR) through 96 FM stations to provide area specific broadcasting.</p>
10. Agriculture-Clinics and Agri-Business by Agriculture Graduates	<p>➤ A central sector scheme “Establishment of Agriculture-Clinics and Agri-business Managed by Agriculture Graduates” is being implemented since 2001-02.</p> <p>➤ The aim is to provide opportunity to all eligible agriculture graduates to support agriculture development through economically viable ventures.</p> <p>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>
11. Different websites on Agricultural Marketing Information	<p>www.agmarknet.nic.in www.agricoop.nic.in www.fieo.com/cwc/ www.ncdc.nic.in www.ikisan.com www.fmc.gov.in www.icar.org.in www.fao.org www.agriculturalinformation.com www.agriwatch.com www.kisan.net www.agnic.org www.nafed-india.com www.indiaagronet.com www.nic.in/eximpol www.agrisurf.com www.Commodityindia.com www.cii.in www.ficci.com</p>

8.1.2 Kisan Call Centre:

The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Government of India launched Kisan Call Centres on January 21, 2004 throughout the country. It has the objective of offering instant solution in local language to the problems faced by the farmers during crop cultivation under diverse challenging situations. The call centres are acting as composite help centres, which consist of a complex tele-communication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by farmers. The subject matter specialists, using telephone and computer interact with farmers to understand their problems and answer their queries as soon as possible. This is a new dimension in agricultural extension management, which makes the full use of on-going information and communication revolution by connecting the farming community in the remotest areas of the country with the experts in agricultural field.

8.1.2.1 Progress of Kisan Call Centre:

Call centre based extension service deliver the knowledge and information exactly as per the requirements of the farming community. This system also helps keep a record of what is being delivered to the farmers in terms of knowledge and information. The Kisan Call Centre scheme is available over the complete country. The Kisan Call Centre scheme has been functioning from 21.1.04. The Call Centres can be accessed by farmers all over the country on common Toll Free Number 1800-180-1551.



8.1.2.2 List of Kisan Call Centres operating in the Country

Sl.No.	Call Centre Location	States Covered
1.	Mumbai	Maharashtra, Goa, Daman, Diu
2.	Kanpur	Uttar Pradesh, Uttranchal
3.	Kochi	Kerala, Lakshadweep
4.	Bangalore	Karnataka
5.	Chennai	Tamil Nadu, Andaman / Nicobar
6.	Hyderabad	Andhra Pradesh
7.	Chandigarh	Chandigarh, J&K, Himachal Pradesh, Punjab
8.	Jaipur	Rajasthan
9.	Indore	Madhya Pradesh, Chattisgarh
10.	Kolkata	West Bengal, Bihar, Odisha
11.	Kolkata	West Bengal, Bihar, Odisha, Jharkhand
12.	Delhi	Delhi/ Haryana
13.	Ahmadabad	Gujarat and Dadra & Nagar Haveli

