REVIEW ARTICLE

EXPORT POTENTIAL AND PACKAGING OF SOME IMPORTANT FRUITS OF INDIA

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Received-11.02.2017, Revised-05.03.2017

Abstract: Fruits and vegetables are an important sub-sector in the agricultural sector because they are valued as protective food. They are very rich source of minerals, vitamins providing more energy per unit weight than cereals. India's is a country with wide agro-climatic conditions as a result of which we have got different climatic condition in different parts of country throughout the year. Because of this reason the production of fruits and vegetables is available in the country throughout the year in one or another part.

Keywords: Agriculture, Fruit, Production, Vegetables

INTRODUCTION

As a result, India ranks second in fruits and vegetable production in the world after china. As per NHB database during 2014-2015, India produced 86.602 million metric tonnes of fruits, 169.478 million metric tonnes of vegetables (Gandhi, 2015). The area under cultivation of fruits in 2014-15 was 6.110 million hectares whereas the area under vegetables was 9.542 million hectares (Gandhi, 2015). India ranks first in the production of Banana (22.94%), Papaya (44.03%) and Mangoes (37.57%). India rank first in production of many vegetables such as Ginger and Okra and ranks second in the production of Potato, Onion, Cauliflower, Brinjal and Cabbage.

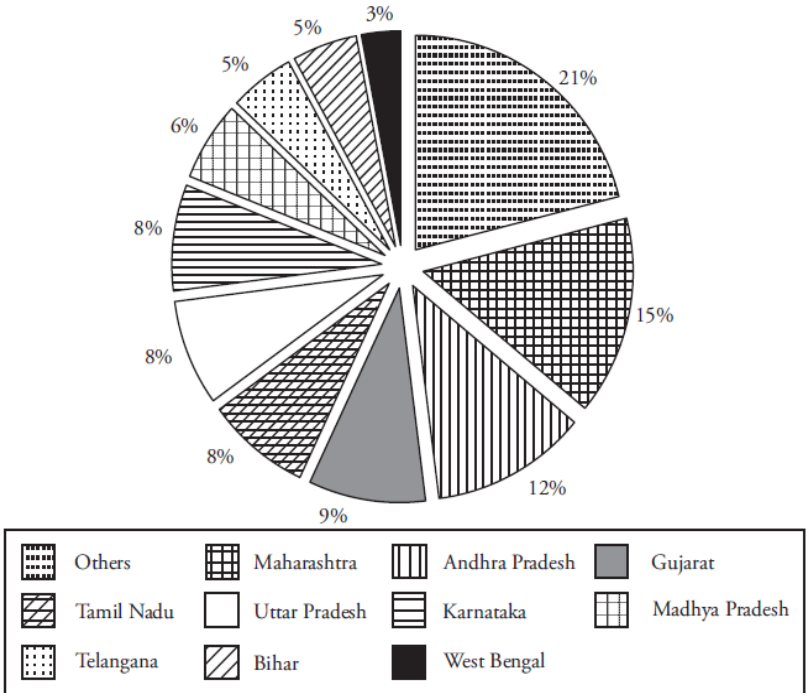

Fig. 1. Leading fruits producing states of 2013-14

During 2013-14, the total fruit production was highest in the case of Maharashtra (134.6 lakh tonnes) followed by Andhra Pradesh (105.11 lakh tonnes). The annual growth in citrus fruits is quite high (10.48%) during 2013-14. This fruit has been contributing 12–13% of total fruit production over the last few years. The graphical representation of production share of leading vegetable-producing states of 2013-14 is shown in Figure 1.
Source: Based on the data of Table 7.2.8. in Horticulture Statistics Division, DAC&FW

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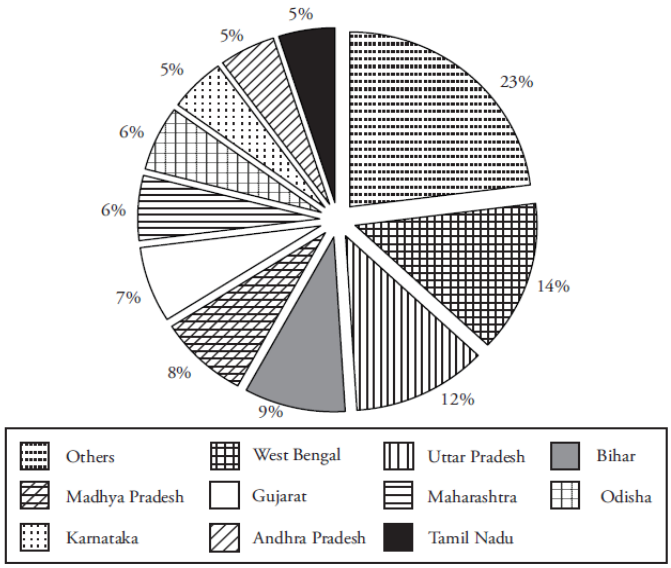

