BY: DR P. CHENNAKRISHNAN

BANANA: GO ORGANIC

With growing consumer appreciation of organically grown fruits, there is an increasing demand for organically grown bananas. A systematic approach to promote organic farming of bananas is therefore required.

India occupies the largest area under banana in the world. It may be noted that 11 per cent of the total global area under banana belongs to India. India also ranks first in banana production, contributing about 23 per cent to the world pool of banana production.

Banana is the second most important fruit crop in India next to mango. Its year-round availability, affordability, varietal range, taste, nutritive and medicinal value make it a favourite fruit among all classes of people. It also has good export potential. Hi-tech cultivation of the crop is an economically viable enterprise leading to increase in productivity, improvement in produce-quality and early crop maturity with the produce commanding premium price.

Banana (Musa sp.) is a large perennial herb with leaf sheaths that form trunk-like pseudostem. Banana has its origin in tropical region of Southeast Asia. It is a nutritional gold mine and is rich in vitamin B6, which helps fight infection and is essential for the synthesis of heme—the iron containing part of haemoglobin. Banana is also rich in potassium and is a great source of fibre.

Edible bananas originated in the Indo-Malaysian region reaching to northern Australia. These were known only in the Mediterranean region in the third century BC, and are believed to have been first carried to Europe in tenth century AD. Early in the sixteenth century, Portuguese mariners transported the plant from West-African coast to South America. The types found in cultivation in the Pacific have been traced to eastern Indonesia from where these spread to the Marquesas and then to Hawaii.

There are two main varieties of bananas—fruit or sweet banana and plantain. Fruit banana is eaten raw out of hand when it turns yellow and develops a succulent sweetness with a soft, smooth, creamy, yet firm pulp. Plantain—a cooking banana—is also referred to as the meal, vegetable

Table I
Banana's Nutritional Value
(per 100 gram)

Principle	Nutrient value	Percentage of RDA
Energy	90 Kcal	4.5%
Carbohydrates	22.84 g	18%
Protein	1.09 g	2%
Total fat	0.33 g	1%
Cholesterol	0 mg	0%
Dietary fiber	2.60 g	7%
Vitamins:		
Folates	20 mcg	5%
Niacin	0.665 mg	4%
Pantothenic acid	0.334 mg	7%
Pyridoxine	0.367 mg	28%
Riboflavin	0.073 mg	5%
Thiamin	0.031 mg	2%
Vitamin A	64 IU	2%
Vitamin C	8.7 mg	15%
Vitamin E	0.10 mg	1%
Vitamin K	0.5 mcg	1%
Electrolytes:		
Sodium	1 mg	0%
Potassium	358 mg	8%
Minerals:		
Calcium	5 mg	0.5%
Copper	0.078 mg	8%
Iron	0.26 mg	2%
Magnesium	27 mg	7%
Manganese	0.270 mg	13%
Phosphorus	22 mg	3%
Selenium	1.0 mcg	2%
Zinc	0.15 mg	1%
Phyto-nutrients:		
Carotene-α	25 mcg	–
Carotene-ß	26 mcg	–
Lutein-zeaxanthin	22 mcg	–

or horse banana. It has lower water content, making it drier and starchier than fruit banana.

Bananas and plantains are grown in every humid tropical region and constitute the fourth-largest fruit crop of the world, following grapes, citrus fruits and apples. World production is estimated to be 28 million tonnes—65 per cent from Latin America, 27 per cent from Southeast Asia, and 7 per cent from Africa. One-fifth of the crop is exported to Europe, Canada, the US and Japan as fresh fruit.

India is a leading banana producer in Asia. Indonesia produces over 2 million tonnes annually while Philippines produces about 500,000 tonnes, exporting mostly to Japan. Taiwan raises over 500,000 tonnes for export. Tropical Africa (principally the Ivory Coast and Somalia) grows nearly 9 million tonnes of bananas each year and exports large quantities to Europe.