8.1.2.3. List of nodal officers of Kisan Call Centres in the country:

Director, Incharge, Directorate of Cotton Development, 14, Ramjibhai, Kamani Marg Ballard Estate, P.B.No.1002 Mumbai – 400038 Director_docd@rediffmail.com	Director, Coconut Development Board, Regional Office, AF 6/2004, 7th Street, 11th Main Road, Annanagar, Chennai – 600040 (Tamil Nadu) cdb@tn.nic.in	Managing Director, National Horticulture Board, Plot No.85, Sector 18, Institutional Area, Gurgaon – 122 015 (Harayana) mdnhb@yahoo.com
Managing Director National Cooperative Development Corporation, Hauz Khas, Institutional Area, New Delhi md@ncdc.stpn.soft.net	Director General National Institute of Agricultural Extension Management (MANAGE), Rajednranagar Hyderabad – 500 030 (Andhra Pradesh) dgmanago@manago.gov.in	Director In-charge Directorate of Pulses Development Vindyachal Bhawan, Bhopal (Madhya Pradesh) dpd@hub.nic.in
Coconut Development Officer Coconut Development Board Ministry of Agriculture, Government of India, Khara Bhawan, SRVHS Road, Cochin-682 011 Kerala cdbkochi@vsnl.com	Director Directorate of Wheat Development C.G.O. Complex-I, 3rd Floor, Kamla Nehru Nagar, Ghaziabad- dwd@hub.nic.in 201 002 (U.P.)	Director Directorate of Jute Development Nizam Palace Campus, 234/4, Acharaya J.C. Bose Road, Kolkata – 700020 djd@hub.nic.in
Director Coconut Development Board, Regional Office-cum- Technology Centre, Hulimavu, Bannerhatta Road, Besides Horticulture Farm, Govt. of Karnataka, Bangalore South, Bangalore – 560 076 (Karnataka) Cdb_blr@kar.nic.in	Director General National Institute of Agricultural Marketing, Kota Road, Bambala, Near Sangener, Jaipur-303 906 (Rajasthan) niam@datainfosys.net	Managing Director Small Farmers Agri. Business Consortium (SFAC), NCUI Building, 5th Floor, August Kranti Marg, 3, Siri Institutional Area, Hauz Khas, New Delhi – 110016 sfac@ren02.nic.in

CHAPTER – IX:

ALTERNATIVE SYSTEMS OF MARKETING

9.1 Direct Marketing:

Direct marketing is an innovative concept, which involves marketing of produce by the farmer directly to the consumers/millers without any middlemen. Direct marketing enables producers and other bulk buyers to economize on transportation cost and improve price realization. It also provides incentive to large scale marketing companies 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, Rythu Bazaar in Andhra Pradesh and Krishak Bazaar in Odisha. 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.

Benefits:

- ★ It generates the idea of market oriented production.
- ★ It increases profit of the producer.
- ★ It helps in better marketing.
- ★ It minimizes marketing cost.
- ★ It encourages distribution efficiency.
- ★ It promotes employment to the producer.
- ★ Direct marketing enhances the consumer satisfaction.
- ★ It provides better marketing techniques to producers.
- ★ It encourages direct contact between producers and consumers.
- ★ It encourages the farmers for retail sale of their produce.

9.2 Contract marketing / farming:

Contract marketing/farming is a system of marketing, where selected crop is grown for marketing by farmers under a 'buy-back' agreement with an agency (entrepreneur or trader or processor or manufacturer). In the wake of economic liberalization, it has gained momentum, as the national and multinational companies enter into contracts with farmers for marketing of agricultural produce. They also provide technical guidance, capital and input facility to contracted farmers. Contract marketing/farming ensures continuous supply of quality produce at mutually contracted price to contracting agencies, as well as ensures timely marketing of the produce.

Though, the contract marketing/farming is not prevalent in the marketing of Banana but, it is beneficial to both the parties i.e. farmers and the contracting agencies.

9.2.1 Advantages to farmers:

- ➔ Price assurance, ensuring fair return to the producer.
- ➔ Proper production planning.
- ➔ Assured market.
- ➔ Availability of cost free production and post- harvest technology.
- ➔ Freedom from the clutches of middlemen.
- ➔ Fair trade practices.
- ➔ Credit facility.
- ➔ Crop insurance.
- ➔ Exposure to new technology and best practices.

9.2.2 Advantages to contracting agency:

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

Though, the contract farming is not prevalent in case of marketing of Mandarin, but looking into the benefits of the contract farming, this system may be explored on the trial basis.

9.3 Co-operative marketing:

“Co-operative marketing” is the system of marketing in which a group of producers join together and register them under respective State Co-operative Societies Act to market their produce jointly. The members also deal in a number of co-operative marketing activities i.e. purchasing of produce, grading, packing, processing, storage, transport, finance, etc. The co-operative marketing means selling of the member’s produce directly in the market, which fetches remunerative prices. Co-operative societies, market the member’s produce collectively and reap the advantage of economy of scale to its members. It also provides fair trade practices and protect against manipulations / malpractices. The main objectives of co-operative marketing are to ensure remunerative prices to the producers, reduction in the cost of marketing and monopoly of traders.

