www.himpub.com

Current Status of Indian Fruit Processing Industry vis-a-vis Brazil

Dr. PURUSHOTTAM BUNG

Current Status of Indian Fruit Processing Industry *vis-a-vis* Brazil

- A Case Study of Mango

Dr. PURUSHOTTAM BUNG

Himalaya Publishing House

Current Status of Indian Fruit Processing Industry *vis-a-vis* Brazil

—A Case Study of Mango

By

Dr. PURUSHOTTAM BUNG

B.E., PDMS (Aust.), MBA (Aust.), Ph.D.

Himalaya Publishing House

● MUMBAI ● NEW DELHI ● NAGPUR ● BENGALURU ● HYDERABAD ● CHENNAI ● PUNE
● LUCKNOW ● AHMEDABAD ● ERNAKULAM ● BHUBANESWAR ● INDORE ● KOLKATA ● GUWAHATI

First Edition: 2014

Published by : Mrs. Meena Pandey for **Himalaya Publishing House Pvt. Ltd.,** "Ramdoot", Dr. Bhalerao Marg, Girgaon, **Mumbai - 400 004.**
Phone: 022-23860170/23863863, Fax: 022-23877178
E-mail: himpub@vsnl.com; Website: www.himpub.com

Branch Offices :

New Delhi : "Pooja Apartments", 4-B, Murari Lal Street, Ansari Road, Darya Ganj, New Delhi - 110 002.
Phone: 011-23270392, 23278631; Fax: 011-23256286

Nagpur : Kundanlal Chandak Industrial Estate, Ghat Road, Nagpur - 440 018. Phone: 0712-2738731, 3296733; Telefax: 0712-2721215

Bengaluru : No. 16/1 (Old 12/1), 1st Floor, Next to Hotel Highlands, Madhava Nagar, Race Course Road, Bengaluru - 560 001.
Phone: 080-32919385; Telefax: 080-22286611

Hyderabad : No. 3-4-184, Lingampally, Besides Raghavendra Swamy Matham, Kachiguda, Hyderabad - 500 027.
Phone: 040-27560041, 27550139; Mobile: 09390905282

Chennai : No. 8/2, Madley 2nd Street, Ground Floor, T. Nagar, Chennai - 600 017. Phone: 044-28144004/28144005; Mobile: 09345345051

Pune : First Floor, "Laksha" Apartment, No. 527, Mehunpura, Shaniwarpeth (Near Prabhat Theatre), Pune - 411 030.
Phone: 020-24496323/24496333; Mobile: 09370579333

Lucknow : Jai Baba Bhavan, Church Road, Near Manas Complex and Dr. Awasthi Clinic, Aliganj, Lucknow - 226 024 (U.P.).
Phone: 0522-2339329, 4068914; Mobile: 09307501550

Ahmedabad : 114, "SHAIL", 1st Floor, Opp. Madhu Sudan House, C.G. Road, Navrang Pura, Ahmedabad - 380 009.
Phone: 079-26560126; Mobile: 09377088847

Ernakulam : 39/104 A, Lakshmi Apartment, Karikkamuri Cross Rd., Ernakulam, Cochin - 622011, Kerala. Phone: 0484-2378012, 2378016; Mobile: 09344199799

Bhubaneswar : 5 Station Square, Bhubaneswar - 751 001 (Odisha).
Phone: 0674-2532129, Mobile: 09338746007

Indore : Kesardeep Avenue Extension, 73, Narayan Bagh, Flat No. 302, IIIrd Floor, Near Humpty Dumpty School, Indore - 452 007 (M.P.).
Mobile: 09301386468

Kolkata : 108/4, Beliaghata Main Road, Near ID Hospital, Opp. SBI Bank, Kolkata - 700 010, Phone: 033-32449649, Mobile: 09910440956

Guwahati : House No. 15, Behind Pragjyotish College, Near Sharma Printing Press, P.O. Bharalumukh, Guwahati - 781009, (Assam).
Mobile: 09883055590, 09883055536

DTP by : Asmita Tandle.

Printed at : M/s. Seven Hills Printers, Hyderabad, On behalf of HPH.

Dedicated
to
My Beloved Parents

Acknowledgements

At the fag end of this great voyage in the quest for knowledge and wisdom, which also marks the beginning of a new horizon, it is in fact an insurmountable task to acknowledge all those people who planted and nurtured the spirit of faith and hope in accomplishing this great endeavor. Still then an attempt has been made to extend heartfelt reciprocative acknowledgement with sincere gratitude and great respect to the following:

First of all, I offer my sincere obisciences unto the lotus feet of Lord, who is cause of all causes and is the source of knowledge, intelligence, spirit, and everything in this material world, without whose mercy nothing can be accomplished in this world. I take this opportunity to offer my respectful regards unto the feet of my beloved parents who stood behind me in all my endeavors and inspired me to take up this task in a challenging spirit and accomplish the same, since beginning.

Secondly, I place on record my sincere gratitute to of Dr. Ashok H. Chachadi, the Professor of Management, KIMS, Karnataka University, Dharwad, the most successful academician and researcher of our region. His critical comments, mind tickling remarks, creative thoughts, encouraging words and complete support (moral, academic, philosophical….) throughout this assignment has enabled me to accomplish this great voyage of knowledge successfully.

It gives me an immense pleasure to express my profound indebtness and heartfelt thanks to the most dynamic, and charming personality, Sri Dr. H.S. Vijaykumar, Honorable Ex-Vice Chancellor, University of Agricultural Sciences, Dharwad, for encouraging me to take up this task and also helping me in all respects throughout.

I owe my thanks to Prof. Ashalatha K.V., Associate Professor, University of Agricultural Sciences, Dharwad, for her valuable guidance.

I extend warm and heartfelt thanks with a great respect to Sri Guru Sevanand Prabhu, an ISKCON devotee from Brazil. His holiness helped me a lot in searching various important websites of Brazil, gathering relevant information pertaining to the topic, and then translating the same from Portuguese language to English.

I gratefully acknowledge the cooperation and help extended to me by all the respondents of survey, i.e., mango cultivators, mango processors and representatives of various associations, who shared required information along with their own views, thoughts and perspectives pertaining to this study. Without their contribution, this task wouldn't have been complete.

Last but not the least, I express my heartfelt thanks to all my colleagues, friends, relatives, well-wishers, DTP expert Sri Anup, and also the students for their kind support in this great endeavor.

I will be failing in my duties, if I don't express my heartfelt indebtness to my wife Smt. Sangeeta, who kept me inspired all along with great love, care and affection. I am indebted to my nephew Sri Venugopal, son Raghunandan and daughters Shraddha and Krishnapriya for cheering me up in times of hardships.

…… any omission in this short note of acknowledgement does not mean lack of gratitude.

