

POTENTIAL IN AGRIBUSINESS – FRUIT AND VEGETABLE PROCESSING INDUSTRY IN INDIA

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ABSTRACT

India is the second largest producer of fruit and vegetables in the world. But, around only 2 percent of fruit and vegetable production is processed. This paper reports the consumption of fruit and vegetables in India and the status, growth and potential for fruit and vegetable processing. Production of fruit and vegetables grew at an annual rate of 4.35 and 5.74 percent, respectively during 1992-2002. Consumers' expenditure on fruit and vegetables has been rising over the years in India. Consumers' demand for fruit was more responsive than was the demand for vegetables to increased income. The study found that the number of processing units has grown by about 3.68 percent per annum during 1992-2003. Capacity utilization was about 37 percent in 1992, which has now increased to about 47 percent. Because of low capacity and poor capacity utilization, processing is at very low level. With regards to exports, there is a lack of processable varieties of fruit and vegetables. However, there has been tremendous growth (20.32 percent compound) in exports of processed fruit and vegetables particularly during the nineties following new economic policies, but India's share of world exports is very low. Among the various processed fruit and vegetable products exported, dried & preserved vegetables constituted the largest share (47 percent). Following economic liberalization, foreign direct investment in the processing sector has been increasing. India has the potential to become a leading exporter of processed fruit and vegetable products. To achieve this, there is a need to remove the constraints facing the industry. Globalization and liberalization have brought unprecedented challenges and severe competition to the processing industry. Firms must be innovative and need to anticipate and respond to the requirements of consumers for their survival and sustained growth. Only then one can hope to see the fruit and vegetable processing industry as a 'sunrise' industry.

Key words: Fruit and vegetables, processing, income elasticity of demand, compound growth rate, installed capacity, exports

INTRODUCTION

Under traditional agriculture, farmers grow crops for their own use, depend upon their own resources and purchase few inputs. Now, with technological advancement, farmers buy a sizable portion of their inputs and produce crops/farm products for the market/ non-farming population. This is called commercial agriculture, which has resulted in increasing productivity, economies of scale, increasing returns to investment, higher income for labour, etc. But at the same time, commercial agriculture has led to problems related to income distribution, industrial peace, social justice, etc.

Marketing, processing, production, farm supplies, research, extension, government policies and programs are important areas for agri-business. The focus in this paper is on processing of agricultural commodities. Processing refers to deliberate activity, which changes a commodity into a more useable form with value addition. Among the agro-processing industries, food processing is the dominant one. Processed food products can be classified into major product groups such as cereal products, fruit and vegetables, dairy, meat, and marine products. Due to diverse agro-climatic conditions, India is rich in raw material for agro-processing industries. As far as fruit and vegetable production is concerned, India with 45.50 million tons of fruit and 90.83 million tons of vegetables occupies first and second place, respectively in the world's total production. Due to lack of post-harvest handling and processing facilities about 30 percent of fruit and vegetables are lost/ damaged. Fruit and vegetables are highly perishable in nature, and processing assumes paramount importance for exploiting the economic potential by creating time, form and space utilities. The demand for processed fruit and vegetable products is bound to rise with increased real income and improvement in the standard of living, modern life style, urbanization, contribution of women to household income, etc. *Roti and Dal* (chapati and pulses) used to be the typical Indian diet since time immemorial. Due to the

substantial reduction in output of pulse crops in India, prices have increased manifold and pulses have become out of reach of the majority of people. Vegetables have become a relatively cheaper substitute for costly pulses. Keeping in view the above facts, this paper reports the consumption pattern of fruit and vegetables in India and the status, growth and potential for the fruit and vegetable processing industry.