The co-operative marketing structure in the different states consists of;

- i) Primary Marketing Society (PMS) at the Mandi level.
- ii) State Co-operative Marketing Federation (SCMF) at the State level.

- iii) National Agricultural Co-operative Marketing Federation of India Limited (NAFED) at the National level.

National Co-operative Development Corporation (NCDC) and State Governments are providing financial assistance and other facilities for development of Co-operative Marketing Societies.

9.3.1 Benefits:

- Remunerative price to producers.
- Reduction in cost of marketing.
- Marketing without commission charges...
- Effective use of infrastructure.
- Credit facilities.
- Reduces malpractices.
- Marketing information.
- Supply of agricultural inputs.
- Collective processing.
- Timely and easy transportation service.

INSTITUTIONAL FACILITIES

9.4 Marketing related schemes of Government / Public Sector:

Name of the scheme / implementing organisation	Facilities provided/salient features/ objectives
1.	2.
1. Marketing Research and Information Network, Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	<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. <p>The scheme provided connectivity to 3026 nodes comprising the State Agricultural Marketing Department (SAMD) /Boards/ Markets. These concerned nodes have been provided with one computer and its peripherals. These SAMD/Boards/ Markets are to 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), Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	<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, standardization and quality control of agricultural produce to improve their marketability.

1.	2.
<p>2. Gramin Bhandaran Yojana (Rural Godowns Scheme), Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.</p>	<p>► 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.</p> <p>► The entrepreneur will be free to construct godown at any place and of any size between 100 to 10,000 MT except for restrictions that it would be outside the limits of Municipal Corporation area. In special conditions, godowns upto 50 MT is also eligible for subsidy and in hilly region it may be 25 MT.</p> <p>► The scheme provides credit linked back-ended subsidy @15 per cent of the project cost with a ceiling of Rs. 28.12 lakh per project and @ 25 per cent of the project cost with a ceiling of Rs. 46.87 lakh per project. For the projects located in North-Eastern states and hilly areas with altitude of more than 1000 m above mean sea level and those belonging to Women Farmers/ their self help groups/ Co-operatives and SC/ST entrepreneurs and their self help groups/ Co-operatives, maximum subsidy admissible is @33.33 percent of the project cost, with a ceiling of Rs. 62.50 lakhs.</p>
<p>3. Scheme for Development / Strengthening of Agricultural Marketing Infrastructure, Grading & Standardization, Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.</p>	<p>To provide additional agricultural marketing infrastructure to cope up with the expected marketable surpluses of agricultural and allied commodities including dairy, poultry, fishery, livestock and minor forest produce.</p> <p>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.</p> <p>To strengthen existing agricultural marketing infrastructure to enhance efficiency.</p> <p>► To promote direct marketing so as to increase market efficiency through reduction in intermediaries and handling channels thus enhancing farmers' income.</p>

1.	2.
<p>3. Scheme for Development / Strengthening of Agricultural Marketing Infrastructure, Grading & Standardization, Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.</p>	<p>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.</p> <p>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.</p> <p>To promote direct integration of processing units with producers.</p> <p>To create general awareness and provide education and training to farmers, entrepreneurs and market functionaries on agricultural marketing including grading and quality certification.</p> <p>This is Reform linked investment scheme. Applicable only in such states/Union Territories, which undertake reforms in APMC Act to allow "Direct Marketing", "Contract Marketing" and to permit agricultural produce markets in private and co-operative sectors.</p> <p>The scheme provides credit linked back-ended subsidy @ 25 per cent of the capital cost of the project with a ceiling of Rs. 50.00 lakh per project. For the projects located in North-Eastern states, in the states of Uttarakhand, Himachal Pradesh, Jammu & Kashmir, hilly and tribal areas, and entrepreneurs belonging to SC/ST and their co-operatives, maximum subsidy admissible is @33.33 percent of the capital cost of the project, with a ceiling of Rs. 60.00 lakhs.</p>
<p>4. Agmark grading and standardization Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.</p>	<p>► Promotion of grading of agricultural and allied commodities under Agricultural Produce (Grading & Marking) Act.1937.</p>