– Purushottam Bung

Contents

List of Tables

List of Figures/Graphs

List of Appendices

List of Abbreviations

Sr. No.	Abbreviation	Full Form
01	AKPMA	All Karnataka Pickle Manufacturers Association
02	APEDA	Agriculture and Processed Food Products Exports Development Authority
03	BoP	Balance of Payment
04	BPRE	Business Process Re-engineering
05	CFTRI	Center for Food Technology Research Institute
06	CGR	Compound Growth Rate
07	CII	Confederation of Indian Industry
08	CSF	Critical Success Factor
09	DGFT	Directorate General of Foreign Trade
10	EMBRAPA	Brazilian Agency for Agriculture Research and Animal Husbandry
11	ERP	Enterprise Resource Planning
12	f.o.b	Free on Board
13	FAO	Food and Agriculture Organization
14	FOREX	Foreign Exchange
15	FPI	Fruit Processing Industry
16	FPO	Fruit Processing Order
17	GDP	Gross Domestic Product
18	GIS	Geographic Information System
19	GNI	Gross National Income
20	HOPCOMS	Horticulture Produce Co-operative Marketing Society

21	I/P	Input
22	ICAR	Indian Council for Agriculture Research
23	ISO	International Standards Organization
24	KSF	Key Success Factor
25	KSPCB	Karnataka State Pollution Control Board
26	LSI	Large Scale Industry
27	mmt	Million Metric Tonnes
28	MNC	Multi National Company
29	MOFPI	Ministry of Food Processing Industry
30	MR	Marketing Research
31	MRP	Material Resource Planning
32	MSI	Medium Scale Industry
33	mt	Metric Tonne
34	NABARD	National Bank for Agriculture and Rural Development
35	NGO	Non Government Organization
36	NHB	National Horticulture Board
37	NHM	National Horticulture Mission
38	O/P	Output
39	PHL	Post Harvest Loss
40	PPP	Purchase Power Parity
41	Qty	Quantity
42	R&D	Research and Development
43	R/M	Raw Material

44	RBH	Rural Business Hub
45	SHD	State Horticulture Department
46	SME	Small and Medium Enterprise
47	SPC	Statistical Process Control
48	SQC	Statistical Quality Control
49	SR	Sales Revenue
50	SSI	Small Scale Industry
51	TQM	Total Quality Management
52	USD	United States Dollar
53	VAT	Value Added Tax
54	VHT	Vapor Heat Treatment
55	WB	World Bank

Foreword

An economy at large will thrive when all the major industries will perform to their fullest potential. The industry will perform to its fullest capacity when each and every incumbent firm is aggressive enough to face the global competition through: ongoing improvement; ability to innovate faster, better and in a cost effective manner; ability to understand the underlying forces that are shaping the competition; and finally their ability to develop a strategic plan of action and successful execution of the same to reap the benefits to the fullest extent possible. A detailed study on each and every industry is what is required today to understand the nuances of a particular industry, i.e. industry structure, competition within the industry, buyers' configuration, suppliers' configuration, composition of new entrants, emergence of new substitutes, configuration of complementors, impact of Government actions, influence of adjacent industries, and so on.

Fruit processing industry in general and mango processing industry in particular is one of the emerging industries of India which has a tremendous potential yet to be unleashed. It is really frustrating to know that India being the largest producer of fruits and vegetables is still in its infancy when it comes to processing of the fruits and vegetables. For some reasons Indian fruit processing industry in general and mango processing industry in particular couldn't grow beyond a certain limit. There lies a huge potential which needs to be exploited and make India a world's biggest fruit processing factory.

Prof. Purushottam Bung is a reputed teacher of Strategy and Entrepreneurship, having long experience of teaching these subjects at both Post Graduate level as well as Doctoral level. He is a seasoned researcher and scholar, with significant contributions in various functional areas of management like Strategy, HR, Production and Operations Management and Entrepreneurship. Prof. Bung was also an entrepreneur, that too from a fruit processing industry, having a rich experience of being an entrepreneur for nearly a decade. He is a rare blend of teacher and entrepreneur.

He has produced a book out of his Doctoral research work which serves basically two purposes. One, it is a ready guide on Indian fruit processing industry in general and mango processing industry in particular giving complete picture of the industry and explaining the underlying forces that are shaping the competition in this particular industry. He has attempted to compare India vis-à-vis Brazil, a global leader in this space covering all the stake holders namely Growers, Processors, Government, Nodal bodies, Middlemen, end Customers, Cooperatives, Associations, etc.

Second, it is a great book based on total research with no theory which can be used by the policy makers, industry incumbents, entrepreneurs and research scholars. This is a great illustration as to how a good research work can be made really useful to the economy at large and industry in particular.

I commend the authors for bringing out a truly valuable textbook.

Professor H. S. Vijaykumar
Vice Chancellor, University of Agricultural Sciences
Dharwad, Karnataka, India

Preface

A nation as a whole flourishes when all the major industries of that nation excel and perform to their fullest potential. The industry will perform to its fullest potential when each and every incumbent firm within that industry is competitive enough to face the global competition and emerge as a leader. A detailed study on each and every major industry and benchmarking it against the global leader is the need of the hour to understand the underlying forces that are active and are shaping the competition within a given industry.

India being Agriculture based economy; fruit processing industry is one of the promising industries of India which has a tremendous future in the days to come. India being the largest producer of fruits and vegetables is still in its infancy when it comes to processing of the fruits and vegetables. There lies a huge potential which needs to be exploited and make India a world's biggest fruit processing factory.

India and Brazil are the developing countries with open market economies share the common history. Both had been the colonies of Portuguese. Brazil became independent in 1822, where as India got its independence in 1947. After independence both countries opted to have democratic rule in their nations, resulted in India becoming the greatest democracy in the world with the population of 1110 million and Brazil, the democracy with the population of 189 million as on 2008. Both countries enjoy almost the similar climatic conditions, i.e., both are tropical with vast agro climatic variations leading to enormous bio diversity. Hence they share the long history of crop husbandry. Both countries lead the world in the production of fruits.

In spite of the above commonalties and similarities between the two nations, both countries stand miles apart when one compares the size and growth of the fruit processing industry. This calls for an in-depth study of this particular industry against a world leader. Hence an attempt has been made to convert the Doctoral research work into a book where-in a comparative study of the fruit processing industry has been made between India and Brazil so that the road map to turnaround the Indian fruit processing industry can be laid in a similar fashion as that of turnaround of dairy industry during 1980s.

As mentioned earlier, this book is fallout of the Doctoral research work. Hence it is important for the reader to know about the research plan in brief. Broadly, the research work undertaken can be classified as descriptive and diagnostic type of research. The research project undertaken is a descriptive study because it is a fact finding investigation with adequate interpretation. Moreover it is more specific than exploratory study, as it has focus on particular aspects or dimensions of the problem studied. It is designed to gather descriptive information on the fruit processing industry. The research project undertaken is a diagnostic study also because the research is aimed at discovering; What is happening in fruit processing industry? Why is it happening? and What can be done about it?, etc., i.e. identifying the causes of a problem and the possible solutions to it. Moreover it is more actively guided by hypotheses that are being formulated at the outset.

The research work undertaken involves both primary research as well as secondary research. Primary research involves collecting first hand information directly from the cultivators, processors, and cooperatives/associations and analyzing the same. Whereas secondary research consists of, gathering required secondary information about fruit processing industry of both the countries through exploring

various secondary sources and analyzing the same. Various credible sources have been explored to gather the required information.

After thorough analysis and subsequent discussion, series of interpretations have been made and in the end conclusions were drawn. Based on the research findings, recommendations were made to all the stakeholders involved.

In total, this book serves two purposes. One, it is a ready referral on Indian fruit processing industry in general and mango processing industry in particular, giving complete information on the industry and explaining the nuances of this industry. The attempt has been made to compare India vis-à-vis Brazil, a global leader in this space covering all the stake holders namely Growers, Processors, Government, Nodal Bodies, Middlemen, End Consumers, Cooperatives, Associations, etc. Second, this book can be used by the policy makers, industry incumbents, and entrepreneurs for better understanding of this particular industry so that better decisions can be made.