Fig. 2. Leading vegetables producing states of 2013-14

During 2013-14, the area under vegetables is estimated at 9.4 million hectares with a production of 162.9 million tonnes in India. For this period the total vegetable production was highest in case of West Bengal (23,045 thousand tonnes) followed by Uttar Pradesh (18,545 thousand tonnes). The graphical representation of production share of leading vegetable-producing states of 2013-14 is shown in Figure 2.

Source: Based on the data of Table 7.2.10. Horticulture Statistics Division, DAC&FW

The high level of production offer opportunities for tremendous export and can earn foreign exchequer and raise the economy of country and helps in increases GDP. India in 2015-16 exported fruits and vegetables worth Rs. 8,391.41 crores which constituted of fruits worth Rs. 3,524.50 and vegetables worth Rs. 4,866.91 crores (APEDA, 2016). India is largest exporter of Mangoes, Walnuts, Grapes, Banana and Pomegranate. Among the vegetables Onions, Okra, Bitter Gourd, Green Chilles, Mushrooms and Potatoes constitute major export basket of the vegetables. Now the major destination for fruits and vegetables are neighbouring countries UAE, Bangladesh, Malasiya, Srilanka. India export share in the global market is just 1%. There is an increasing acceptance of Indian fruits in many parts of world. However, Indian exporter and government chain is not strong enough to boost the Indian farmer and exporter to send this fruits and vegetables to different parts of the world. The present plans in last few years in private sector, public sector and APEDA assistance has helped to set up the chain for export of fruits and vegetables is a tough process as these are highly perishable. So capacity building initiatives are required at the level of farmers, exporters, processers in order to boost the export of fruits and vegetables to the developing countries in order to earn good foreign chequer.

Low availability of quality fruits and vegetables is mainly due to considerably high post-harvest losses, poor transportation, improper storage and low processing capacity with a growing population. The increased production of fruits and vegetables and other agricultural produce will be fully realised only when they reach the consumer in good condition and at a reasonable price. The post-harvest losses could be considerably reduced by adopting improved packaging, handling and efficient system of transport.

Packaging is an important consideration in vegetable and fruit market. The use of properly designed containers for transporting and marketing of vegetables can significantly reduce the losses and maintain their freshness succulence and quality for longer period (Stokes, 1974). The package must be capable of protecting the product from the transport hazards; preventing the microbial and insect damage; minimising the physiological and biochemical changes and losses in weight. Packaging is required not only for preservation and protection but also for safe transportation of products during storage and handling (APEDA, 2005). Increasing exports and stringent export market needs have also influenced the packaging trend. Packaging of fruits and vegetables is undertaken primarily to assemble the produce in convenient units for marketing and distribution.

Universal Product Codes (UPC or bar codes) may be included as part of the labelling (Erdei, 1993). The UPCs used in the food industry consist of a ten-digit machine readable code. The first five digits are a number assigned to the specific producer (packer or

shipper) and the second five digits represent specific product information such as type of produce and size of package. Although no price information is included, UPCs are used more and more by packers, shippers, buyers, and Example of a UPC retailers as a fast and convenient method of inventory control and cost accounting.

The package must stand up to long distance transportation, multiple handling, and the climate changes of different storage places, transport methods and market conditions. In designing fruit packages one should consider both the physiological characteristics of the fruit as well as the whole distribution network. Careful packing of fruits and vegetables is necessary to keep the produce in place with minimum shaking. Fruits and vegetables are normally packed in layers in crates and in each layer products are packed alternately placing the beak of one in between the shoulders of two. This method of packing is easy to follow and quick. It also provides enough room without compressing it.