METHODOLOGY

Data on the number of processing units, production, installed capacity, capacity utilization and related parameters were collected from published sources i.e. Annual Reports of the Ministry of Food Processing Industry, Government of India; FAO, Production Year Book; FAO, Trade Year Book; Fertilizer Statistics; Economic Survey of India, etc. To study the consumption pattern of fruit and vegetables, data on Monthly Per Capita Expenditure was collected from National Sample Survey (NSS) Rounds for the years 1983-84 (38th round), 1987-88 (43rd round), 1993-94 (50th round) and 1999-2000 (55th round). To determine changes in demand for fruit and vegetable products, the income elasticity of demand was calculated. To calculate this, total consumption expenditure of households has been taken as a proxy of income and the double log function below used for determining the income elasticity of demand:

$$Y = a x^b$$

$$\text{Log} Y = \text{Log } a + b \text{ Log } x$$

Where:

Y = consumption expenditure on item concerned (in rupees)

x = total consumption expenditure or income (in rupees)

b = regression coefficient (income elasticity)

To determine trends, a linear regression equation was estimated. The annual growth rates were calculated by using an exponential function as given below:

$$Y = abt$$

$$\text{Log } Y = \text{Log } a + t \text{ Log } b$$

$$r \text{ (Compound Growth rate)} = (\text{Antilog } b - 1) \times 100$$

Where,

Y = Dependent variable,

a = Constant,

b = Regression coefficient,

t = Time

r = Compound growth rate

RESULTS AND DISCUSSION

Production of fruit and vegetables: Production of fruit and vegetables in India has gradually increased over time. The average annual production of fruit was 16.18 million tons during 1973-75 and 45.82 million tons during 2000-02, an increase of 183.19 percent (Table 1).

Table: 1 Total production of fruit and vegetables in India over time
(Million tons)

Year	Fruit	Vegetables
1973-75	16.18	33.78
1976-78	17.48	38.51
1979-81	18.70	40.99
1982-84	22.38	44.66
1985-87	25.31	48.38
1988-90	27.04	52.32
1991-93	31.00	60.85
1994-96	40.19	71.31
1997-99	44.27	83.68
2000-2002	45.82	93.76
Compound Growth Rate (percent) – 1973-2002	4.34	3.80
1992-2002	4.35	5.74

Similarly, the average annual production of vegetables rose to 93.76 million tons during 2000-02 from 33.78 million tons in 1973-75, an increase of 177.56 percent.

A large variety of fruit is grown in India and with a total of over 46 million tons, accounts for about 10 percent of world production. India ranks first in the production of mango, banana, sapata and acid lime. In 2001-02, bananas occupied the top position at 16.45 million tons accounting for about 35.74 percent of total fruit production, followed by mangoes (23.12 percent), citrus (9.95 percent), papaya (3.95 percent), apple (3.08 percent), pineapple (2.73 percent), guava (2.39 percent) and grapes (2.39 percent) (Table 2).

Table: 2 Production of important fruit and vegetables in India: 2001-02

		(Millions tons)	
Fruit	Production	Vegetables	Production
Banana	16.45	Potato	24.00
Mango	10.64	Brinjal	7.80
Citrus	4.58	Tomato	7.42
Papaya	1.82	Cabbage	5.70
Apple	1.42	Onion	4.85
Pineapple	1.26	Cauliflower	4.70
Guava	1.10	Okra	3.42
Grapes	1.10	Peas	3.11
Sapata	0.70	Others	35.54
Litchi	0.42	Total	96.54
Others	6.53		
Total	46.02		

Vegetables constitute the most important food next only to cereals and milk. India is the leading world producer of cauliflower, second in onion and third in cabbage. Among vegetables, potato occupies the top position with 24 million tons accounting for about 24.86 percent of total vegetable production followed by brinjal (8 percent), tomato (7.69 percent), cabbage (5.90 percent), onion (5 percent), cauliflower (4.87percent), okra (3.54 percent), and peas (3.22 percent).

Production of fruit and vegetables increased at an annual rate of 1.66 million tons and 4.32 million tons, respectively during 1992-2002. Production of fruit grew at an annual compound rate of 4.35 percent and vegetables at 5.74 percent between 1992 and 2002.

Consumption of fruit and vegetables: The per capita monthly expenditure on fruit, vegetables, food and total consumption expenditure in 1983, 1987-88, 1993-94 and 1999-2000 is presented in Table 3.

