

Review Article

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Marketing and Production of Fruits and Vegetables in India

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ABSTRACT

India is one of the important fruit and vegetable producing countries in the world. In production, it ranks second after China in the case of both fruits and vegetables. India support more than 17 % of the population with only 2.4 % land share. At the global level, it appears that we are slowly moving towards global food crisis. Recently published special report of UN on the Right to Food estimated that nearly one billion people sleep without food across the world, and among every six seconds a child dies of malnutrition. Over the past few years, horticulture has made remarkable progress in terms of expansion in area and production under different crops, increase in productivity, crop diversification, technological interventions for production and post-harvest and forward linkages through value addition and marketing. Fruits and vegetables account for nearly 90% of the total horticulture production in the country. There are several challenges namely tumultuous weather, seasonal cyclones, occasional drought, demographic pressure, industrialization, urbanization and unprecedented use of pesticides and compulsion for migration of rural masses to urban areas, especially for their livelihood. Albeit, there has been a major change in various sectors of horticulture, which resulted in enhanced production of horticulture recent years. Horticulture is not merely a means of diversification but forms an integral part of food, nutritional security and poverty alleviation, and also an essential ingredient of economic security. India, like many other countries, is very concerned about food security, thus rural development has become primary area of focus in the current agricultural and horticultural development programs.

Keywords

Fruits, Vegetables,
Horticulture,
Production, India.

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Introduction

India is considered as the fruit and vegetable basket of the world. It being a home of wide variety of fruits and vegetables holds a unique position in production figures among all countries. It is the second largest producer of fruits after China in the world with an annual production of 88.98 million tonnes from an area of 7.21 million hectares. It is also the second largest producer of vegetables next to China with an annual production of 162.89

million tonnes from an area of 9.39 million hectares (Anonymous, 2014). This is possible because of agro climatic variations, enormous biodiversity, fertile soil and a large cultivable area. Indian agriculture has reached at the peak production level of various crops but the nutritional security is still a big question mark in front of all planners and researchers. India accounts for 16 per cent of world production of vegetables and 11 per cent of the world's

fruit production. It is the largest producer of mangoes, bananas, papaya, sapota, chillies, ginger and okra etc. The horticulture sector has witnessed a tremendous growth as a result of investment through National Horticulture Mission (NHM) and a number of other programmes (Singh and Toppo, 2010). Fruits and vegetables play an important role in agriculture and industrial economy. These crops, which are among the perishable commodities, are important ingredients of human diet. Fruits are one of the oldest forms of food known to human being. Moreover, in a country like India, where 20-40 per cent of the population is vegetarian, the need of fruits and vegetables in our diet is evident. Almost all fruits and vegetables contain varying amount of food contents, such as carbohydrates, fats, proteins, vitamins, minerals, etc. While carbohydrates, fats and proteins can be derived from other foods like cereals, sugar, pulses and oil seeds also, but vitamins and minerals are mainly obtained from fruits and vegetables. Vegetables are plant parts varying in their water, protein, vitamin, mineral and carbohydrate contents. Green leafy vegetables are good source of folic acid and iron. Expenditure on vegetables forms 11 per cent of total food expenditure in the rural India and 10.5 per cent in urban India (Singh and Suhag, 2010).

Presently horticulture contributes 28 per cent of agricultural GDP (Gross domestic product). Country has emerged as the world's largest producer of coconut and tea and the second largest exporter of coffee, cashew and spices. Only 2 per cent of horticulture produce is processed, 0.4 per cent is exported and 22 per cent is lost or get wasted in market chain (Amarasinghe *et al.*, 2008). Exports of fresh and processed fruits, vegetables, cut flowers, dried flowers have also been picking up. The ongoing economic reforms in India are likely to result in structural changes in agriculture particularly in favour of fruit and

vegetable crops, which has great potential to increase farm income as well as nutritional status of the citizens of the nation. On demand side, the increasing purchasing power and more working women have positive impact on changes in life style and food consumption habits of Indian population (Amarasinghe *et al.*, 2007). The National Sample Survey (NSS) suggests that there has been a decline in per capita cereal consumption since the early 1970s. It is estimated that to fulfill the increased demand for high value horticultural crops in South Asia, the production of these crops has to be increased by 142 per cent by 2020.