Nutritional value

Banana is one of the most popular fruits, ideal for any age group. These are natural no-fuss, sealed in their own wrapper providing a versatile fruit for snack, dessert, cooking or for blending into nutritional milk shakes. Banana is eaten in many ways and has plenty of nutritional and medicinal benefits. Ripe banana is utilised in a multitude of ways in the human diet—from simply being peeled and eaten out of-hand to being sliced and served in fruit cups and salads, sandwiches, custards and gelatins or mashed into ice cream, bread, muffins and cream pies. Banana puree is important as infant food.

Fresh bananas provide adequate levels of minerals like copper, magnesium and manganese. Magnesium is essential for bone strengthening and has cardiac-protective role as well. Manganese is used by the body as a co-factor for the antioxidant enzyme superoxide dismutase. Copper is required in the production of red blood cells.

Because of its impressive potassium content, bananas are highly recommended by doctors for patients with low potassium level. 100 grams of banana pack 358 milligrams of potassium and 90 kcal of energy. It also has 1.09 grams of protein and 2.6 grams of fibre. No wonder banana is considered an important food to boost the health of malnourished children. Those who lack sodium in their diets can't go wrong with banana, with its 1 milligram of sodium. There is also 22.84 grams of carbohydrate in a large banana. Table I gives the nutritional data on banana.

Medicinal uses

All parts of the banana plant have medicinal applications; the flower helps cure bronchitis, dysentery and ulcers; cooked flowers are given to diabetics; the astringent plant sap is beneficial in hysteria, epilepsy, leprosy, fevers, haemorrhages, acute dysentery and diarrhoea, and it is applied on haemorrhoids, insect and other stings and bites; young leaves are placed as poultices on burns and other skin afflictions; the astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhoea and used for treating malignant ulcers; the roots are administered in digestive disorders, dysentery and other ailments; banana-seed mucilage is given in cases of diarrhoea.

Anti-fungal and antibiotic principles are found in the peel and pulp of fully ripe bananas. The antibiotic acts against mycobacteria. A fungicide in the peel and pulp of green fruits is active against a fungus disease of tomato plants. Norepinephrine, dopamine, and serotonin

are also present in the ripe peel and pulp. The first two elevate blood pressure while serotonin inhibits gastric secretion and stimulates the smooth muscles of the intestines.

Some of the specific diseases known to be cured by banana are:

Anaemia. High in iron, banana is believed to stimulate the production of haemoglobin in the blood and so helps in cases of anaemia.

Blood pressure. Banana is extremely high in potassium yet low in salt, making it a perfect food for helping to beat blood pressure. Even the US Food and Drug Administration has allowed the banana industry to make official claims for the ability of banana to lower the risk of blood pressure and stroke.

Brain power. A study on 200 students in a school showed that eating bananas at breakfast, break and lunch improved their brainpower. Research has shown that the potassium-packed fruit can assist learning by making pupils more alert.

Constipation. The fruit contains good amount of soluble dietary fibre. Including bananas in the diet can help restore normal bowel action, helping to overcome constipation without resorting to laxatives.

Depression. According to a recent survey undertaken amongst people suffering from depression, many felt much better after eating a banana. This is because banana contains tryptophan—a type of protein that the body converts into serotonin, which is known to relax you down, improve your mood and generally make you feel happier.

Hangovers. One of the quickest ways of curing a hangover is to make a banana milkshake, sweetened with honey. Banana calms the stomach and along with honey, builds up depleted blood-sugar levels. The milk soothes and rehydrates your system.

Heartburn. Bananas have a natural antacid effect in the body so it provides relief during heartburn.

Morning sickness. Snacking on bananas between meals helps to keep blood-sugar levels up and avoid morning sickness.

Mosquito bites. Rubbing the mosquito-bitten area with the inside of a banana skin reduces swelling and irritation.

Overweight and at work. Studies at the Institute of Psychology in Austria found that pressure at work leads to gorging on comfort-food like chocolates and crisps. Looking at 5000 hospital patients, researchers found that the most obese were more likely to be in high-pressure jobs. The report concluded that to avoid panic-induced food cravings, we need to control our blood-sugar levels by snacking on high-carbohydrate foods such as bananas every two hours to keep levels steady.