1.	2.
4. Agmark grading and standardization Directorate of Marketing & Inspection, Head Office, N.H.-IV, Faridabad.	<p>► 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 the 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 producer and consumer.</p>
5. Capital Investment Subsidy for Construction/ Modernization Expansion of Cold Storage and Storage's for Horticulture Produce National Horticultural Board, 85, Institutional Area, Sector – 18 Gurgaon - 122015 (Haryana) Website : www.nhb.gov.in	<p>► To promote setting up of cold storages in the country for reducing post harvest losses.</p> <p>► Creation and modernization/rehabilitation of cold storages.</p> <p>► Pattern of Assistance:</p> <ul style="list-style-type: none"> • The assistance will be as credit linked back-ended subsidy @ 40% of the capital cost of project in general areas and 55% in case of Hilly and Scheduled Areas for a maximum storage capacity of 5000 MT per project.
6. Development of Commercial Horticulture through Production and Post-Harvest Management, National Horticultural Board, 85, Institutional Area, Sector – 18 Gurgaon - 122015 (Haryana) Website : www.nhb.gov.in	<p>► To develop post-harvest management infrastructure;</p> <p>► To develop high quality horticultural farms in identified belts.</p> <p>► To improve linkages between horticulture producers and marketers</p> <p>► To create integrated network for marketing of horticulture produce.</p> <p>► To increase producer's share in consumer price.</p> <p>► To encourage networking of schemes for resource mobilization with all other related agencies/organizations.</p>
7. Schemes for Infrastructure Development, Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com	<p>► Establishment of common infrastructure facilities.</p> <p>► Assistance for purchase of specialised transport units for animal products horticulture and floriculture sector.</p>

1.	2.
<p>7. Schemes for Infrastructure Development, Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com</p>	<p>► Assistance to exporters / producers / growers / Cooperative organization and federations for horticulture and floriculture sector for :</p> <ol style="list-style-type: none"> Mechanisation of harvest operation of the produce. Setting up of sheds for intermediate storage and grading / storage / cleaning operation of produce. Setting up of mechanized handling facilities including sorting, grading, washing, waxing, ripening, packaging & palletisation etc. Setting up of both pre cooling facilities with proper handling system as well as cold storage for storing. Providing facilities for preshipment treatment such as fumigation, X-ray screening, hot water dip treatment, Water softening Plant. Setting up of integrated post harvest-handling system (pack houses / green houses with any two or more of the above facilities). Setting up of specialised storage facilities such as high humidity cold storage deep freezers, controlled atmosphere (CA) or modified atmosphere (MA) storage etc.
<p>8. Schemes for Market Development, Agricultural & Processed Food Products Export Development Authority (APEDA), NCUI Building 3, Siri Institutional Area, August Kranti Marg, New Delhi - 110 016 Website: www.apeda.com</p>	<p>► Development of packaging standards and design.</p> <p>► Up-gradation of already developed packing standards.</p> <p>► Assistance to exporters for use of packaging material.</p> <p>► Development and dissemination of market information with base on products, infrastructure etc.</p> <p>► Assistance for conducting surveys, feasibility studies etc.</p>

1.	2.
<p>9. National Horticulture Mission Govt. of India Ministry of Agriculture Department of Agriculture & Cooperation, New Delhi</p> <p>http://nhm.nic.in/</p>	<ul style="list-style-type: none"> ▶ To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies which include research, technology promotion, extension, post harvest management, processing and marketing, in consonance with comparative advantage of each State/region and its diverse agro-climatic feature. ▶ To enhance horticulture production, improve nutritional security and income support to farm households. ▶ To establish convergence and synergy among multiple on-going and planned programmes for horticulture development. ▶ To promote, develop and disseminate technologies, through a seamless blend of traditional wisdom and modern scientific knowledge. ▶ To create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth.
<p>10. Scheme of technology mission for integrated development of horticulture in North Eastern states Jammu & Kashmir, Himachal Pradesh and Uttarakhand (TMNE) Government of India Ministry of Agriculture Department of Agriculture & Cooperation (Horticulture Division) Krishi Bhawan, New Delhi</p> <p>www.dacnet.nic.in/techmissionscheme</p>	<ul style="list-style-type: none"> ▶ To ensure adequate, appropriate, timely and concurrent attention to all the links in the production, post-harvest management and consumption chain in North Eastern states including Sikkim. ▶ To maximise economic, ecological and social benefits from the existing investments and infrastructure created for horticulture development. ▶ To promote ecologically sustainable intensification, economically desirable diversification and skilled employment to generate value addition. ▶ To promote the development and dissemination of eco- technologies based on the blending of the traditional wisdom and technology with frontier knowledge such as bio-technology, information technology and space technology.