This book, I presume may inspire the other researchers from various disciplines to translate their research work in to a book form so that it can be made useful to the economy at large and industry in particular.

Purushottam Bung

About the Book

An economy at large will thrive when all the major industries will perform to their fullest potential. The industry will perform to its fullest capacity when each and every incumbent firm is aggressive enough to face the global competition. A detailed study on each and every industry is what is required today to understand the nuances of a particular industry. Fruit processing industry in general and mango processing industry in particular is one of the emerging industries of India which has a tremendous potential yet to be unleashed. There lies a huge potential which needs to be exploited and make India a world's biggest fruit processing factory.

The book which is produced out of the Doctoral research work serves basically two purposes. One, it is a ready guide on Indian fruit processing industry in general and mango processing industry in particular giving complete picture of the industry and explaining the underlying forces that are shaping the competition in this particular industry. The attempt has been made to compare India vis-à-vis Brazil, a global leader in this space covering all the stake holders namely; Growers, Processors, Government, Nodal bodies, Middlemen, end Consumers, Cooperatives, Associations, etc. Second, it is a book based on total research with no theory which can be used by the policy makers, industry incumbents, entrepreneurs and research scholars.

1 Chapter

Introduction

TABLE 1: Key recent economic, agronomic, and demographic parameters

India	*Key recent parameters*	*Brazil*
3287590	Total area in sq km	8511965
2973190	Total land area in sq km	8456510
314400	Total area covered by water in sq km	55455
Tropical in south to temperate in north	Climate	Mostly tropical but temperate in south
1703000	Total arable land in sq km (2008)	674000
100000	Total arable land under permanent crops in sq km	77000
1270190	Total non arable land in sq km	7782510
558080	Total irrigated land in sq km	29200
22.80%	Total forest area (%)	56.50%
677010	Total forest cover in sq km	4776981
1110	Total population (2008) in million	189
1.70%	Population growth rate	1.50%
84.70%	Urban population (%) (2008)	29.00%
2726	GNI (PPP) (2008) in US$ billion	1647
911.8	GDP (Official exchange rate) (2008) in US$ billion	1067.5
821	GDP per capita (2008) in US$	5648
2726	GNI Per Capita (PPP) (2008) in US$	8700
9.20%	GDP real growth rate (2008)	3.70%
18.60%	% of GDP from agriculture sector (2005)	8.40%

27.60%	% of GDP from industry sector (2005)	40%
53.80%	% of GDP from services sector (2005)	51.60%
Under developing	Country status	Under developing
496.4 million	Total labor force (2005)	90.41 million
60%	% of labor force in agriculture	20%
17%	% of labor force in industry sector	14%
23%	% of labor force in service sector	66%
8.90%	Unemployment rate	9.80%
29%	Population below poverty line (2008)	22%
99.45	Total exports f.o.b.(2005) in US$ billion	118.3
138.09	Total imports f.o.b.(2005) in US$ billion	77.62
-38.64	Net exports f.o.b. (2005) in US$ billion	40.68
28.1% GDP	Total Investment (gross fixed) (2005)	19.9% of GDP
7.90%	Industrial production growth rate (2005)	3.40%
US$ 136 billion	Forex reserves and gold	US$ 53.8 billion
₹ 44.1011 per US$	Official exchange rate (2005)	2.434 reals per US$
341	No. of airports	4276
60.0 million	Internet users	25.9 million
Federal republic	Constitution of the government	Federal republic
Was Portuguese colony & got independence in 1822	History	Was British & Portuguese colony got independence in 1947
Coal, iron ore, manganese, mica, bauxite, NG, limestone, diamond, Petrol-eum, arable land	Natural resources	Bauxite, gold, iron ore, manganese, nickel, phosphate, platinum, tin, uranium, petroleum, timber

Source: The little green and red book series of world bank and FAO statistical year book series of UN publications

TABLE I: Major fruit producing countries of the world, their production, % contribution and CGR (Compound Growth Rate):

Qty: 000'Tonnes

Countries	*Quantity (2003)*	*% contribution*	*CGR*
China	72003	13.60	6.70
India	45911	9.54	3.04
Brazil	34064	7.75	-1.16
USA	29125	6.66	-0.29
Italy	15728	3.76	-0.50
Spain	17071	3.31	3.48
France	9730	2.38	-1.18
Turkey	11200	2.28	2.07
Mexico	14716	2.89	3.00
Philippines	11804	2.29	4.95
Thailand	7521	1.61	1.16
Iran	12712	2.54	3.63
Others	198665	41.39	1.41
Total	**480250**	**100.00**	**2.05**

Source: FAO Production year books for the years 1996 to 2003 (Refer Appendix-I)

TABLE II: Major mango producing countries of the world, their production, % contribution and CGR (Compound Growth Rate):

Qty: 000'Tonnes

Countries	*Quantity (2003)*	*% contribution*	*CGR*
India	10500	45.47	CGR
China	3413	11.34	-0.86
Thailand	1750	5.75	11.3
Mexico	1503	6.21	2.32
Pakistan	1036	3.97	0.85
Philippines	890	3.52	4.85
Indonesia	731	3.663	9.08
Brazil	845	2.63	4.88
Nigeria	730	2.87	6.18
Egypt	326	1.16	3.55
Others	3839	13.45	5.54
Total	**25563**	**100**	**14.05**

Source: FAO Production year books for the years 1996 to 2003 (Refer Appendix-II)

Preamble

From Table 1, it is clear that India and Brazil are both developing countries with open market economies share the common history. Both had been the colonies of Portuguese. Brazil became independent in 1822, where as India got its independence in 1947. After independence both countries opted to have democratic rule in their nations, resulted in India becoming the greatest democracy in the world with the population of 1110 million and Brazil, the democracy with the population of 189 million as on 2008[1].

Economic condition of the two countries is also comparable. Gross Domestic Product (GDP) of India was US$ 911.8 billion for the year 2008 where as the GDP of Brazil was US$ 1067.5 billion during the same year. Total Indian exports were worth US$ 99.45 billion during year 2005 where as the total Brazilian exports were worth US$ 118.3 billion during the same year. India imported goods and services worth US$ 138.09 billion during year 2005 where as Brazilian imports were worth US$ 77.62 billion during the same year. Exports and imports structure, both region wise and commodity wise, of both nations are comparable. Inflation, unemployment rate, GDP growth rate, and poverty rate are also comparable.

Both countries enjoy almost the similar climatic conditions, i.e., both are tropical with vast agro climatic variations leading to enormous bio diversity. Hence they share the long history of crop husbandry. As shown in Table 1, both countries lead the world in the production of fruits. In 2003, India produced 46 million metric tons (mmt) of fruits where as Brazil produced 34 mmt of fruits, contributing to 9.55 percent and 7.09 percent of global production, respectively[2] (Refer Table 1).

In spite of the above commonalties and similarities between the two nations, both countries stand miles apart when one compare the size and growth of fruit processing industry and also the total loss of fruits due to wastage and value destruction at various levels. Following discussion prove this statement.