PMS. Banana contains vitamin B6, which regulates blood-glucose levels and positively affects your mood.

Seasonal affective disorder (SAD). Banana can help SAD sufferers as it contains the natural mood enhancer—trypotophan.

Smoking. Bananas can help people to quit smoking as their high levels of vitamins C, A1, B6, B12 as well as potassium and magnesium, help the body to recover from the effects of nicotine withdrawal.

Stress. Potassium is a vital mineral, which helps normalise the heartbeat, sends oxygen to the brain and regulates the body's water-balance. When we are stressed, our metabolic rate rises, thereby reducing our potassium levels. These can be rebalanced with the help of a high-potassium banana snack.

Infections. The fruit is a good source of vitamin C (about 8.7 milligram per 100 gm). Consumption of foods rich in vitamin C helps body to develop resistance against infectious agents and scavenge harmful oxygen-free radicals.

Strokes. According to a research

Table II

Area, Production and Productivity of Banana

	Area (ha)	Production ('000 tonnes)	Average productivity (tonnes/ha)
World	4,544,702	69,280	15.20
India	529,700	16,225	30.63

Source: FAOSTAT

Table III

Area, Production and Productivity of Banana

Year	Area ('000 ha)	Per cent of total fruit area	Production ('000 MT)	Per cent of total fruit production	Productivity (MT/ha)
1991-92	383.9	13.4	7790.0	27.2	20.3
2001-02	466.2	11.6	14,209.9	33.0	30.5
2002-03	475.3	12.5	13,304.4	29.4	28.0
2003-04	498.6	10.7	13,856.6	30.4	27.8
2004-05	589.6	11.9	16,744.5	34.0	28.4
2005-06	569.5	10.7	18,887.8	34.1	33.2
2006-07	604.0	10.9	20,998.0	35.3	34.8
2007-08	658.0	11.2	23,823.0	36.3	36.2
2008-09	709.0	11.6	26,217.0	38.3	37.0
2009-10	770.3	12.2	26,469.5	37.0	34.4

Source: Indian Horticulture Database 2010

Table IV

State-Wise Area, Production and Productivity of Banana

(area in '000 ha, production in '000 MT, productivity in MT/ha)

State	2007-08			2008-09			2009-10		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Maharashtra	80.0	4962.9	62.0	80.0	4960.0	62.0	85.0	5200.0	61.2
Tamil Nadu	114.1	6116.5	53.6	124.4	6667.0	53.6	113.7	4980.9	43.8
Gujarat	57.7	3157.7	54.7	60.9	3571.6	58.7	61.9	3779.8	61.0
Andhra Pradesh	75.2	2631.2	35.0	80.1	2804.0	35.0	80.6	2819.6	35.0
Karnataka	70.5	1793.3	25.4	75.4	1918.8	25.4	104.4	2132.3	20.4
Madhya Pradesh	15.2	788.2	51.9	28.8	1498.0	51.9	33.0	1459.8	44.2
Bihar	30.5	1329.4	43.6	31.3	1373.6	43.9	31.5	1435.3	45.6
Uttar Pradesh	–	–	–	–	–	–	30.4	1138.6	37.41
West Bengal	37.4	892.2	23.9	39.8	954.1	23.9	41.0	982.2	23.96
Assam	44.1	610.9	13.9	47.9	852.6	17.8	53.4	805.2	15.1
Kerala	61.5	493.9	8.0	59.8	472.9	7.9	51.3	406.2	7.92
Others	71.7	1046.8	14.6	80.4	1144.5	14.2	84.2	1329.5	15.79
Total	**658.0**	**23,823.0**	**36.2**	**709.0**	**26,217.0**	**34.4**	**770.3**	**26,469.5**	**34.36**

Source: Indian Horticulture Database 2010

published in The New England Journal of Medicine, eating bananas as part of a regular diet can cut the risk of death by strokes by as much as 40 per cent.