The Fruits and Vegetables (F&V) sector has been a driving force in stimulating a healthy growth trend in Indian agriculture. Given the rising share of high value commodities in the total value of agricultural output and their growth potential, this segment is likely to drive agricultural growth in the years to come (ASSOCHAM, 2013).

It plays a unique role in India's economy by improving the income of the rural people. Cultivation of fruit and vegetables is substantially more labor-intensive than growing cereal crops and offers more post-harvest opportunities to add value (Joshi *et al.*, 2004; Weinberger and Lumpkin, 2005). The efficiency of marketing for fruits and vegetables in India has been of significant concern in the recent years. Poor efficiency in the marketing channels and inadequate marketing infrastructure are believed to be the cause of not only high and fluctuating consumer prices, but also a little amount expended by consumer reached to the farmers (Kaul, 1997). Indian farmers typically depend heavily on middlemen particularly in fruits and vegetable marketing. The producers and the consumers often get a poor deal and middlemen control the market, but do not add much value. There is also massive wastage,

deterioration in quality as well as frequent mismatch between demand and supply both spatially and over time.

The study also made an attempt to identify the prevailing value chain from the Farmer → Pre-harvest contractor → Commission Agent → Wholesaler → Retailer → Consumer in terms of costs, prices and their shares in the selected markets.

Emerging challenges for horticulture

The organized supply of a wide range of reasonably priced horticultural crops in most developed countries has led to a marked gratification about the need for ongoing research and development (R&D) programmes in horticulture. Consequently, many governments world-wide have scaled back funding for food production (at least in the applied areas of R&D) and unfortunately, most research-driven universities have now disbanded horticulture/horticultural science departments and combined them into plant science departments with a very strong focus on the molecular sciences. On the contrary, the basic necessity for research on horticultural crops has not decreased, rather the challenges have increased in complexity given the existing consumer demands for affordability, safety and continuity of supply; increasing needs to achieve sustainable practices; requirements to deal with challenges originating from a more uneven climate, the loss of productive soils through urban intrusion, and the loss of low-cost labour. Hence, specific priorities, as given below need to be identified for horticultural research to meet such challenges.

With ever increasing public consciousness, the promotion of healthy habit benefits through the eating of various fresh and dried fruits and vegetables as well as their juices, dried products and extracts-many of which

have extensive on-label claims (Martin and Luxton, 2005) is on the rise. However many such claims have not in fact been clinically confirmed and regulators are increasingly requiring label claims to either be substantiated or removed. Obviously, to correctly determine the presumed health benefits in many fruits and vegetables would be an interesting area of endeavor where there is a union of horticultural science with nutritional and medical research. Further, owing to increased consumer interest towards the eating of fresh rather than frozen produce, another challenge for horticultural science is to improve methods for short term storage so that best quality is retained rather than to focus on longer-term storage for prolonged marketing. The concept of sustainability of horticultural crops narrate both to the use of resources, such as water and nutrients, in a way which considers future needs, and the accountable use of objectionable compounds such as pesticides which will not compromise the quality of the environment.

Overview of fruit and vegetable economy of India

This section gives a brief account of fruits and vegetables economy of India. This is examined in terms of the production and productivity of major fruits and vegetables at the national level as well as in various states along with the export and import status.

Fruits and vegetables production in India

India ranks second in the world in the combined production of fruits and vegetables. Out of 654 million tons of fruit production in the world, India accounts for about 89 million tons sharing about 13.6% of world's production. Of the 1160 million tons of vegetables produced in the world, India produces as much as 163 million tons and so India's share in the world's vegetable market

is about 14 per cent. To boost the production and productivity of vegetables and fruits in the country, government is implementing Horticulture Mission for North East and Himalayan States (HMNEH) including Uttarakhand and National Horticulture Mission (NHM) in the remaining states under Mission for Integrated Development of Horticulture (MIDH). These schemes provide support for production of planting material, high yielding variety vegetable seed production, vegetable cultivation, rejuvenation of senile orchards, protected cultivation, creation of water resources, creation of infrastructure to prevent post-harvest losses of horticultural crops and for adoption of integrated nutrient management (INM)/integrated pest management (IPM).