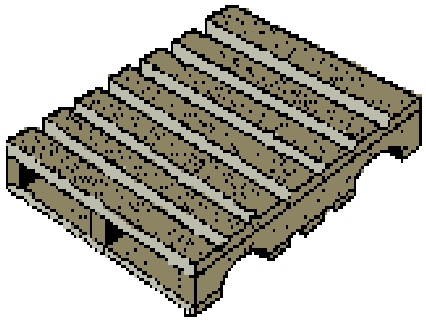

Fig. 3. Figure of Standard Size Pallets

Pallets literally form the base on which most fresh produce is delivered to the consumer (Fig. 3). Standard size pallets make efficient use of truck and van space and can accommodate heavier loads and more stress than lighter single-use pallets (National Wooden Pallet and Container Association. Washington, 1993)

Table 1. Some of the common cardboard boxes with Palletisation details:

S. No.	External Dimensions of the box LXBXH (MM)	Type of Pallet	No. of Boxes Per Layer (On Base)	Arrangement of Boxes on Pallet Base (LXW)	Base Utilization
1	400X200X150	IATA-A	75	15(W)X5(L)	91.76
		IATA-B	77	7(L)X11(W)	85.75
		EURO-A	12	3(L)X4(W)	100.00
		EURO-B	15	3(L)X5(W)	100.00
2	500X300X200	IATA-A	42	6(L)X7(W)	96.34
		IATA-B	42	6(L)X7(W)	87.70
		EURO-A	4	2(L)X2(W)	62.50
		EURO-B	8	4(W)X2(L)	100.00
3	600X300X200	IATA-A	35	5(L)X7(W)	96.34
		IATA-B	35	5(L)X7(W)	87.70
		EURO-A	4	2(L)X2(W)	75.00
		EURO-B	6	2(L)X3(W)	90.00
4	400X200X105	IATA-A	75	15(W)X5(L)	91.76
		IATA-B	77	7(L)X11(W)	85.75
		EURO-A	12	3(L)X4(W)	100.00
		EURO-B	15	3(L)X5(W)	100.00
5	350X220X100	IATA – A	78	13(L)X8(W)	91..55
		IATA – B	80	8(L)X10(W)	85.75
		EURO –A	10	5 (L)X2(W)	80.21
		EURO-B	12	3(L)X4(W)	77.00
6	260X230X100	IATA - A	104	13(L)X8(W)	95.11
		IATA - B	117	13(L)X9(W)	97.39
		EURO -A	12	4 (L)X3(W)	74.75
		EURO-B	16	4(L)X4(W)	79.73
7	225X170X100	IATA - A	117	13 (L)X4(W)	90.58
		IATA - B	130	13(L)X10(W)	91.61
		EURO -A	15	5 (L)X3(W)	79.10
		EURO-B	20	5(L)X4(W)	84.38

8	225X225X100	IATA - A	117	13(L)X9(W)	90.58
		IATA - B	130	13(L)X10(W)	91.61
		EURO -A	15	4 (L)X3(W)	74.75
		EURO-B	20	5(L)X4(W)	84.38
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		IATA - B	117	13(L)X9(W)	97.39
		EURO -A	12	4 (L)X3(W)	74.75
		EURO-B	16	4(L)X4(W)	79.73
10	600X300X200	IATA - A	35	5(L)X7(W)	96.34
		IATA - B	35	5(L)X7(W)	87.70
		EURO -A	4	2 (L)X2(W)	75.00
		EURO-B	6	2(L)X3(W)	90.00

Source: APEDA, 2005

Specification details of Pressure Sensitive Tape & Reinforcement Strap

A. Pressure Sensitive Tap

i) **Material of Construction** : BOPP OR PVC
(biaxally oriented
polypropylene or
polyvinyl chloride)

ii) **Thickness** : 20 µ

iii)**Width (minimum)** : 50 mm

iv) **Adhesive Property** : as per is:3676-1986

for further specification details refer is: 2880-1978

b. Reinforcement Strap

i) **Material of construction** : pp (polypropylene)

ii) **Width (minimum)** : 12 mm

iii) **Thickness (minimum)** : 0.05 mm

iv) **Breaking load(min.)** : 80 kg/12 mm width

v) **Elongation (max.)** : 25%

Source: APEDA, 2005

Export potential and packaging for some of the important fruits with largest exported from India:-

Pomegranate: India is largest producer of Pomegranate in the world. Variety of Pomegranate are having soft seed less acids and attractive colours of fruits and grains. India can export Pomegranate throughout the year. It is being produced in the states of Maharashtra and Karnataka which are close to the western port of Mumbai. Cooperative society of Maharashtra have formed an apex cooperative in the name MAHA ANAR. Farmers of this area are trained in the production and registers with GLOBAL GAP certification. The total export of Pomegranate was 30158 tonnes with a value of 14726 lakh in 2011-12 (APEDA Website, accessed on 10 July 2015). The main varieties being exported are Ganesh, Rubi, Arakta and Bhagwa. The major countries where Pomegranate exported are UAE, Saudi Arab, Kuwait, UK, Russia and Thailand.