Table 3: Monthly per capita expenditure on fruit and vegetables over different NSS Rounds

Rural					(Rs)
Year	Vegetables	Fruit & nuts	Total food	Non-food	Total consumption expenditure
Rural					
1983-84	5.3	1.6	73.8	38.8	112.6
1987-88	8.2	2.6	100.8	57.3	158.1
1993-94	19.1	5.9	177.8	103.6	281.4
1999-2000	30.0	8.4	289.0	197.0	486.0
Urban					
1983-84	8.2	3.5	97.0	67.1	164.1
1987-88	13.1	6.3	139.8	110.2	249.9
1993-94	25.0	12.2	250.3	207.7	458.0
1999-2000	43.9	20.7	411.0	444.0	855.0

The monthly per capita total expenditure (MPCE) has been increasing over the years in India. However, the increase in MPCE was more pronounced in 1999-2000 (55th round) over 1993-94 (50th round) than in 1993-94 (50th round) over 1983-84 (38th round). The average monthly per capita total expenditure (food and non-food expenditure) was Rs. 112.6 in 1983-84 (38th round), which increased to Rs. 486 in 1999-2000 (55th round) in rural India whereas in urban India, it increased from Rs. 164.10 to Rs. 855 during the same period. With the passage of time, the percentage of expenditure on food items has declined in both areas, indicating that with increased income, consumers spend relatively more on non-food items. The MPCE on fruit and vegetables has also shown a rising trend in both areas. In the case of vegetables, the MPCE in rural areas was Rs. 5.30 in 1983-84,

which increased to Rs. 30.0 in 1999-2000 in rural areas and in urban areas, it rose to Rs. 43.90 in 1999-2000 from Rs.8.20 in 1983-84. The MPCE was higher in urban than in rural areas in all four rounds. Rising consumption on fruit and vegetables must be due to increased consumer incomes and changes in consumption. It is a good sign, indicating increasing awareness about the importance of fruit and vegetables in diets.

Income elasticity: The income elasticity of demand for fruit and vegetables has been computed for the rural and urban areas for 1993-94 (50th round) and 1999-2000 (55th round) based on the data collected from NSS rounds. In rural and urban regions in 1993-94, the income elasticity of demand for fruit was 1.50 and 1.36 percent respectively, indicating elastic demand in both regions. It shows that fruit consumption increases by 1.50 percent for each one per cent increase in income in rural regions and by 1.36 percent in urban regions. In the case of vegetables, the income elasticity of demand was 0.62 in rural areas and 0.67 in urban areas indicating relatively inelastic demand in both areas. The income elasticity of demand for fruit has increased over the years and reached 2.03 in rural and 1.68 in urban areas in 1999-2000 (55th round). In relation to vegetables, there has not been much increase in income elasticities (0.72 in rural and 0.73 in urban regions) during this period. From the above, it is inferred that consumer demand for fruit is more responsive to income than is the demand for vegetables.

Fruit and vegetable processing industry – status and growth:

India is the second largest producer of fruit and vegetables in the world. But only about 2 percent is processed compared to about 80 percent in Malaysia, 30 percent in Thailand, and 60 – 70 percent in the UK and USA. Fifteen percent of milk is processed. Although India has an abundant supply of food, the food processing industry is still nascent. Despite low volumes, the processed food industry ranks fifth in size in the country, representing 6.3 percent of GDP. It accounts for 13 percent of the country's

exports and 6 percent of total industrial investment. The performance of the fruit and vegetable processing sector and other sectors is depicted in Table 4.

Table 4: Trends and growth in the fruit and vegetables sector and other sectors: 1992-2003