The vast production base offers India tremendous opportunities for export. During 2015-16, India exported fruits and vegetables worth Rs. 8,391.41 crores which comprised of fruits worth Rs. 3,524.50 crores and vegetables worth Rs. 4,866.91 crores. Mangoes, walnuts, grapes, bananas, pomegranates account for larger portion of fruits exported from the country while onions, okra, bitter gourd, green chillies and potatoes contribute largely to the vegetable export basket. The major destinations for Indian fruits and vegetables are UAE, Bangladesh, Malaysia, Netherland, Sri Lanka, Nepal, UK, Saudi Arabia, Pakistan and Qatar. Though India's share in the global market is still nearly 1% only, there is increasing acceptance of horticulture produce from the country. This has occurred due to concurrent developments in the areas of state-of-the-art cold chain infrastructure and quality assurance measures (APEDA, 2017).

Fruit and vegetable marketing

Marketing of horticultural crops is quite complex and risky due to the perishable

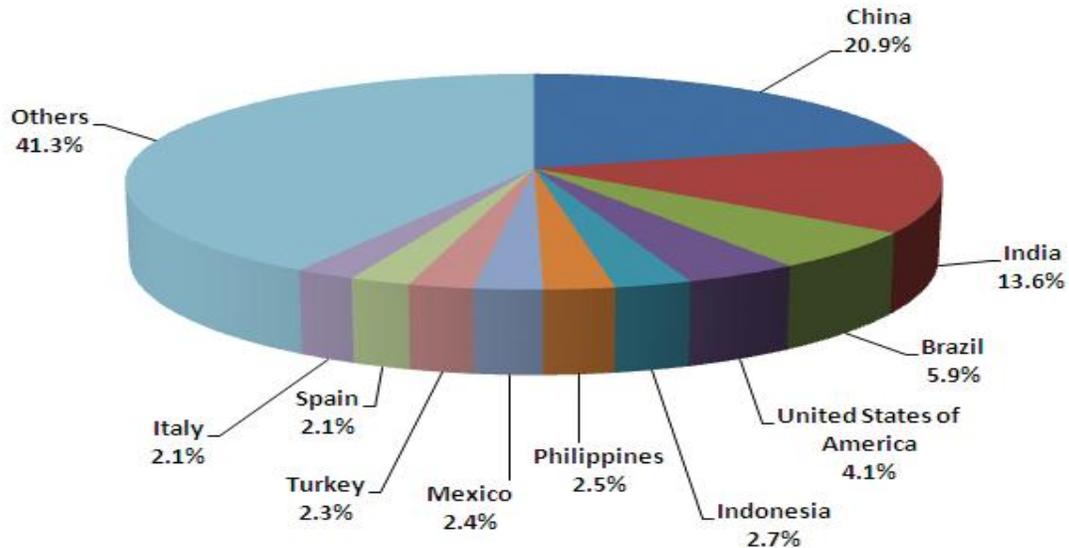
nature of the produce, seasonal production and bulkiness. The spectrum of prices from producer to consumer, which is an outcome of demand and supply of transactions between various intermediaries at different levels in the marketing system, is also unique for fruits and vegetables. Moreover, the marketing arrangements at different stages also play an important role in price levels at various stages viz. from farm gate to the ultimate user. These features make the marketing system of fruits and vegetables to differ from other agricultural commodities, particularly in providing time, form and space utilities. While the market infrastructure is better developed for food grains, fruits and vegetables markets are not that well developed and markets are congested and unhygienic. The markets in many of the major cities in some states are not covered by market legislation and continue to function under civic body as well as private ownership.