Temperature control. Many cultures see banana as a cooling fruit that can lower both the physical and emotional temperature of expectant mothers. In Thailand, for example, pregnant women eat bananas to ensure that their baby is born with a cool temperature.

Ulcers. Banana is used as a dietary food against intestinal disorders because of its soft texture and smoothness. It is the only raw fruit that can be eaten without distress in over-chronic ulcer cases. It also neutralises over-acidity and reduces irritation by coating the lining of the stomach.

Instant energy. Banana pulp is composed of soft, easily digestible flesh with simple sugars like fructose and sucrose, which replenish energy and revitalise the body instantly. For these qualities, banana is eaten by athletes to get instant energy and as a supplement food in the treatment plan for underweight children.

Ageing and diseases. Banana contains many health-promoting flavonoid poly-phenolic antioxidants such as lutein, zeaxanthin, beta and alpha carotenes in small amounts. These compounds help act as protective scavengers against oxygen-derived free radicals and reactive oxygen species that play a role in ageing and various disease processes.

International scenario

Banana is the fifth-largest agricultural commodity in world trade after cereals, sugar, coffee and cocoa. India, Ecuador, Brazil and China alone produce half of total bananas of the world. The advantage of this fruit is its availability round the year. The present scenario of area, production and productivity of banana is given in Table II.

According to FAO estimates, the major banana exporting countries are Ecuador, Colombia, Costa Rica and Philippines and major importing countries are the US, Belgium, Germany and UK. As in the case for most tropical products, due to special climatic conditions needed to grow bananas, these are mainly produced in developing countries. Around 98 per cent of world production takes place in developing countries. Developed countries are the usual destination for export bananas. In 2007, around 130 countries produced bananas. However, production as well as exports and imports of bananas are highly concentrated in a few countries.

The ten major banana producing countries accounted for more than 75 per cent of total banana production in 2007. Furthermore, India, China, Philippines, Brazil and Ecuador alone produced more than 60 per cent of the total world banana production. This concentration of banana production has increased over time although showing a different regional distribution.

National scenario

In recent years, considering the adverse impact of indiscriminate use of chemicals, new trend for organic

production of banana is increasing in the country. A new name, i.e., 'green foods,' has been coined for this. This refers to organically-grown crops, which are not exposed to any chemicals right from the source of planting material to the final post-harvest handling and processing. It is based on recycling of natural organic matter. In this system, nutritional requirements are met through the use of enriched composts, cakes, promotion of green manure, interseeding cover crops, mulching, etc, while pests and diseases are kept below threshold level through integrated crop management.

The major banana producing states of India are Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Assam and Madhya Pradesh.

Although separate data on organic banana is not available, the area, production and productivity of banana from 2001-02 to 2009-10 are presented in Table III and state-wise area, production and productivity in Table IV.

Major Banana Producing Belts

1. Bihar (Hazipur and Bhagalpur)
2. West Bengal (Hoogly, 24 Pargana North & Nadiya)
3. Maharashtra (Jalgaon, Ahmednagar, Dhule, Nanded, Parbhani)
4. Gujarat (Bharuch, Jhagadiya, Rajpipla, Surat, Narmada, Varodara & Balsad)
5. Madhya Pradesh (Bhuranpur, Barwani and Dhar)
6. Andhra Pradesh (east Godavari, west Godavari, Kurnool, Cuddapah)
7. Karnataka (Chamrajnagar, Mysore, Ramnagar, Bangalore Rural, Tumkur, Belgaon, Bagalkot)
8. Tamil Nadu (Coimbatore, Erode, Kanyakumari, Karur, Theni, Thiruvannamalai, Thoothukudi, Thiruchirapalli, Vellore and Thanjavur)
9. Kerala (Nendrum)

Varieties cultivated

Commercially, bananas are classified into 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*, grand naine, etc. Grand Naine—an imported variety from Israel—is gaining popularity and may become the most preferred variety due to its tolerance to biotic stresses and good-quality bunches. The fruit develops attractive uniform yellow colour with better shelf life and quality than other cultivars. Important banana varieties cultivated in different states of India are given in Table V.