1.	2.
<p>10. Scheme of technology mission for integrated development of horticulture in North Eastern states Jammu & Kashmir, Himachal Pradesh and Uttarakhand (TMNE) Government of India Ministry of Agriculture Department of Agriculture & Cooperation (Horticulture Division) Krishi Bhawan, New Delhi</p> <p>www.dacnet.nic.in/techmissionscheme</p>	<p>▶ To provide the missing links in ongoing horticulture development projects.</p> <p><u>The Technology Mission have four Mini Missions:</u></p> <p>i) Mini Mission-I: Research: Coordinated and implemented by ICAR. ii) Mini Mission-II: Production and Productivity: Coordinated by DAC and implemented by the Agriculture / Horticulture Departments of the States. iii) Mini Mission-III: Post-harvest management, marketing and export: Coordinated by DAC and implemented by NHB, DMI, NCDC, NAFED and APEDA. iv) Mini Mission-IV: Processing: Coordinated and implemented by MFPI.</p>
<p>11. National Agriculture Development Programme- Rashtriya Krishi Vikas Yojana (RKVY) Government of India Ministry of Agriculture Department of Agriculture & Cooperation Krishi Bhawan, New Delhi http://india.gov.in</p>	<p>▶ To incentivise the states so as to increase public investment in Agriculture and allied sectors. ▶ To provide flexibility and autonomy to states in the process of planning and executing Agriculture and allied sector schemes. ▶ To ensure the preparation of agriculture plans for the districts and the states based on agro-climatic conditions, availability of technology and natural resources. ▶ To ensure that the local needs/crops/priorities are better reflected in the agricultural plans of the states. ▶ To achieve the goal of reducing the yield gaps in important crops, through focussed interventions. ▶ To maximize returns to the farmers in Agriculture and allied sectors. ▶ To bring about quantifiable changes in the production and productivity of various components of Agriculture and allied sectors.</p>

1.	2.
12 (i) Scheme for Infrastructure Development Ministry of Food Processing Industries, Ministry of Food Processing Industries, Panchsheel Bhavan, August Kranti Marg, New Delhi-110 049 Website: www.mofpi.nic.in	To provide financial assistance for development of facilities like common processing, cold storage, food testing and analysis laboratory, effluent treatment plant, power, water etc. in Food Park, Packaging Centre, Integrated Cold Chain, Value Added Centre, Irradiation Facilities.
12 (ii) Scheme for Technology Upgradation / Establishment / Modernization of Food Processing Industries	To provide financial assistance for the cost of plant and machinery/TCW.
12 (iii) Scheme for Quality Assurance, Codex Standards and Research & Development	Financial assistance for Setting Up/ Upgradation of Quality Control/ Food Testing Laboratory for implementation of Hazard Analysis and Critical Control Points (HACCP), ISO 9000, ISO14000, Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) for Total Quality Management, Bar Coding, Codex Standards Research and Development in Processed Food Sector.
12 (iv) Scheme for Backward and Forward Integration and Other Promotional Activities	<p>Backward Linkage: To increase capacity utilization of Food Processing Industry by ensuring regular supply of raw material through contract farming.</p> <p>Forward Integration: To increase capacity utilization of Food Processing Units by ensuring regular market for their products by establishing linkages with the market.</p> <p>Promotional Activities: To build awareness among the consumers about the advantages of processed food and their quality assurance mechanism. Dissemination of information about the processed food industry through publications, journals, press advertisements. Financial assistance for seminars/workshops /symposiums, studies/ surveys/ feasibility reports to assess the potential and other relevant aspects of Food Processing Industries.</p>

9.4 Institutional credit facilities:

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

The institutional agriculture credit disbursed through co-operatives was 31 per cent, 60 per cent through Commercial Banks and 9 per cent through Regional Rural Banks during 2003-2004.