Some studies have shown that producers' share in consumers' rupee is comparatively lower for perishable crops (Saikia, 1985; Singh, 1985; Ashturker and Deole, 1985). This could be due to a variety of factors such as number of intermediaries, cost of various market functions rendered by intermediaries, spread of location of the producers and consumers. Further the degree of perishability, variety and quality, and various market imperfections, market infrastructure etc. also influence the marketing costs and price levels. Producers' share was found to be relatively high in areas where better infrastructure facilities for marketing were made available. Some studies have cited examples of an improvement in producers' share over a period of time due to improvement in market infrastructure, such as cold storage facilities. On the other hand the low share of consumers' rupee for potato growers in different parts of the country may be due to high margins of intermediaries.

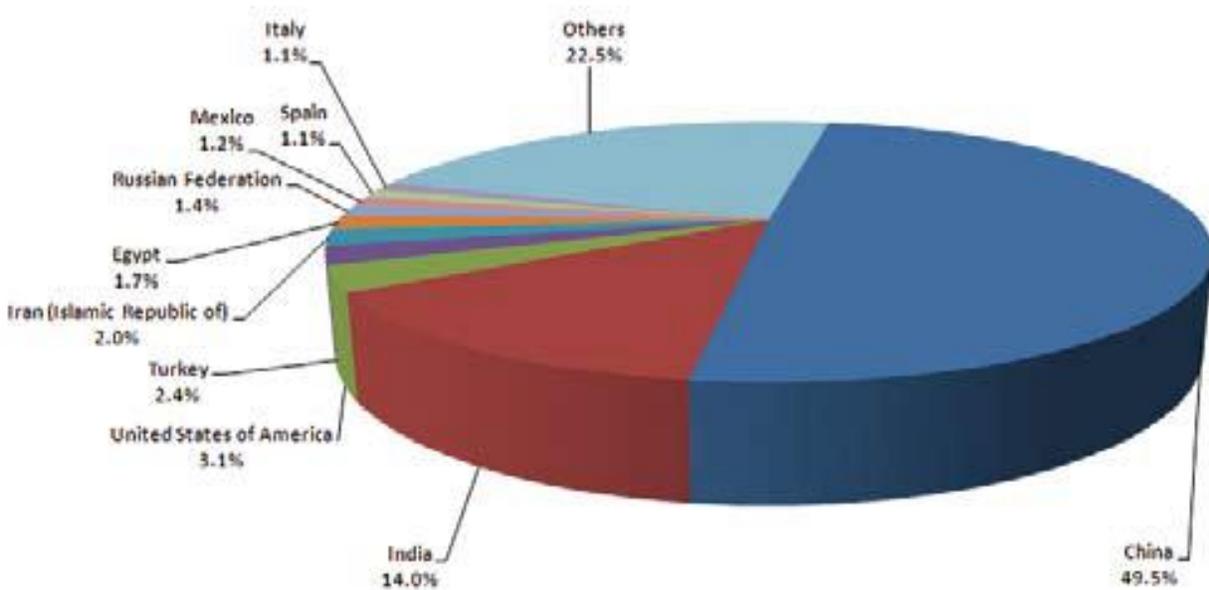
Producers' share also often varied during peak and lean seasons (Subbanarasaiah, 1991). Substantial variation in producers' share in consumers' rupee for fruits and vegetables was also observed even in the same location itself.

Damage cost, intermediaries exploitative practices, perishability of product, transportation cost and high storage cost etc. have been reported to be the major problems of marketing vegetables and fruits in farmers' market (Kumar, 2012).