Fig. 4. Corrugated fibre board (CFB) Boxes for Pomegranate (APEDA, 2005, New Delhi).

Carbboard corrugated boxes of 4-5 kg capacity with a dimension of 375*275*100mm and 480*300*100mm are the sizes of boxes respectively as shown in fig.4. These are made up of 3 to 5 ply and have a bursting strength of minimum 10 kg/cm^2. Puncture resistance is minimum 250 ozs inches/tear inch Min and compression strength 150. kgf ,Min. Burst factor (Craft) minimum20, manufacturing joint should be made by glue and with number of ventilation 16 at different angles of the box. Number of pieces/box should not be more than 2.

Measures for enhancing competitiveness for export

- There is a need to export Pomegranate to South East Asian countries to economise the cost of transport and popularise in Canada, USA, south America Australia, Korea and Japan.
- There is a need of packing house in the major growing area in Karnatka and Andhra Pradesh.

Litchi: India is second largest exporter of Litchi in the world. India produces superior Litchi varieties having high pulp to stone ratio and with high yields. The total production of Litchi is concentrated mainly in Bihar, West Bengal, Assam and Jharkhand and to a smaller extent in Tripura, Punjab, Uttarakhand and Orissa. India is in advantageous position with regard to geographical location compared to Thailand and China, as India is nearer to Europe and Gulf countries for exporting Litchis to these countries. Export of Litchi from India during 2014-15 is 961.43 tonne which value 215.18 lakhs (APEDA Website, accessed on 10 July 2015). Litchi variety mainly Shahi, Early Bedana, Late Bedana and Bombai are exported. Uttarakhand farmers they have also framed a society Litchi Exporters Association, Nainital, which is major exporter of Litchi.

Fig. 5. Corrugated fibre board (CFB) Boxes for Litchi (APEDA, 2005, New Delhi)

Packaging is normally done in corrugated or solid fibre board cartons as shown figure 5. Normally Corrugated Fibre Board boxes of capacity 2 kg and 4 kg are used for export with bursting strength of 6 and 10 Kg/cm^2 and puncture resistance and compression strength of 225 and 350 Kgf.

Measures for enhancing competitiveness for export:

- To exploit export of organic litchi in foreign markets.
- Assam and Punjab needs to be encouraged and to facilitate pack houses.

Pineapple: Pineapple is cultivated in India in North East, West Bengal and Eastern Bihar. Western ports can be exploited for exporting to Gulf and European Union which will save a transport also. Agri Export Zone for promoting exports of Pineapple has already been established in North Bengal. There are good prospects for cultivation of organic Pineapples in Kodagu district of Karnataka and Ratnagiri district in Maharashtra state. Total export of Pineapple in 2014-15 is 3751.53 tonne with value of 1664.92 lakhs (APEDA Website, accessed on 10 July 2015) The most common varieties exported from India Kew, Queen and Mauritius. Pineapple is mainly transported by ship and to small extent by air.

Fig. 6. Corrugated fibre board (CFB) Boxes for Pineapple (APEDA, 2005, New Delhi)

Packaging is normally done in corrugated or solid fibre board cartons as shown figure 6. Four sizes of pineapple are packed in different packaging 1.5kg (A), 1-1.5kg (B.), 0.6-1 kg (C) and 0.5 Kg (D). A single vertical pack contain 4 fruits in 2-3 layer and small sized 5 fruits in 5 layers are packed. Dimensions of boxes 535*290*280 and 535*430*195. Partitions in the box are done after each layer with corrugated fibre board. Number of holes in the box will depends upon the number of fruits i.e. 1. (Post- Harvest Manual for Export of Pineapples, APEDA, New Delhi)

Measures for enhancing competitiveness for export:

- To save on transport, advantage of western ports needs to be taken for exporting to Gulf and European countries and to meet the huge demands of European Union (EU), South and Central American countries.
- Need for packhouses and cool chain facilities.