Year	Production of fruit and vegetable products (lakh tons)	Installed capacity of fruit and vegetables processing (lakh tons)	Capacity utilization of fruit and vegetables processing (percent)	Number of licensed units under FPO	Number of modern rice mills	Number of roller flour mills	Production of milk (million tons)	Production of processed milk products (lakh tons)	Production of marine products (lakh tons)
1992	3.5	9.5	36.84	4057	32969	696	58.5	2.2	43
1993	4.69	11.08	42.33	4132	32969	702	61.2	2.29	46
1994	5.59	12.6	44.37	4270	33557	750	63.5	2.49	47
1995	6.76	14.02	48.22	4368	34113	800	65	2.61	49
1996	8.5	17.5	48.57	4674	34685	812	68	2.76	53
1997	9.6	19.1	50.26	4932	34688	812	71	2.85	53
1998	9.1	20.4	44.61	5112	34688	820	74.5	3.01	56
1999	9.4	20.8	45.19	5198	35088	820	74.5	3.07	56
2000	9.8	21	46.67	5293	35088	820	78	3.16	56
2001	9.9	21.1	46.92	5569	35000	820	84.6	3.2	60
2002	10.3	21.98	46.86	5569	NA	NA	NA	NA	NA
2003	10.72	23.28	46.05	6097	NA	NA	NA	NA	NA
Linear Trend value	0.62	1.24	0.48	177.77	257.55	14.25	2.66	0.12	1.75
CGR (%)	9.33	8.09	1.15	3.68	0.76	1.89	3.87	4.42	3.48

Source: Annual Reports, Ministry of Food Processing Industry, Govt. of India (various issues).
CGR - Compound Growth Rate

Production of processed fruit and vegetables has gone from 3.5 lakh tons in 1992 to 10.72 lakh tons in 2003, an increase of 0.62 lakh tons per annum. However, production of processed fruit and vegetables is much less than the installed capacity of fruit and vegetable processing units reflecting low capacity utilization. Fruit and vegetable processing industry capacity has increased from 9.5 lakh tons in 1992 to 23.28 lakh tons in 2003. As a result of withdrawal of an excise duty on fruit and vegetable products in the Union Budget of 2001, the installed capacity and growth of this sector has been increasing steadily. Production in 2003 was approximately 4 percent above 2002. As regards capacity

utilization this was only 37 percent in 1992, i.e. against installed capacity of 9.5 lakh tons, only 3.5 lakh tons of fruit and vegetables were processed. Capacity utilization slowly increased and reached 50 percent in 1997. In the next year it declined to 44.61 percent, which may be due to the imposition of an 8 percent excise duty on fruit and vegetables products in 1997. After that it again increased and now is around 46 - 47 percent. In 1992, there were 4057 FPO licensed units and 6097 units in 2003, an increase of about 178 units annually.

The number of modern rice mills rose from 32969 in 1992 to 35000 in 2001, an increase of about 258 mills per annum. Roller flour mills went from 696 in 1992 to 820 in 2001 or about 14 new mills per annum. The production of processed milk products, milk and marine products increased at the rate of 0.12 lakh tons, 2.66 million tons and 1.75 lakh tons per annum, respectively. In India, a significant portion of the processing of fruit and vegetables is carried out as a small scale cottage industry. However, both modern and traditional methods of processing are also used on large scales to process fruit and vegetables, for example, potato chips, banana chips, raisins, pickles, jellies, and squashes.

The production of processed fruit and vegetable products grew at the compound rate of 9.33 percent per annum and installed capacity grew at 1.15 percent per annum between 1992-2003. The number of modern rice mills, roller flour mills, production of milk, processed milk products and marine products have grown at 0.76, 1.89, 3.87, 4.42 and 3.48 percent, respectively. Licensed units under FPO have grown at 3.68 percent per annum.

Export of fruit and vegetable products: The fruit and vegetable processing sector in India has a tremendous potential for export due to the diversity in horticultural production and seasons. The domestic consumption of processed foods is still low because of

traditional eating habits and low purchasing power of the masses and hence initially the success of the fruit and vegetable processing sector is primarily linked to exports. Fruit and vegetables have a strong export potential in India provided the domestic market becomes more stable in production of standard and quality products. Exports have fluctuated over the years but increased from Rs. 206 crore in 1992-93 to Rs. 1207 crore in 2002-03 (Table 5).