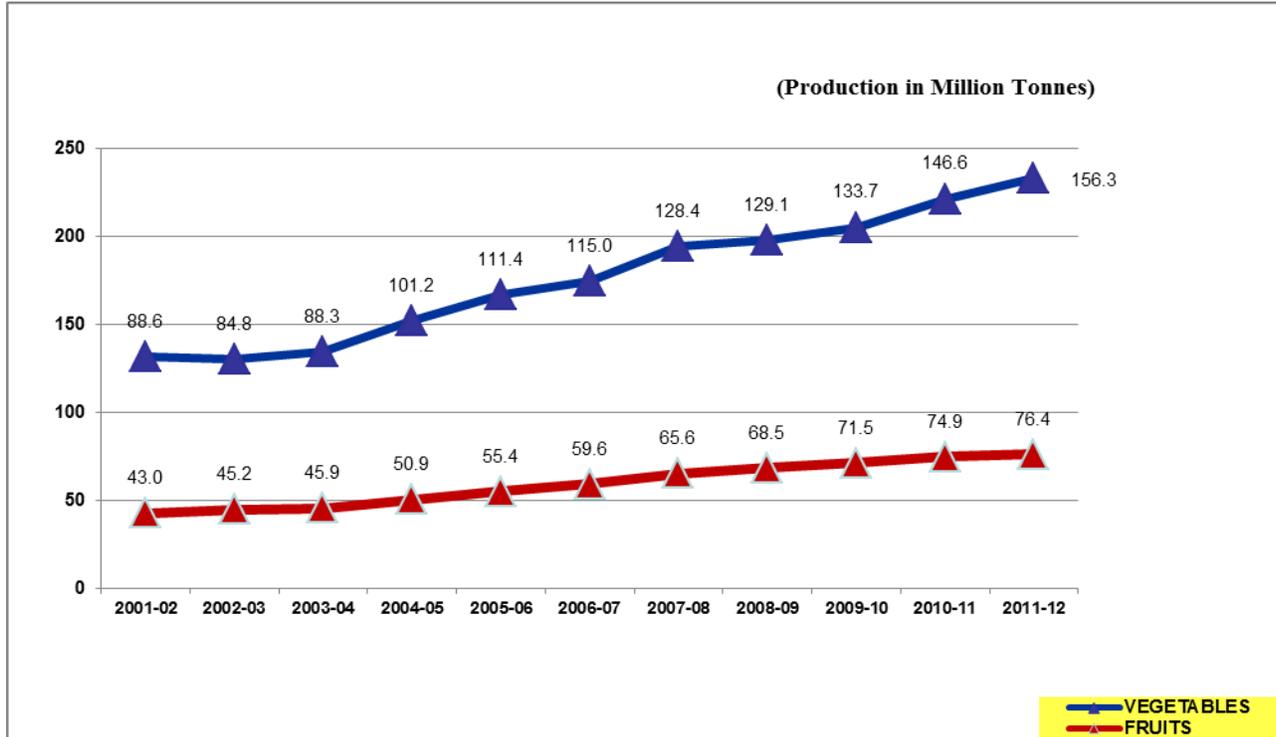
Major fruits producing countries



Major vegetables producing countries



Trends in Fruits and Vegetables Production in India



Source: D/o Agriculture & Cooperation, GOI

Table.1 Selected vitamins and other bioactive components in fruits and vegetables

Vitamins	
Folacin:	Avocado, orange, asparagus, black bean, black-eyed pea, Brussels sprout, chive, endive, green pea, kidney bean, mustard greens, navy bean, okra, soybean, spinach, turnip greens
Vitamin C:	Blackberry, blueberry, cantaloupe, cranberry, grapefruit, kiwi fruit, lemon, lime, mango, orange, papaya, peach, raspberry, strawberry, tangerine, broccoli, Brussels sprout, cabbage, cauliflower, kale, kohlrabi, spinach, sweet red/green pepper, tomato
Other bioactive components	
Allicin:	Chives, garlic, leek, onion, shallot
Capsaicin:	Chili pepper
Carotenoids:	Carrot, pumpkin, sweet potato, apricot, cantaloupe, guava, mango, peach, persimmon, grapefruit, asparagus, beet greens, broccoli, Brussels sprouts, cabbage, carrot, cassava leaves
Lycopene:	Guava, red/pink grapefruit, watermelon, tomato
Lutein:	Kiwi fruit, orange, tangerine, watermelon, asparagus, broccoli, Brussels sprouts, cabbage, carrot, collards, corn, kale, lettuce, potato, pumpkin, spinach, sweet red pepper, tomato, turnip greens
Zeaxanthin:	Orange, persimmon, collards, corn, kale, lettuce, pumpkin, red pepper, spinach, tangerine, turnip greens
Citric acid:	Grapefruit, lemon, lime, orange, tangerine
Saponins:	Asparagus, beet, garlic, spinach
Caffeic acid:	Apple, gooseberry, grape, olive, raspberry, strawberry; broccoli, Brussels sprout, carrot, endive, red onion, savoy cabbage, sweet potato, tomato
Chlorogenic acid:	Apple, apricot, blackberry, blueberry, cherry, cranberry, grape, plum, pomegranate, strawberry; cabbage, carrot, sweet red/ green pepper, tomato
Limonene:	Grapefruit, lemon, orange, tangerine, carrot, celery
Sources: Smith <i>et al.</i> , 1995; Perry <i>et al.</i> , 1996; Holden <i>et al.</i> , 1999; Barratt-Eornell and Drewnowski, 2002; Mayo Clinic <i>et al.</i> , 2002; Pennington, 2002; WHO and Tufts University School of Nutrition and Policy, 2002	