Brazil processes 70 percent of the total fruit production with a minimum loss of around 20 percent[3], whereas India processes just 2 percent of the total production with an alarming loss of around 40-50 percent[4]. The comparison of exports of fruits and processed fruit products between the two nations reveal that Brazilian exports of fruits and processed fruit products were worth US$ 719 million during year 2004, whereas Indian exports of the same were worth US$ 109 million in the same year (around 15 percent of the Brazilian exports). If we include all the major groups related to FPI (Fruit Processing Industry) as

detailed in the Appendix-VII, the Brazilian exports stand at US$ 822 million where as Indian exports of the same stand at US$ 127 million during the same year (around 15.50 percent of Brazilian exports)[5].

Indian Fruit Processing Industry seems to be in its infancy stage and growing at a very slow pace. In year 1998-99 there exist over 4000 Fruit Processing units in India with an aggregate capacity of 1.2 million metric tons which was less than 4 percent of total fruit production. This industry is growing at around 20 percent every year. Moreover the industry is dominated by large no of smaller units (cottage scale/home scale/small scale) having small capacities ranging from 20 tons to 250 tons per year. Only 20 percent of the production of processed fruits is being exported[6].

In spite of several serious measures taken by the Govt. of India to re-vitalize the industry like;

1. Formation of altogether separate ministry called Ministry of Food Processing Industries to take care of this Industry.
2. Liberalization of import of technology.
3. Allowing equity participation.
4. Drastic reduction of duties on import of capital goods required for Food Processing.
5. De licensing all food processing industries except beer, potable alcohol and wine
6. Automatic approval of foreign investment up to 51 percent except few items reserved for small scale sector.
7. Foreign technology tie-ups, etc.

The position of the Indian Fruit processing industry seems to be improving rather very slowly[7].

Considering the following facts about this industry:

1. It has a very high multiplier effect on economy than that of power and telecom sectors.
2. Vast export potential
3. Rapid growth in the domestic demand for processed fruit products because of;
   (i) Smaller nuclear family set-ups.
   (ii) Percentage of working women is increasing rapidly.

(iii) Income levels are rising, especially income of the middle-class population. The sheer size of the middle-class population is also increasing at a phenomenal rate.

(iv) Tangible changes in the eating habits of people.

(v) People in general have become health conscious.

4. Fruits and vegetables are the food of the future[8].
5. Horticulture – The focus of the next phase of green revolution[9].
6. India has the unique distinction of being able to grow almost all types of fruits and vegetables.

It is being argued that India has a huge potential and can be the largest food factory in the world[10].

The possible reasons for the poor growth of this industry in India include;

1. Low productivity at the farm level because of the following problems which leads to higher cost of raw material;
   (i) Inferior quality of seeds/seedlings/saplings
   (ii) Mechanisms for assessing Quality of seeds, seedlings/ saplings are not made available to cultivators
   (iii) Predominance of old and senile orchards
   (iv) Hi-tech horticulture is being adapted on a very limited scale[11].
2. Non availability of ideal processing varieties of fruits. Too many varieties (over 3000 varieties of mango for example) have been grown in India and majority of them are table varieties which are not suitable for processing.
3. Indian production is made up of produce of large number of varieties and therefore lacks uniformity in physiochemical characteristics. This leads to poor o/p due to poorer yield.

   E.g. 16 tons of Indian pineapple produce one ton of concentrate where as only 8 tons of Philippine pineapple produce the same output.

   E.g. 7 tons of Indian tomato produces 1 ton paste, where as 4 tons of Italian tomato produce the same output[12].
4. Poor post-harvest management leading to huge post harvest loss because of;
   (i) Poor infrastructure facilities to store and transport.

(ii) Weak processing infrastructure. Lack of sufficient number of processing units is a major bottleneck, as the crops are seasonal and are perishable.

5. Lack of necessary infrastructure facilities like cold storage units, cold chain, drying yards, freeze drying units, pre-cooling centers, etc., surrounding major cultivation areas. This leads to non availability of raw material to processing units throughout the year.
6. Huge storage and transportation costs; because farms, raw material markets, cold storage units and processing centers (units) are situated in distant locations. This results in higher prices of raw material. This is the reason prices of Indian products (both fruits and processed fruit products) are higher than the prices prevailing in the international markets (E.g. Indian export prices of pineapple and oranges are two to four times higher than the prices prevailing in the international markets[13]).
7. Majority of the small FPIs (Fruit Processing Industries) function only during the harvesting season of the crop and remain idle for the rest of the year. Fruits need very specific handling and storing requirements if their quality and freshness are to be maintained. Moreover products need to be stored at specific temperature and humidity levels. Cold chain is required right from the farm gate till the end product reaches customer. This will ensure continuous supply of raw material to such industries.
8. Horticulture crops were treated as one of the several means of land use of secondary importance, with food grain crops receiving prime attention. Hence it leads to reduced production of fruits and thus inadequate supply of raw material to Fruit Processing Industry.
9. Domestic demand for processed fruits is quite meager because of economic conditions and eating habits of people. Indian people, in general, prefer fresh fruits and vegetables than processed fruit products.
10. Non availability of credit facilities by the banks and financial Institutions to the fruit processors in order to meet the seasonal financial requirements of this sector.
11. Less 'R&D' work is being undertaken in this sector. It is carried out by few national Institutions like ICAR (Indian

Council for Agriculture Research), CFTRI (Center for Food Technology Research Institute), etc.

12. Poor sanitary and phyto-sanitary measures.
13. Lack of innovation with respect to packaging.

Looking at the above problems/constraints facing this industry, it is clear that they involve following stake holders;

1. Fruit cultivators
2. Private and public fruit processors
3. Government Departments/Nodal bodies like/Concerned Institutions like; **NHB** (National Horticulture Board), **NHM** (National Horticulture Mission), **MOFPI** (Ministry of Food Processing Industry), **APEDA** (The Agriculture and Processed Food Products Export Development Authority), **ICAR** (Indian Council for Agriculture Research), **CFTRI** (Center for Food Technology Research Institute, Mysore), **SAUs** (State Agriculture Universities), etc.
4. Ministry of Agriculture (of both State and Central Government), the APEX body which frames strategies and policies for the future.
5. Cold chain members
6. Cultivators co-operative organizations, Processors co-operative organizations, Other Associations, NGOs, etc.
7. Middle men
8. Retailers, Wholesellers, Super markets, and other channel members

It becomes clear that all the stake holders involved are pursuing their own interests without much co-ordination amongst them, leading to poor growth of this industry. Hence a coordinated, integrated and strategic effort of all the above bodies (stake holders) is must to turnaround this industry. Fruit Processing Industry of India has to undergo a radical shift to address all the above constraints and reap the enormous advantages/benefits/profits which this sector is to offer and be the world's largest fruit processing factory. Problems/constraints have to be studied in wholesome, integrated and strategic manner rather than adopting piecemeal approach.

Some work has been done in this direction, but lot more needs to be done to exploit the tremendous potential, which the India has in this sector. This definitely requires an in-depth comparative study (Bench-

marking Study) of the Indian Fruit Processing Industry with the leading countries like Brazil (Bench-marking partner).

Needless to say that this particular study (Bench-marking Study) would have been done with other major fruit producing countries such as USA and others. But other conditions including; Economical, Agrarian, Agronomical, Climatic, Technological, etc., being dissimilar, such a comparison becomes an infeasible one and would be of little use to India.