Table: 5 Export of processed fruit and vegetable products: 1992-93 to 2002-03

(Rs. Crore)

Years	Dried & processed vegetables	Mango pulp	Pickles & chutneys	Others	Total
1992-93	85.73 (41.63)	58.34 (28.33)	28.65 (13.91)	33.21 (16.13)	205.93 (100.00)
1993-94	107.08 (39.88)	57.98 (21.59)	36.13 (13.46)	67.31 (25.07)	268.5 (100.00)
1994-95	146.52 (42.08)	80.71 (23.18)	49.75 (14.290)	71.23 (20.46)	348.21 (100.00)
1995-96	247.66 (50.38)	84.61 (17.21)	52.53 (10.69)	106.77 (21.72)	491.59 (100.00)
1996-97	231.07 (48.77)	105.01 (22.16)	56.43 (11.92)	81.26 (17.15)	473.77 (100.00)
1997-98	479.89 (63.02)	125.31 (16.46)	76.71 (10.07)	79.59 (10.45)	761.5 (100.00)
1998-99	383.08 (54.29)	138.56 (19.63)	75.96 (10.77)	108.11 (15.31)	705.68 (100.00)
1999-2000	589.9 (59.37)	196.53 (19.78)	89.99 (9.06)	117.23 (11.79)	993.64 (100.00)
2000-01	738.29 (54.87)	263.85 (19.60)	136.46 (10.14)	206.94 (15.38)	1345.54 (100.00)
2001-02	537.15 (48.80)	241.34 (21.93)	120.34 (10.93)	201.74 (18.33)	1100.57 (100.00)
2002-03	561.03 (46.48)	297.01 (24.61)	154.16 (12.77)	194.73 (16.13)	1206.93 (100.00)
Linear Trend value	60.99	24.85	11.99	16.37	114.19
CGR (%)	23.18	19.24	17.38	16.61	20.32

Note: Figures in parentheses indicate percentages.

Dried and preserved vegetables constituted the largest share of processed fruit and vegetable exports. Processed exports were 41.63 percent in 1992-93 declining to 39.88 percent in 1993-94, then increasing and reaching 63.08 percent in 1997-98, before falling to 46.48 percent in 2002-03. Mango pulp is in 2nd place and its share of total exports ranged from 16.46 percent in 1997-98 to 28.33 percent in 1992-93. The contribution of

pickles and chutneys to total exports of fruit and vegetable products ranged between 9.06 percent in 1999-2000 and 14.29 percent in 1994-95. The main countries importing Indian processed fruit and vegetable are the Gulf countries, USA, UK, Germany and Russia.

Exports of processed fruit and vegetables have increased significantly during the 1990s particularly after economic liberalization. During the 1980s exports of processed fruit and vegetables grew at a compound rate of 5.3 percent (Singh and Vasisht, 1995), but in the 1990s were 20.32 percent. Export of dried and preserved vegetables, Mango pulp, pickles and chutneys growth rates were 23.18, 19.24 and 17.38 percent per annum, respectively.

Constraints faced by the Fruit and Vegetable processing industry: It is estimated that in India about 30-40 percent of the total harvest goes to waste and only about 2 percent of total production is processed. Constraints inhibiting the growth of the fruit and vegetable processing industry include:

1. Limited availability of varieties suitable for processing, which affects processing in two ways. Firstly, it causes low processing volumes. For instance, in India only about 2.0 percent of total fruit and vegetables grown are processed, in contrast to Malaysia (83 percent), Philippines (78 percent), Brazil (70 percent) and Thailand (30 percent). Secondly, it results in high processing costs. For instance, to produce one ton of orange juice in India, 14 tons of raw material is needed, whereas only about 10 tons is needed in other countries.
2. Fruit and vegetables are highly perishable and require a reasonable storage and transportation system, which does not always exist in India. The lack of these facilities causes huge annual wastage. Government plans to upgrade cold storage facilities continue to be on the back burner. The existing facilities are highly inadequate to keep pace with rising production of fruit and vegetables in the country.
3. In India, legislation regulates the processed food industry like the Prevention of Food Adulteration Act, 1954 and the Fruit Products Order, 1955. No doubt, these laws are meant to provide uniform and high quality food products to consumers but due to certain practical problems they have hampered the growth of the processing industry.
4. Production is concentrated mainly in unorganized and tiny sectors where economies of scale are not possible. Attainment of international acceptable quality products in these small units is difficult.