Table.2 State-wise area and production of fruit crops, 2013-14 to 2014-15

A: Area in '000 ha
P: Production in '000 Tonne

States/UTs	2013-14		2014-15 (Advanced estimate)	
	Area	Production	Area	Production
Andaman and Nicobar Islands	3.55	29.73	3.58	33.88
Andhra Pradesh	640.05	10510.56	642.29	10114.15
Arunachal Pradesh	89.09	321.26	90.00	331.40
Assam	144.68	2007.80	155.51	2242.74
Bihar	302.07	4013.58	303.95	3999.49
Chhattisgarh	212.89	1930.18	226.50	2065.47
Goa	11.28	81.19	11.34	81.78
Gujarat	370.76	8001.96	370.76	8001.96
Haryana	50.59	554.90	52.53	650.00
Himachal Pradesh	220.71	866.34	220.71	722.98
Jammu and Kashmir	355.21	2073.94	359.09	1542.68
Jharkhand	94.03	890.04	94.14	898.08
Karnataka	396.00	6652.42	407.27	6941.88
Kerala	376.95	2889.50	263.51	2835.79
Lakshadweep	0.22	0.48	0.22	0.48
Madhya Pradesh	203.79	5696.00	214.38	9756.63
Maharashtra	1565.00	13457.92	606.94	9756.63
Manipur	54.05	515.69	55.61	532.97
Meghalaya	35.30	348.00	36.01	375.83
Mizoram	57.55	343.90	66.14	386.62
Nagaland	40.56	411.00	40.56	411.00
Odisha	325.86	2148.27	325.76	2134.60
Puducherry	0.64	12.58	0.56	14.17
Punjab	76.59	1541.24	78.70	1742.97
Rajasthan	37.40	581.78	38.61	618.98
Sikkim	16.02	24.05	17.59	26.42
Tamil Nadu	328.55	7369.86	344.97	8107.39
Telangana*	364.48	4440.98	370.56	5565.84
Tripura	68.38	786.35	67.27	563.50
Uttar Pradesh	378.97	6887.45	462.76	8541.60
Uttarakhand	171.62	678.4	202.22	758.31
West Bengal	223.50	2909.71	228.25	3298.70
Total	7216.31	88977.41	6358.27	88819.26

Source: Horticulture Statistics Division, DACandFW.