"So there lies a strong need to pursue an in depth study on the fruit processing industry so that the road map to turnaround the Indian fruit processing industry can be laid in a similar fashion as that of turnaround of dairy industry during 1980s."

2 Chapter

Review of Literature

The review of literature in the field of fruit processing industry of India and Brazil has revealed several contemporary issues of importance and are discussed in brief here-in-under. They include issues related to growth in the production of fruits, growth with respect to processing of fruits, present availability and future requirement of infrastructure, emergence of wide product range, adoption of emerging new technologies by the firms, management practices (procurement management of raw materials and other inputs, marketing management of finished products and other outputs, production management, etc.) followed by both cultivators and processors, and strategies and policies pursued by all the stake holders involved for the overall growth of this industry.

The Indian fruit processing sector is undoubtedly a potential sector and has a tremendous scope for unparalleled growth prospectus in the coming days. The Government of India has taken a lot of initiatives and policy decisions for commercializing agriculture with specific importance on high tech horticulture and developing the fruit processing, preservation and packaging sectors to its full capacity. The fruit processing sector is rapidly being transformed into a high volume profit making industry. A distinct shift is seen among the consumers for processed, prepared and packed fruit products not only in the so called developed countries but also in the developing countries like India. This has catalyzed the research work in this area leading to publishing of numerous research articles and papers.

Literature discussed in this chapter, which throws light on the contributions made by the prominent researchers in this study area, will set the guidelines for this particular research project and indicate the tremendous scope for the further research in this particular area. Literature available pertaining to subject matter of this research work of both the countries, i.e., India and Brazil are being discussed in brief.

Biodiversity International News of Brazil, (2006), made a remark on EMBRAPA (Brazilian Agency for Agriculture Research and Animal Husbandry), a prime government nodal agency of Brazil, about the announcement that the number of seed samples stored in its Gene Bank had topped 102000, putting the Brazilian gene bank at No. 7 in the world in total number of accessions. More than 500 species were represented in the gene bank, which has restored lost varieties and species of local communities in Brazil. The gene bank will open four new cold storage chambers this month, doubling its capacity to 240000 accessions.

Rocha *et. al.*, (2001), studied the efficiency of the starch degradeation index for estimating maturity in mango 'Tommy Atkins', a predo-minant variety of mango grown in Brazil, aiming its utilization as an alternative method at field. The efficiency of the method was evaluated through correlation between the index and each of the following traits: starch content, skin color, pulp color, pulp firmness, Ph, titratable acidity, soluble solids, reducing sugar and non reducing sugar. The experiment was completely randomized with five treatments and six replications, and was based on pulp and skin colors. They found a good correlation between the index and each of the traits studied, however pulp color had the best correlation coefficient. And the above correlation analyses indicate that the grower can utilize this method.

NFI Archive Report (2003), reported that the fruits and vegetables that are grown only on 6-7 percent of gross cropped area have contributed more than 18.8 percent of the gross value of agricultural output and 52 percent export earnings out of total agricultural produce. They further opined that during the last few years considerable emphasis has been given to this sector. Accordingly, areas under fruit production has increased by 172 percent from 1961-1993, productivity per hectare was nearly doubled leading to an increase in production to the tune of 320 percent. The average labor requirement for fruit production is 860 man-days per hectare per annum as against 143 man-days for cereals crops. Crops like grapes, bananas, and pineapple generates much larger employment roughly from 1,000 to 2,500 man-days per hectare per annum, the researcher added.

Vinodchari (2003), reported that India is among the world's major producer of food, producing over 600 million tons of food products every year. The researcher further explained that the food processing industry ranks fifth in size in the country representing 6.3 percent of GDP, accounts for 13 percent of the country's export and involves 6 percent of total industrial investment in the country.

Brunini *et. al.,* (2002), in their research work titled *'Quality of Tommy Atkins mango pulp frozen and stored at -18 degree Celsius'* with the aim of evaluating the best preservation methods of Tommy Atkins mango pulp manufactured using two different processing methods namely; ground pulp and sliced pulp frozen and stored at -18 degree Celsius found that ground pulp had reasonable aspects until twenty weeks while sliced pulp had reasonable aspects for eighteen weeks. In general the appearance, texture and flavor were affected by the storage time.

MOFPI (Ministry of Food Processing Industries) Report, (1999), reported that India is the largest producer of fruits (41.5 mmt) and second largest producer of vegetables (67.28 mmt) in the world. The country tops in production of banana, mango, potato, tomato, onion, green peas and coconut. Only 2 percent of the fruits/vegetables produced are being processed at present. The installed capacity of fruits and vegetables processing industries has increased to 21 lakh tons in 1999 with 4589 fruit/ vegetables processing units. Exports during 1998-99 were worth ₹ 678 crores.

Perosa, *et. al.,* (2002), in their article titled "*Post-harvest techniques and expansion of the mango culture in the Sao Paulo state – Brazil"* highlighted that the worldwide demand for mango has been increasing over the last few years and Brazilian mango production for exportation has been showing a great possibility of growth, where the use of floral induction and post-harvest techniques have helped to participate in new market shares while the supply from other countries has been reduced. They noted that in the last decade, the mango production and exportation have been increasing in the Sao Paulo state. They found that adoption of new post-harvest techniques for improving the mango quality required for exportation has a great influence on the production growth. In addition, this activity has shown to be considerably profitable for producers.

TIFAC Report (2003), the task force on Agro food processing of TIFAC on the sub group on fruits and vegetables, has given the technology status and future vision for India. The report states that the total production of fruits in the world is around 370 mmt. India ranks first in the world with an annual output of 32 mmt. TIFAC study has focused on 12 selected vegetables which accounts for about 65 percent of the total production in India. It is estimated that around 20-25 percent of the total vegetables is lost due to poor post harvesting practices. Further while discussing about the future trends, the report highlighted that fruits and vegetables would continue to be harvested manually in the future. While small land holdings and non availability of good quality planting material have been the major issues of concern, it is expected that quality of planting material would improve in the long run

due to right selection, hybridization, proper breeding and adoption of tissue culture.

Junqueira, *et. al.,* (2004), in their research article based on series of experiments conducted on 'effect of soybean oil in the control of 'anthracnose' (a most important post-harvest disease of mango) and on post-harvest conservation of mango' found that immersing the fruits for five minutes in soybean oil alone or with benomyl or thiabendazol at 22 or 40 degree Celsius increased mango shelf life period and was efficient in the control of anthracnose instead of using the fungicide thiambendazole alone that can leave residues in the fruit. Thus this method will also satisfy the consumers who claim for pesticide free fruits and pollution free environment. US Commercial Services Report (2000), reported that the Indian food processing industry is a high priority sector and is poised for excellent growth in the next century. The government of India has adopted a major policy decision for commercializing agriculture and packaging sectors. Agricultural production and food processing together accounts 30 percent of India's GDP and employs more than 70 percent of its work force.

Silva, *et. al.,* (2001), in their research work titled *"Effect of earth worm excrements and cattle manure on leaf nutrient concentration and on the production of mango"* found that the traits of nitrogen in the leaves were high and the concentration of calcium were low and there was an increase in production in all the growing seasons.

MOFPI (Ministry of Food Processing Industries) in its annual report (2000-01), reported that the country's share in the world trade of processed fruits and vegetables is still less than 1 percent. As such, abundant investment opportunities are there in the expanding domestic market and export arena. An increasing acceptance of new products together with innovative market development efforts is seen.