Table V

Important Banana Varieties Cultivated in India

State	Varieties grown
Andhra Pradesh	Dwarf Cavendish, Robusta, Rasthali, Amritpant, Thellachakrakeli, Karpoora 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), Gandevi 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
Orissa	Dwarf Cavendish, Robusta, Champa, Patkapura (Rasthali)
Tamil Nadu	Virupakshi, Robusta, Rad Banana, Poovan, Rasthali, Nendran, Monthan, Karpuravalli, Sakkai, Peyan, Matti
West Bengal	Champa, Mortman , Dwarf Cavendish, Giant Governor, Kanthali, Singapuri

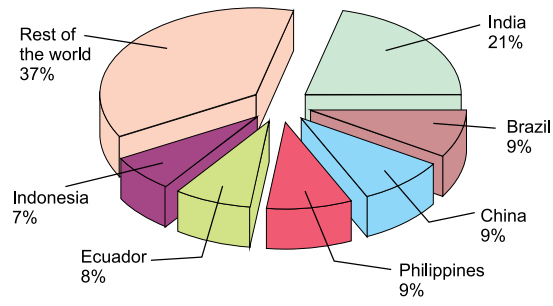
Economic importance

Banana is a very popular fruit due to its low price and high nutritional value. The fruit is easy to digest and free from fat and cholesterol. Banana powder is used as the first baby food. It helps in reducing 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 is 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 bags, pots and wall hangers. Rope

Graph I

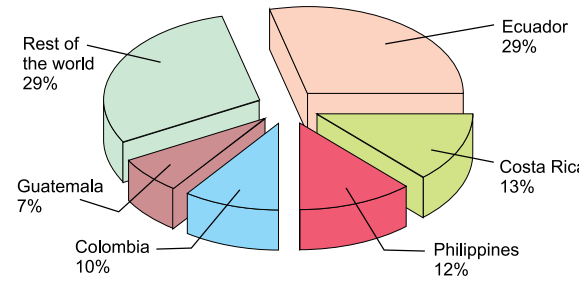
Distribution of the World Banana Production



Source: UNCTAD Secretariat from FAO statistics

Graph II

World Banana Exports



Source: UNCTAD Secretariat from FAO statistics

and good-quality paper can be prepared from banana waste. Also, banana leaves are used as healthy and hygienic eating plates.

Indian export of fresh banana

The productivity per hectare in India is more than twice that of the world. Even though nearly 23 per cent of total world output is produced in India, the export is negligible when compared to other countries. The exports of Indian banana are mainly to UAE, Saudi Arabia and other Gulf countries. The exports of fresh banana from India from 2007-08 to 2009-10 are given in Table VI.

World banana exports

World exports of bananas show a high level of concentration, with developing countries accounting for the bulk of exports. Only Latin America and the Caribbean supplied about 70 per cent of world exports in 2006. The four leading banana exporting countries in 2006 (Ecuador, Costa Rica, Philippines and Colombia) accounted for 64 per cent of world exports with Ecuador alone providing more than 30 per cent. The share of the American region (South, Central America and the Caribbean) decreased from 80 per cent on an average over the 1970-1980 decades to 70 per cent in the 2000s. Within this region, the share of each sub-region has also fluctuated. For instance, the share of the Caribbean region has fallen from 8 per cent in the 1970s to less than 2 per cent in the 2000s. Furthermore, the share of Central America has decreased from 42 per cent of world exports in the 1970s to 26 per cent in 2006, while in the same period South America's share increased from 28 to 40 per cent.

For major exporting countries like Ecuador or Costa Rica, exports of bananas represented 9.3 per cent and 7.7 per cent of the total value of exports in 2006, respectively. The highest levels of dependence on banana exports can be found in the Windward Islands countries—Saint Lucia, St Vincent, Grenadines and Dominica.