Table.3 State-wise area and production of vegetable crops, 2013-14 to 2014-15

A: Area in '000 ha
P: Production in '000 Tonnes

States/UTs	2013-14		2014-15 (Estimated)	
	Area	Production	Area	Production
Andaman and Nicobar Islands	6.89	51.79	6.91	51.83
Andhra Pradesh	439.64	8149.76	294.76	5458.44
Arunachal Pradesh	1.40	35.00	1.70	41.00
Assam	281.40	3031.90	337.94	4647.79
Bihar	809.80	15097.77	842.00	14467.15
Chhattisgarh	403.43	5465.92	425.07	5812.32
Dadra and Nagar Haveli	1.10	5.50	1.10	5.50
Delhi	27.30	436.95	22.50	392.65
Goa	7.00	79.92	7.20	81.94
Gujarat	582.28	11571.24	578.35	11543.29
Haryana	373.17	5565.90	375.00	5805.80
Himachal Pradesh	86.60	1635.88	86.60	1638.47
Jammu and Kashmir	63.06	1395.47	63.06	1395.47
Jharkhand	313.61	4238.13	316.67	4279.28
Karnataka	418.69	7500.69	462.86	8564.77
Kerala	147.69	3572.67	115.43	2882.51
Lakshadweep	0.25	0.33	0.25	0.33
Madhya Pradesh	628.72	13019.31	649.82	13479.30
Maharashtra	726.00	10161.83	599.86	8289.01
Manipur	25.19	271.04	27.58	288.44
Meghalaya	43.60	515.34	44.60	534.00
Mizoram	41.10	254.14	45.78	284.81
Nagaland	38.55	492.37	38.55	492.37
Odisha	677.33	9433.66	670.35	9372.13
Puducherry	0.90	16.26	2.08	18.84
Punjab	191.02	3936.19	196.52	4054.08
Rajasthan	148.88	1114.07	163.76	1237.49
Sikkim	26.11	134.53	26.12	134.92
Tamil Nadu	289.74	8678.82	305.29	9584.29
Telangana*	220.94	3647.28	165.35	2740.80
Tripura	46.69	780.52	35.57	606.08
Uttar Pradesh	859.38	18544.96	1097.05	24515.36
Uttarakhand	88.28	1016.83	90.98	1082.97
West Bengal	1380.30	23044.95	1445.50	24516.95
Total	9396.05	162896.91	9541.43	168300.38

Source: Horticulture Statistics Division, DAC&FW.

Table.4 Export of horticulture produce from India

Products	Qty In MT, Value in Rs Lakh					
	2013-14		2014-15		2015-16	
	Qty	Value	Qty	Value	Qty	Value
Fruits and vegetables seed	17816.7	41053.76	12499.31	42703.80	10925.60	49353.68
Fresh mangoes	41279.97	28542.85	42998.33	30253.66	36329.01	31710.03
Fresh Grapes	192616.91	166647.45	107257.81	108648.99	156218.34	155131.67
Walnuts	6726.36	32453.5	2665.85	13645.24	3291.71	11791.54
Other fresh fruits	240552.45	102159.21	274436.09	124588.02	308261.23	153815.57
Mango pulp	174860.33	77294.76	154820.66	84138.54	128866.01	79616.93
Fresh Onions	1482498.58	316961.25	1238102.60	230054.14	1201245.29	274741.05
Other Fresh Vegetables	953731.22	229332.27	835501.20	240223.60	699600.34	211949.80
Cucumber and Gherkins (Prepared and Preserved)	218749.79	95520.18	251183.01	120242.24	202926.91	99917.20
Other Processed Fruits and Vegetables	287384.61	226660.26	316059.42	256991.89	320732.58	290033.31
Dried and Preserved Vegetables	56158.38	74271.74	63701.77	84713.55	66189.61	91420.90
Floriculture	22485.21	45590.62	22947.27	46077.23	22518.58	47942.04

Source: APEDA Website, May 2017

Table.5 Import of horticulture produce from India

Products	Qty In MT, Value in Rs Lakh					
	2013-14		2014-15		2015-16	
	Qty	Value	Qty	Value	Qty	Value
Fruits and vegetables seed	8198.19	44943.47	14115.24	61147.72	14328.07	70303.49
Fresh Grapes	14717.62	24493.59	20586.18	37150.46	20340.70	44519.74
Fresh mangoes	7.52	2.49	0.00	0.00	0.95	0.60
Walnuts	178	431.08	1341.85	3620.67	5543.83	11026.52
Other fresh fruits	643546.29	384405.46	742344.91	496298.77	697665.58	464879.03
Fresh Onions	17843.88	3329.51	386.93	63.88	87323.61	20112.70
Cucumber and Gherkins (Prepared and Preserved)	5.42	10.43	157.96	174.96	22.46	24.16
Other Fresh Vegetables	7299.17	733.75	15863.45	4330.25	10340.91	1783.33
Dried and Preserved Vegetables	3818.93	4538.19	3355.20	4188.75	4285.99	4355.09
Other Processed Fruits and Vegetables	48426.32	54305.09	42453.56	56930.81	50976.53	60670.78
Floriculture	4308.8	11219.43	4813.70	11326.18	4768.81	11440.01