Pinheiro, *et. al.,* (2005), in their research work titled *'Evaluation of microbiological quality of fruits minimally processed commercialized in super markets'* described minimal processing as handling, preparing, packing and distribution of agricultural products. These together with value added processes such as selection, cleaning, peeling and cutting will increase the value attached to them. The researchers concluded that the need to have a good quality control system, following the good manufacturing practices, implementation of a preventive HACCP system are all essential in order to assure the consumer a healthy and a safe product.

G.K. Kaul (1997), in his report on status of fruits and vegetables in India stated that the annual growth, both in area and production of horticultural crops has gained considerable momentum following

planned diversification in Indian agriculture, encouraged by the Government from the Eighth Five Year Plan onwards. Further he highlighted that several fruit crops have proved to be most remunerative for replacing subsistence farming in the rain fed, dry land, hilly, arid and coastal agro systems.

Surinder Sud (1998), in his article on India's revolutionary progress in food production opined that the interest shown by the domestic corporate sector and transnational corporations in setting up food processing units indicate that India would soon emerge as an important player in the international processed foods market. The Government already has approved about 343 proposals for 100 percent Export Oriented Food Processing Units and joint ventures since the beginning of the economic reforms, i.e., in the early 1990s. These would involve an investment to the tune of ₹ 43040 Million including foreign direct Investment worth ₹ 7880 Million.

Pina, *et. al.,* (2003), studied the mango processing and conserveation by combined methods. The physical, chemical, microbiological and sensorial stability of mango pieces was achieved through bleaching using saturated vapor for two minutes, adjusting water activity (Aw) to 0.97, pH to 3.6, addition of 600 ppm of acetic acid, 1000 ppm of Sodium Benzoate and 600-900 ppm of sulphur di oxide. The mango products processed under these conditions showed higher physical, chemical, microbiological and sensory stability than the other methods.

MOFPI report (2001), It's report on summary on fruits and vegetable processing documented in the report of Ministry of Food Processing Industries (MOFPI) highlights the following facts;

1. India is the second largest producer of vegetables and third largest producer of fruits.
2. Thirty percent of the fruits and vegetables get wasted due to lack of proper processing and packaging facilities.
3. Only 2 to 3 percent of the total produce is being processed in India.
4. Total cultivation area under fruit and vegetables is around 12.0 million hectares and accounts for 7 percent of the total cultivation area.
5. Main fruits produced in India are Mango, Banana, Citrus, Guava and Apple. These fruits account for 75 to 80 percent of total fruit production.

Castro Neto, *et. al.,* (2003), in their research work titled *'Effect of water deficit on the transpiration and stomatal resistance of mango tree'* found that flowering induction of mango growth has not given satisfactory results mainly due to inadequate irrigation management. Transpiration and stomatal resistance of mango trees can reflect the water status of the plant. Monitoring the transpiration and stomatal resistance of mango trees during water deficit and irrigation period suggests that the flower induction by water deficit is not efficient due to incorrect irrigation management.

K.P. Prabhakaran Nair (2006), expressed that Indian agriculture is being undermined because of the unreformed policies in the agriculture sector that continue to encourage monoculture such as wheat and rice in Punjab and sugarcane in Maharashtra, where the cultivation has lead to exploitation of ground water causing long term environmental degradation. The extensive input subsidies which are not conducive to efficient agro practices may cause greater harm in the future. Indian agricultural extension network is comparatively inefficient when compared with the other countries like China and Brazil.

Researcher argued that China's success in the agriculture processing sector is mainly due to their 'bottom up' approach where in around 1.5 million farmer agro technology extension agents, who work shoulder to shoulder with the farmers in the field adopting innovative practices all the time. Whereas we adopt 'top down' approach, where in agricultural scientists, doing research, frame strategies and policies for future in consultation with politicians and bureaucrats. But least importance has been given to extension activities through which technological innovations and advance practices will reach to ultimate farmers.

According to the researcher Indian agriculture sector will bloom only when the mentality of India's agricultural fraternity will give top priority to providing necessary help and support to our farmers in the field.

Renata Tieko Nassu, *et. al.,* studied the degree of acceptance of fresh and processed fruits namely melon, mango and cashew apple using combined methods by the consumers. The researchers found that fresh cashew apples received lesser acceptance than the processed cashew apples while fresh mangoes were more acceptable than processed mangoes and degree of acceptance of fresh and processed melons were more or less the same.

Paulo Faveret Filho, *et. al.,* (1998), analyzed the production of fruits within Brazil from various perspectives emphasizing the obstacles to establishing a large scale export strategy. The study revealed that the world market for fresh fruits is growing very rapidly, but is heavily

influenced by the government policies of the main importing countries and the level of competition. International competitiveness appears to be increasingly dependent on efficient systems of commercialization which are the result of both public and private sector initiatives, albeit in various combinations. Brazil has not yet succeeded in assembling such a system, a fact that is largely to blame for its poor export performance. Further, authors reported that Brazilian fruit sector lacks the coordinating effects of market and public policies that would permit the establishment of a productive chain together with the required infrastructure and mechanisms of commercialization, which will cater to the needs of both domestic and international markets. These are necessary for it to realize its potential.

Manish Jain (2002), in his article explained that India accounts for 10 percent of the total world production of fruits and ranks second after China. It leads the world in the production of mango, banana, sapota and acid lime and has recorded highest productivity in grapes. Area under fruit has increased from 2.87 million hectares during 1991-92 to 3.729 million hectares during 1998-99 recording an increase of 29.93 percent. Similarly production increased from 28.63 mmt (million metric tons) to 44.02 mmt recording an increase of 53.83 percent. During the same period, productivity of fruits increased by 18.4 percent. Further he listed five largest fruit producing states of the country viz., Maharashtra (17.08 percent), Karnataka (12.37%), Andhra Pradesh (10.42%), Bihar (8.82%) and Uttar Pradesh (8.20%).

Researcher also noted the trend that out of the horticultural crops produced in the country, approximately 60 percent is consumed by the local population or marketed in the nearby market yards and only about 40 percent of the produce is channeled through the regulated markets for the consumption of urban population in the cities. Export markets account for less than 5 percent of the total production except in some commodities like cashew, spices, onion, etc. He noted further that the bare minimum infrastructural facilities are lacking even in the regulated markets. The horticulture produce suffer significant post-harvest losses due to lack of adequate post-harvest and marketing infrastructure viz., Processing units, packaging and grading facilities, cold storage facility, refrigerated transport vehicles/containers, storage and phytosanitary facilities, etc.

Researcher strongly recommends for an integrated development of horticulture industry in order to meet not only the requirements/demand of the domestic market but also to exploit the export potential to maximum extent. Emphasis on quality production needs to be strength-

hened together with sound post-harvest management of the highly perishable horticultural commodities.

Assis, *et. al.,* (2004), in their experimental study on *'Nutritional balance and physiological disorders in mango Tommy Atkins'* concluded that high concentrations of Ca (calcium) and Mg (Magnesium), as well as low ratios of N/Ca (N: Nitrogen) and K/Ca (K: Potassium), both in the flesh and in the skin, were efficient to prevent physiological disorders in mango fruits; the nutrient concentration in the skin may show better, the condition of physiological disorders than the nutrient concentration in fruit flesh; and the TSS (Total Soluble Solids) values and TSS/TTA (TTA: Total Titrable Acids) ratio in fruits with symptoms were much higher than in fruits without symptoms, due to over ripening of flesh tissues.