The institutional credit to agriculture is offered in the form of short term, medium term and long term credit facilities:

Short terms and medium term loans:

Name of scheme	Eligibility	Objective/Facilities
1.	2.	3.
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 (PML)	All categories of farmers.	<ul style="list-style-type: none">➤ This loan is given to help farmers to store produce at 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	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.

1.	2.	3.
3. Kisan Credit Card Scheme	All agriculture clients having good track record for the last two years.	<ul style="list-style-type: none"> ➤ 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; a maximum amount of Rs. 50,000 and Rs. 25,000 respectively.
4. National Agricultural Insurance Scheme	Scheme is available to all farmers – loanee and non-loanee both-irrespective of the size of their holding.	<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 crops as a result of natural calamities, pests and diseases attack. ➤ To encourage the farmers to adopt progressive farming practices, high value in-puts and higher technology in agriculture. ➤ To stabilize farm incomes, particularly in adverse periods. ➤ General Insurance Corporation of India (GIC) is the Implementing Agency. ➤ Sum insured may extend to the value of threshold yield of the area insured. ➤ Coverage of food crops (cereals, millets and pulses), oilseeds and annual commercial / horticultural crops. At present, crops like Sugarcane, Potato, Chilies, Ginger, Onion and Turmeric are covered under the scheme. ➤ Provides subsidy of 50 per cent of premium charged from small and marginal farmers. The subsidy is phased out over a period of 5 years on sunset basis.

9.5 Long terms loans:

Name of scheme	Eligibility	Objective/Facilities
Agricultural Term Loan	All categories of farmers (small/medium and agricultural labourers) are eligible, provided they have necessary experience in the activity and required area.	<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.

9.6 Organisations / agencies providing marketing services:

Name of the organisation and address	Services provided
1.	2.
<p>1. Directorate of Marketing and Inspection (DMI)</p> <p>NH-IV, New CGO Complex Faridabad</p> <p>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 standardization and grading of agricultural and allied produce. ➤ Market development through regulation, planning and designing. ➤ Promotion of cold storage. ➤ Promotion of rural godowns and market infrastructure. ➤ Training of personnel in agricultural marketing. ➤ Undertakes extension and publicity activities to educate producers, traders and consumers. ➤ Providing agricultural marketing information. ➤ Liaison between the Central and State Governments through its regional offices (11) and sub-offices (26) spread all over the country.

1.	2.
<p>2. Agricultural and Processed Food Products Export Development Authority (APEDA)</p> <p>NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016</p> <p>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>3. National Agricultural Cooperative Marketing Federation of India Limited (NAFED),</p> <p>Nafed House, Sidhartha Enclave, New Delhi – 110014</p> <p>Website: www.nafed-india.com</p>	<ul style="list-style-type: none"> ➤ Co-ordinate and promote the marketing and trading activities of its affiliated co-operative institutions; ➤ Make arrangements for the supply of the agricultural inputs required by member institutions; ➤ Promote inter-state and international trade in agricultural and other commodities; ➤ Act as an agent of the government for the purchase, sale, storage and distribution of agricultural products and inputs.
<p>4. Central Warehousing Corporation (CWC), 4/1 Siri Institutional Area, Opp. Siri fort New Delhi -110016</p> <p>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 disinfestations services.