Source: APEDA Website, May 2017

Demand and Production of Fruits and Vegetables during the Last Three Years

Year	2011-12	2012-13	2013-14	2014-15
Total Demand (F & V) ('000 tons)	222750.5	229707.1	235528.2	239794.9
Production (F &V) ('000 tons)	232749.0	243471.0	251874.0	257119.6

Source: - Production: - Department of Agriculture and Cooperation.
Demand: NSSO Report No 541 66th Round Survey (July 2009 June 2010)

Different Marketing Channels

Producer-trader-wholesaler-retailer-consumer.

Producer-trader-retailer-consumer.

Producer-trader-consumer.

Producer-consumer.

An Efficient Marketing System Can-

Reduce post-harvest losses.

Enhance farmers' realization.

Reduce consumer price.

Promote grading and food safety practices.

Induce demand-driven production.

Enable higher value addition.

Facilitate export.

Future strategy

To combat the wide spectrum of spoilage, National Horticulture Board (NHB), besides few other agencies like APEDA, MFPI, NCDC etc. started schemes during the IX Plan on the commercial production and management of post-harvest related infrastructural facilities at various levels of operation. The results shown by these programmes in a short span of time are indicative of the fact that the infrastructure so created has not only helped in reducing the losses to a significant level, but avenues of export have also been strengthened. The type of infrastructure created so far is the combination of individual components like grading/packing centers, pre-cooling units, cold storages, platform for collection of produce, transport vehicle and plastic crates/CFB boxes etc. For an integrated development of horticulture industry and also

to achieve our targets for feeding the population as well as for meeting the requirements of the processing industry and exports, emphasis on quality production needs to be integrated with post-harvest management of the highly perishable horticultural crops. Considering the role horticulture has to play and the constraints in its development and the mandate of doubling food production and reducing the gap between requirement and availability, the following thrust areas are identified to be given due consideration for better development of horticulture:

To act as a catalytic organization for providing technical/financial support for all round development of horticulture sector, emphasis should be laid on increasing production with an objective of achieving complete nutritional security.

Encouraging adoption of appropriate post-harvest management technologies for maximizing return to the farmers/growers.

Feasibility studies for setting up the marketing, processing plants, cold storage, transportation system for raw and processed perishable horticultural products and other related fields and undertake designing, planning and execution of projects on their basis.

Promotional activities to give boost to the process of employment generation, increase income of small and marginal farmers and involvement of women and backward communities in the horticulture development process.

To encourage shifting food habits from quantity food to quality food through increased availability and mass media promotion of health oriented benefits of the consumption of fruits and vegetables.

To stimulate private investment particularly in the fields of infrastructure, marketing and research and development with particular emphasis on the special needs of processing industry and exports.

In the world economy, the horticulture crops are very important in the high nutritional value supply of human life. The Fruits and Vegetables (F&V) sector has been a driving force in stimulating a healthy growth trend in Indian agriculture. It plays a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labor intensive and as such they generate lot of employment opportunities for the rural population. Fruits and vegetables typically constitute an essential part of the daily diet in India and they are in great demand round the year from most sections of the population. The commercial value of fruits and vegetables in terms of direct consumption, processing as well as trade has risen substantially in recent years. Still many rural people are deprived of fruits and vegetables consumption due to poverty and the fresh horticultural produces are becoming a food and diet only of the rich but once farmers were made to produce for themselves and for market, fruits and vegetables prices would get reduced and all section of people can enjoy it and maintain a good dietary pattern and keep up a better health. For an integrated development of horticulture industry emphasis on quality production needs to be integrated with appropriate post-harvest management of horticultural crops. Government and private operators have to join hands to improve the physical infrastructure, information sharing and the service required for quality improvement of the supply chain. If concerned effort is made by all the stakeholders, there is every possibilities that India emerges as the leading horticultural crops producing, processing, exporting and consuming country in the world.

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