Gouri Sundaram (2000), in a study on processed tropical fruits indicated that India is the second largest producer of fruits and vegetables in the world with an annual production of 94 mmt (million metric tons). It has the distinction of producing almost all tropical and exotic fruits and vegetables because of varied climatic conditions. Due to the short life span of these crops, as much as 30-35 percent of the fruits and vegetables perish at various stages viz., harvesting, storage, grading, transport, packaging and distribution. Only 2 percent of these crops are processed in to value added products. Hence there is strong need for maximum commercial utilization of fruits and vegetables and to adopt innovative production and marketing practices to the requirements of the world market and also to cater to domestic demand which over the past few years has been increasing because of various socio economic factors.

Dias, *et. al.,* (2003), in their research work titled *'Incidence and severity of mango flower malformation in six different cultivars (varieties)'* aimed at evaluating the incidence and the severity of mango flower malformation in the six cultivars namely; Rosa, Haden, Bourbon, Palmer, Tommy Atkins and Van Dyke in the semi arid zone of Brazil found that the highest percentage of incidence and severity of flower malformation was gotten by Haden variety where as Rosa and Bourbon cultivars presented minimum occurrence of the disease.

MOFPI Report, (1998), in their documentation on fruit processing submitted to Ministry of Food Processing Industry, highlighted that fruit and vegetable processing industry in India is highly decentralized. A large number of units are in home scale sector, cottage scale sector and small scale sector having installed capacity of 50 tons to 250 tons a year, where as a smaller number of large scale Indian and multinational companies have larger installed capacities in the range of 05 to 30 tons per hour. Due to effective liberalization policies and withdrawal of

excise duty on fruit and vegetable products there has been significant rise in the growth rate of production of this industry.

Offenbach, *et. al.,* (2003), in their research article titled *'The effect of modified atmosphere and refrigeration on post-harvest of mango'* with the aim of evaluating the post-harvest behavior of mango in refrigeration and the potential of the modified atmosphere technology, tending to permit a best post-harvest conservation of mangoes, found that all the parameters such as fruit weight loss, peel and color, firmness, decay incidence, pH, total soluble solids, titratable acidity and their ratios were all within the normal range and reacted positively if PEBD with ethylene absorber sachet is used to modify the atmosphere of the fruit than the other methods such as using PVC sachets, permeable selective film with ethylene absorber sachet (Conservax), etc.

McKinsey and CII study report, (2001), in their article reported that, according to a joint study conducted by McKinsey and Confederation of Indian Industry (CII), a staggering 50 percent of production of fruits and vegetables in India are lost due to wastage and value destruction. In monetary terms, the loss was estimated at over ₹ 23,000 crores a year.

Katar Singh *et. al.,* (2002), in their study on role of Banks in promoting India's export of fruits and vegetables, explained that banks have played an important role in extending finance for agricultural exports since nationalization, i.e., 1969. In 1969 commercial banks provided only 14.6 percent of their total credit to the priority sector and the same had gone up to 43 percent in 2001. Similarly the percentage of credit disbursed to agriculture sector has gone up from 5.4 percent to 18 percent over the same period. They further opined that, to achieve substantial increase in exports of fruits and vegetables we require continuous flow of better eco friendly technologies, easy availability of institutional finance for production and post production operations and higher level of investment in creating basic infrastructure such as roads, markets, power, airports, etc.

Jatosti and Spina (1992), reported that citrus fruit production world wide rose 12.4 percent between 1976 and 1981. Oranges made up 71 percent of total harvest, lemon and lime 9 percent. The greatest expansion of production occurred in Brazil, while US production has stagnated. There was a marked trend towards processing which accounted for one third of production.

Bastine Latha and Palanisami (1994), worked out the growth rates in area, production and productivity of major crops of Kerala. The

exponential function, Y=ABt was fitted to the data of 25 years (1965-66 to 1989-90) to compute the compound growth rates.

Deepak Shah and Narayan Murthy (1998), studied marketing pattern of horticultural crops in Maharashtra. The grape orchardists marketed their produce either through forwarding agents in whole sale markets or through commission agents or directly to the Wholesaler. The per box (4Kg) total marketing cost was estimated to be the highest when the produce was sold through forwarding agents in the whole sale markets compared to the produce sold through other marketing channels.

Deepak Shah (2000), studied the marketing pattern of grapes in Maharashtra. Since majority of the orchardists sold their produce in the domestic market, the estimation of marketing cost was attempted for domestic market only. The following channels were visualized in marketing of grapes in the domestic market.

Channel I : Producer ⟶ Forwarding Agents ⟶ Wholesaler

Channel II : Producer ⟶ Commission Agents ⟶ Wholesaler

Channel III : Producer ⟶ Wholesaler

Channel IV : Producer ⟶ Pre harvest Contractor ⟶ Wholesaler

Munir *et. al.,* (1989), studied issues pertaining to post-harvest technology in Uttar Pradesh, India. He suggested that most harvesting; threshing; storage; transport; and marketing processes are still carried out using traditional implements, though modern technologies are used in state farms.

Marchal (1990), opined that after harvest, the organization of processing, marketing and sales activities in the developing countries is not proper and has lead to excessive losses. The position could be improved by setting up processing centers closer to farms and storage yards closer to markets and harvesting at the most appropriate stage and improved handling. He observed that processing was limited and the products were often not suited to the needs of traditional consumption.

Shepherd (1993), studied a market oriented approach to post-harvest management in developing countries. Many past interventions in the post-harvest sector of developing countries have failed because, whilst being technically correct they have been planned without reference to the market needs and the ability or willingness of the market to pay for the supposed improvement. This study emphasizes the need to place post-harvest activities, particularly the loss prevention activities, within a market context. So providing pointers for planners and technologists active in the post-harvest sector is a must.

Chaudhary *et. al.,* (1987), reported that the total number of fruit and vegetable processing units in India were around 1,300 with an installed capacity of 3 lakh MT (Metric Tons). Capacity utilization was increased from 25-30 percent in 1970 to 40 percent in 1982. Factors like high cost of packaging material, high incidence of import duty and lack of research efforts for modernization of packaging and other techniques were found to be affecting the industry's production and exports.

Madan and Ullasa (1991), conducted a survey in orchards, markets and processing units in Karnataka to determine the extent and causes of post-harvest losses in mango. The post-harvest loss to the extent of four percent was estimated at the processing unit end. The major cause for the loss was the occurrence of post-harvest diseases including; 'stem-end-rot', 'Anthrocnose', 'Aspergillus' and 'Chizopus rots'. The authors suggested that these losses could be reduced by following the recommended production technology.

Channappa Gowda (1995), reported that in Karnataka, horticultural crops are grown in an area of 12.34 lakh Ha which accounted for 11.5 percent of the total cropped area. As per an estimate, 25 to 40 percent of India's fruits and vegetables production, valued about ₹ 3,000 crores goes waste due to lack of post-harvest infrastructure and handling facilities.

Karwasra *et. al.,* (1997), reported that post-harvest losses in fruits and vegetables in India is worth about ₹ 4,000 crores annually. In general physical terms, post-harvest losses in these commodities vary from 9 to 40 percent. Any reduction in these losses through proper post-harvest management will generate additional quantity to meet internal and external requirements even at existing level of production.