Table VI

Export of Banana from India

(Quantity in kg, value in Rupees)

Country	2007-08		2008-09		2009-10	
	Quantity	Value	Quantity	Value	Quantity	Value
United Arab Emirates	5264.9	1185.84	10,208.1	2475.51	18,644.2	4744.37
Saudi Arabia	1911.8	389.92	5123.1	1089.60	9416.2	2426.74
Kuwait	916.2	185.71	1532.8	383.77	5551.8	1616.17
Iran	22.0	3.44	23.0	2.65	5203.7	1166.97
Bahrain	1011.8	215.81	1262.5	445.51	2890.5	1070.67
Qatar	784.2	172.55	1347.5	318.21	2684.2	843.32
Oman	683.5	147.85	947.2	224.62	1977.0	526.21
Nepal	4867.3	169.10	7855.4	304.02	6558.5	347.29
Maldives	830.1	79.79	1242.0	139.85	648.0	104.87
Bangladesh	130.1	9.43	88.4	9.47	95.0	35.58
USA	18.9	4.81	46.1	8.15	105.4	30.58
UK	131.0	22.79	121.7	26.21	76.3	18.77
Others	90.7	20.90	603.7	117.9	468.4	93.90
Total	**16,662.6**	**2607.94**	**30,401.5**	**5545.44**	**54,319.2**	**13,025.47**

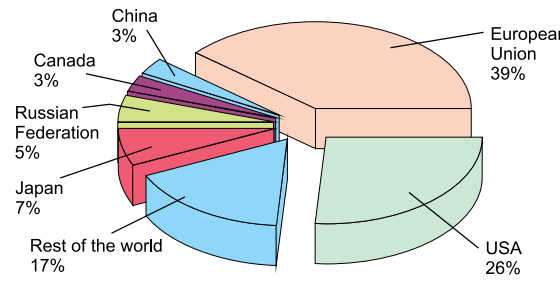
Source: APEDA Website, March 2011

Banana imports

From a historical perspective, banana imports are relatively concentrated. The main importing areas are European Union, the US and Japan, which together accounted for more than 70 per cent of total world imports in 2006, while the first ten banana importing countries represented more than 80 per cent of total imports.

Graph III

Banana Imports



Source: UNCTAD Secretariat from FAO statistics

Problems and suggestions

Assistance under most of the horticulture schemes is based on cost norms of the ninth plan, which has became quite irrelevant in the current situation, where cost of all the inputs have increased by many folds. To make the assistance more realistic and fruitful, review of cost norms, greenhouses and shade nets, micro-irrigation, post-harvest management and market infrastructure is recommended.

The current financial assistance currently for area expansion is not adequate to enable high-density plantations and for cultivation of high-capital crop like banana.

India has the potential to emerge as a major exporter of organically grown bananas by promotion of bio-fertilisers, bio-pesticides, recycling the wastes of eco-friendly inputs and setting up national certification schemes and accreditation agencies to certify organic products in the country.

Five to ten banana growers who undertake common production and marketing plan for identified and committed markets, can comprise a cluster. Through these clusters, assistance on how to access inputs, information-sharing on sources of quality planting materials and proper cultural management, and provision of technical assistance from the government and other resource organisations can be extended to the member growers.

Programme on promotion of organic farming lacks focus and technology. It therefore needs to be detached and carried out under a special authority. Also, community-based initiatives for organic farming, production of bio-fertiliser, bio-control, training in harvesting and post-harvesting, etc are required.

With growing consumer appreciation of organically grown fruits, there is also an increasing demand for organically grown bananas. A systematic approach to promote organic farming in bananas is required.

The country should tap the huge potential for export of banana. The quality of the produce is the key to improving the market share in the international banana market.

There is also a need to develop infrastructure for better handling, transportation and storage of banana for both the domestic and export markets. Market promotion, research and identification of new markets for exports should also be taken up on priority. Given the challenges posed by climate change, there is a need to promote global partnership initiatives to share expertise and technologies to overcome these. ■

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