1.	2.
5. National Co-operative Development Corporation (NCDC), 4, Siri Institutional Area, New Delhi-110016 Website: www.ncdc.nic.in	<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 marketing societies is provided towards; <ul style="list-style-type: none"> i) Margin money and working capital finance to augment business operations of agricultural produce. ii) Strengthening the share capital base, and iii) Purchase of transport vehicles.
6. Director General of Foreign Trade (DGFT), Udyog Bhavan, New Delhi. Website:www.nic.in/eximpol	<ul style="list-style-type: none"> ➤ Provides guidelines / procedure of export and import of different commodities. ➤ Allot import-export code number (IEC No) to the exporter of agricultural commodities.
7. Mother Dairy Fruit and Vegetable Private Limited Mother Dairy Fruit and Vegetable Private limited Patparganj, Delhi 110092 www.safalindia.com	<ul style="list-style-type: none"> ➤ It is a subsidiary company of a wholly owned company of the National Dairy Development Board (NDDB). ➤ Mother Dairy sells the Safal range of fresh fruits & vegetables, frozen vegetables and fruit juices at a national level through its sales and distribution networks for marketing food items.. ➤ The company markets an array of fresh and frozen fruit and vegetable products under the brand name SAFAL through a chain of 295 owned Fruit and Vegetable shops and more than 20,000 retail outlets in various parts of the country.
8. State Agricultural Marketing Board (SAMBs)	<ul style="list-style-type: none"> ➤ Implementation of the regulation of marketing of agricultural and allied commodities in the state. ➤ Provide infrastructural facilities for the marketing of notified agricultural produce. ➤ Grading of agricultural produce in the markets. ➤ To co-ordinate all the market committees for information services. ➤ Provide aid to financially weak or needy market committees in the form of loans and grants. ➤ To eliminate malpractices in the marketing system. ➤ To arrange or organise seminars, workshops or exhibitions on subjects relating to agricultural marketing.

MARKETS FEES, COMMISSION CHARGES, TAXES AND MISCELLANEOUS CHARGES IN IMPORTANT
APMS MARKETS OF THE STATE

Name of the State : Odisha

1 Truck/Lorry = 16 Tonnes

Crop : Banana

Sl. No.	Name of the important market	Market fee	License fee Rs./ annum	Sales tax	Octroi	Commission Charges	Market charges Rs./ Per truck	Other charges	Charges paid by whom	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	Not Available	1% sale price of producer	Rs.1000/- p.a.	No	No	No Commission Agent. 4% commission is charged by wholesalers paid by retailers.	Loading : Rs.1850/- Unloading : Rs.1500/- Weighing : As usual	Nil	Loading at source : Wholesalers Unloading at Destination : Wholesalers Loading and unloading at wholesaler Point : Retailer	

Note : Please mention the source from where the data / information collected

Source : Odisha State Agricultural Marketing Board.

MARKETS FEES, COMMISSION CHARGES, TAXES AND MISCELLANEOUS CHARGES IN IMPORTANT
APMS MARKETS OF THE STATE

Name of the State : West Bengal

Crop : Banana

Sl. No.	Name of the important market	Market fee	License fee Rs./ annum	Sales tax	Octroi	Commission Charges	Market charges Rs./ Per truck	Other charges	Charges paid by whom	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	Sheoraphuli	Banana is not notified as Agricultural Produce in West Bengal.								
2.	Barasat									
3.	Howrah									
4.	Machhua (Kolkata)									
5.	Siligudi									
6.	Asansol									
7.	Baharampur									
8.	Krishnanagar									
9.	Kalyani									

Note : Please mention the source from where the data / information collected

Source : West Bengal State Marketing Board, Kolkata.

MARKETS FEES, COMMISSION CHARGES, TAXES AND MISCELLANEOUS CHARGES IN IMPORTANT
APMS MARKETS OF THE STATE

Name of the State : Jharkhand

Crop : Banana

Sl. No.	Name of the important market	Market fee	License fee Rs./ annum	Sales tax	Octroi	Commission Charges	Market charges Rs./ Per truck	Other charges	Charges paid by whom	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	Ranchi	1%	Rs.22/- p.a. (Renewal)	Nil	Nil	8% on Sale price	Loading charges : Rs.2000/- per truck. Unloading charges : Rs.1500/- Per truck.	Nil	Buyer	

Note : Please mention the source from where the data / information collected

Source : APMC Trader, Ranchi.