5. Modern technology is available to a handful of large companies. Obsolete technology in production, processing, packaging and distribution coupled with high costs and government duties and taxes make Indian products less competitive in world markets.
6. Absence of effective backward linkages in the fruit and vegetable processing industry with small farmers also cause mismatches between industry production schedules and the supply of raw materials.
7. The high cost of raw material, machinery and packaging material; poor technology in processing, packaging and distribution; inadequate and expensive air- cargo and shipping and port facilities, etc. also inhibit the growth of this industry.

Potential for Fruit and Vegetable processing: Despite various constraints, there exists great potential for further fruit and vegetable processing in India. Important factors in achieving this potential are:

1. There is an opportunity to tap under exploited minor fruit. Many products, though nutritious, are not suitable for consumption in their fresh state, but can be processed into excellent products. Processing could make better use of existing capacity in the processing industry.
2. With the improvement in living standards and more women supplementing the family income, there is a shift in food requirements and the demand for processed fruit and vegetables is bound to increase. Convenience foods, ready-to-eat and fast foods have become a social necessity. The availability of convenient fruit and vegetable products providing nutritious products at reasonable prices during the off season should greatly help working women to save their valuable and creative time. Also, today with the impact of the electronic media, rural people have also become users of processed fruit and vegetables.
3. Fruit and vegetable processing causes huge solid wastes. Processing of wastes/by-products may increase total returns or lower unit processing costs. It is estimated that every year fruit and vegetables worth about Rs.3000 crore are wasted due to lack of post harvest processing. If this loss is avoided /controlled, it would not only increase the income of the growers but also add to the food basket of the country.
4. India is the largest producer of fruit and vegetables in the world, accounting for about 10 and 13 percent of world total fruit and vegetable production, respectively. But India's share of world trade is small suggesting the country has potential for more exports (Table 5).
5. Fruit and vegetable processing has close and direct rural linkages throughout the country. This helps to create employment both in skilled and unskilled segments in growing, harvesting, transportation, storage, processing and distribution.
6. The Ministry of Food Processing Industry in India is extending financial assistance in the form of grants in-aid for setting up new processing units, modernization and

upgrading of existing units. This will go a long way in boosting the fruit and vegetable processing sector.

Policies needed for sector development: Some suggestions for achieving growth and development in the fruit and vegetable processing industry in India are given below:

1. Varieties of fruit and vegetables fit for processing should be developed. The processors should enter into contracts with farmers and procure the products at specified prices. Currently, contract obligations are not always met. If the demand for processed products is not adequate, companies do not procure the product claiming inferior quality. If the free market prices are higher than contract prices, farmers will not sell produce to the processors. It is necessary to develop a contract binding both parties to their obligations. The Ministry of Food Processing Industry is operating a scheme to strengthen backward linkages through promotion of contract farming.
2. Farmers need to be encouraged to form cooperatives to grow raw materials for industry. They could supply semi-finished material, thus cutting transport cost of peel, pomace, etc.
3. There is a long distance from factory to ports/sea ports and products may not be dispatched for export immediately after reaching the ports/sea ports. Refrigerated vans for taking products from factories to ports/sea ports and storage facilities need upgrading.
4. The possibility needs to be explored for collaboration with multinationals, to better compete in the world market.
5. Efforts should be made to improve capacity utilization, using multi purpose processing plants. Installing flexible machinery that can process a range of products is vital.
6. Research and development and technology transfer should be encouraged by giving special incentives by providing better quality material and improving productivity.

CONCLUSIONS

Demand as well as production of fruit and vegetables has increased considerably over time in India. Production of fruit has grown at an annual compound growth rate of 4.35 percent and vegetables at 5.74 percent during 1992-2002. Now, further processing has assumed paramount importance for commercial exploitation by creating time, form and space utilities. The installed capacity utilization is low (below 50 percent). The growth in output of processed fruit and vegetables was greater during the 1990's than the 1980's, mainly due to new Government economic policies. India witnessed a substantial increase

in exports of processed fruit and vegetables during the 1990's but total exports still remain a very small fraction of total output. Exports could be increased by developing appropriate research and development policies and relaxing the constraints faced by the processing industry.

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