Banana: Banana is an important fruit crop of many tropical and subtropical regions of India. Largest area under Banana cultivation is in Tamil Nadu state followed by Maharashtra, Gujarat, Andhra Pradesh and Karnataka states. Grand Naine, Robusta, Dwarf Cavendish, Nendran and Red Banana are variety commonly grown in India. Export of Banana during 2014-15 is 63274.40 Tonne which value 24194.77 Lakhs (APEDA Website, accessed on 10 July 2015).

Fig. 7. Corrugated fibre board (CFB) Boxes for Banana (APEDA, 2005, New Delhi)

For packaging bananas, boxes of 5 ply strength and of the following dimensions need to be used- Card board fibre boxes and other materials-

- Top = 48.25cm X 31.75cm X 20.25cm -5 ply
- Bottom= 47.50 X 31.25cm X 19.75cm -5ply
- Gap plate= 3 ply

Foam sheet or foam pad= 20mm thick, 38cm X 25cm size with 10 mm holes. Weight of final packed box is approximately 13.0 Kg (Fig. 7)

Measures for Enhancing Competitiveness for Exports:

- Production technology on modern lines needs to be demonstrated to the growers.
- Farmers should be educated for export requirements and international quality standards.
- Protocol for shipping to Gulf countries need to be standardized.
- Most modern packhouse facilities need to be created in Maharashtra and Gujarat.
- It will be advisable to have some working arrangements for ripening of our banana.

Mango: Indian mangoes come in various shapes, sizes and colours with a wide variety of flavour, aroma and taste. The Indian mango is the special product that substantiates the high standards of quality and bountiful of nutrients packed in it. A single mango can provide up to 40 percent of the

daily dietary fibre needs – a potent protector against heart disease, cancer and cholesterol build – up. In addition, this fruit is a warehouse of potassium, beta - carotene and antioxidants. In India, mangoes are mainly grown in tropical and subtropical regions. The major mango-growing states are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Tamil Nadu. Andhra Pradesh ranks first in mango production with a share of 24.48% and highest productivity. India is also a prominent exporter of fresh mangoes to the world. The country has exported 36329.01 metric tonnes of fresh mangoes to the world worth Rs. 317.10 crores during the year 2015-16 (Gandhi, 2016). The main varieties being exported are Ganesh, Rubi, Arakta and Bhagwa. The major 5 importing countries of India's Mangoes were UAE, Bagladesh, UK, Saudi Arabia, and Nepal respectively; these countries alone comprises of around 87% of India's total export of Mango.

Domestic strengths for exporting mango from India are listed below:

- Agri Export Zones for facilitating exports have been established in almost all mango growing areas.
- Packhouses on modern lines have been provided in all mango exporting regions i.e. in Ratnagiri and Sindhudurg in Maharashtra and in Navsari and Borsad in Gujarat for Alphonso variety; in Latur and Aurangabad for Kesar mango; in Saharanpur and Malihabad in U.P. for Dashehari and Chausa mangoes.
- Facilities for facilitating mango exports like Post-harvest Management Centre have been established at Malihabad and Saharanpur. Similarly a mango Export Facility Centre has been established at Ratnagiri.
- Mango farmers of Alphonso and Kesar are already being trained in GLOBALGAP requirements.
- Mango growers of Saharanpur have already branded their product as "NAWAB" mango.
- Facilities for Vapour Heat Treatment and irradiation for eliminating fruit fly have already been set up.

Fig. 8. Corrugated fibre board (CFB) Boxes for packing of Mango (APEDA, 2005, New Delhi)

As shown in fig. 8 fruits are packed in cardboard boxes of 3 and 5 ply with a dimensions of 230*140*140 and a capacity of 4 and 8 kg, bursting strength of 6.5 and 10 kg/cm^2 respectively, compression strength of 275 kgf and with 4 holes (Post- Harvest Manual for Export of Mangoes, APEDA, New Delhi.).

Measures for Enhancing Competitiveness for Exports:

- Fruits shall be packed in compliance with recommended International code for packaging of fresh fruits (CAC/RCP 44-1995, Amd. 1-2004).
- Creation of CA facilities (helpful to keep the fruits for long time) on large scale will help to increase export potential of all fruits.

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