Chengappa *et. al.,* (1981), computed the growth rates of area, production and productivity of coffee in India. Linear model of the type $Y(t) = a + bt$ and exponential model of the type $Y(t) = abt$ were used to work out the growth rates. The exponential function indicated a good fit. The annual growth rate of production was 5.68 percent for Arabica and 7.40 percent for Robusta, while combined growth rate was 6.10 percent.

Mandal and Das gupta (1981), estimated the post-harvest losses for eight fruit crops and six vegetable crops both in terms of quantity and monetary value in whole sale and retail markets of Kolkata, West Bengal during 1977 and 1978. The fruits considered for the study together lost 35460 tons worth ₹ 827.00 lakhs and the six vegetables together lost 73240 tons worth ₹ 61.2 lakhs. The study revealed that the losses varied depending on locality, time period, mode of transportation followed etc.

Madan and Subramanyam (1987), conducted a survey in Kolar district of Karnataka to assess the post-harvest loss of Mango fruit at the fields (orchards) as well as at the markets (both whole sale and retail). The commodity movement analysis technique was used to identify the points for where the loss occurred and to identify how the commodity was handled by the different market functionaries. The post-harvest losses of mango were recorded at two stages, i.e., at the assembling markets (14.30 percent) and at the time of storage for ripening at whole sale and retail markets and processing units (11.91%).

Madan and Ullasa (1991), conducted a survey in orchards, markets and processing units in Karnataka to determine the extent and causes of post-harvest losses in mango. The post-harvest loss to the extent of 4 percent was estimated at the processing unit end. The major cause for the loss was the occurrence of post-harvest diseases including stem-end-rot, Anthracnose, Aspergillus and Rhizopus rots. The author suggested that these losses could be reduced by following the recommended production technology.

Roy and Pal (1991), assessed the extent of losses in mango at various stages of post-harvest operations. They found that the fruits discarded at the field level were 1.30 percent, culled fruits ranged from 12 to 18 percent and were sold at lower prices. The physiological losses in weight during transportation of the produce were 3.68 percent. At the time of ripening in the boxes total loss was 7.53 percent and the extent of loss was still higher in pile ripening method. To reduce the post-harvest losses in mango, they suggested taking up the spray of fungicides to control storage diseases, which occur primarily due to Anthracnose and stem-end-rot.

Indian Institute for Horticultural Research (IIHR) Report (1992), reported the post-harvest losses in mango, orange and banana among the fruit crops and onion and tomato among the vegetable crops. The estimated post-harvest loss in different varieties of mango varied from a minimum of 17.10 percent (Dashehari) to a maximum of 36.70 percent (Totapuri). The estimated post-harvest loss was 11 to 14 percent in the case of banana. Two percent of loss occurred in field after harvest, 2 percent of loss occurred with the whole sale trader and 8 percent after the ripened fruits reached the retail stage. Out of the total Coorg oranges harvested, 8.5 percent was rejected on the field, 3.5 percent after transportation to the whole sale market and a further 3.5 percent at the retail level. The post-harvest losses in vegetables revealed that the total loss in Bangalore Rose and Bellary red onions was estimated at 13.5 percent and 30 percent respectively. The study also showed that the extent of loss depended on the variety of crop, season and area of production.

Atteri (1994), worked out the physical and economic losses of Dashehari and Chausa varieties of mango in new *sabji mandi* (new vegetable market) of Delhi and found that the quantity of fruits affected ranged from 1.0 percent to 50 percent. It was 15.2 percent at whole sale and 7.74 percent at retail level for Dashehari, where as these figures for Chausa were 21.83 percent and 9.62 percent respectively. The percentage of economic losses for Dashehari at whole sale and retail levels were 7.73 percent and 5.73 percent respectively. The corresponding figures for Chausa variety were 6.02 percent and 6.71 percent. The study suggested to put serious efforts to train farmers for judging the right stage of harvesting so that the losses could be minimized.

Rao and Manohar (1995), studied loss of fruits in packing and transportation and observed the occurrence of damages to the fruits mainly at three stages, viz., harvesting and transportation of the produce to the whole sale markets, repacking and transportation by the Wholesellers and loading and unloading of the fruits at various locations. They also reported that the extent of damage of fruits vary with the packing material used. About 100 to 2000 kgs of fruits were damaged in a truck carrying 7 to 10 tons of fruits where leaves were used as packing material. Where as the extent of loss was only 10 percent when the boxes of 6 mm thickness were used as packing material.

Sharma *et. al.,* (1995), worked out the post-harvest losses during storage, transportation and marketing of major vegetable crops (capsicum, tomato, beans and peas) in Solan district of Himachal Pradesh based on the primary data collected from a sample of 60 farmers. According to the study, the minimum losses were found to be in the case of beans. The extent of losses was found to be highest while transporting the vegetables from fields to the storage yards. The losses during transportation were about 10 percent for peas and beans and more than 21 percent in the case of tomatoes. About 18 percent of the losses were found during grading and packing. The main causes for losses noticed were attack of pests and diseases, breakage of fruits, uneven size and mixture of different varieties. The losses at the market were more than 30 percent for beans and peas while these were less than 15 percent for capsicum.

Indian Institute for Subtropical Horticulture (1996), conducted a survey in Farukhabad and Kanpur regions of Uttar Pradesh to estimate the post-harvest losses in Papaya. It was reported that the losses during harvesting occurred mainly due to accidental falling of the fruits. About 10 percent of the fruits got cracked in varying intensities during harvesting. Rottening losses to the extent of 25.1 percent were observed at the ripening stage. The aggregate loss at retailer level was 7.2 percent.

An analysis of pooled losses in entire post-harvest distribution system of Papaya revealed that only 53.03 percent of the produce reached the consumer in good marketable condition. In other words 46.97 percent of the produce was lost at various stages.

Srinivas *et. al.,* (1997), conducted a survey to assess the post-harvest losses of Totapuri (Bangalore) and Alphonso (Badami) mangoes in Karnataka and reported a total post-harvest loss of 17.9 percent (3.5 percent at the orchard or farm; 4.9 percent during transportation; 4.1 percent during storage; and 5.3 percent at the retail level). The major causes for losses observed in the order of their occurrence were physical injuries like breakages, spoilage due to poor handling and storage, immature or over maturing of the fruits, under size or over size, pilferage during transportation and handling and damages caused to fruits by birds and hailstorms.

Gajanan (2002), studied the marketing practices and post-harvest loss assessment in Poovan variety of Banana in Tamil Nadu. Trichy district was selected based on its maximum contribution to the area under banana. The producers of banana were found to use two main channels for marketing their produce, i.e., selling in the local market either through pre-harvest contractor or commission agents (channel I) and selling to the agents or the Wholesalers in the distant markets like Bengaluru, Mumbai and Chennai (channel II). The post-harvest losses in channel I was found to be slightly less at around 19 percent when compared to 21 percent in channel II. The main reason for the higher loss in channel II was transit loss. Further, in order to make the best use of the utilizable waste banana fruits, it was suggested to establish processing units of banana in the main production area as it was found feasible.

Sreenivasa Murty *et. al.,* (2002), conducted post-harvest loss estimation in Bangarpalli variety of mango at different stages of marketing. Krishna district in Andhra Pradesh was selected as it ranked first in terms of area and production in the state. The post-harvest losses in mango at different stages of mango were estimated under two heads, viz., physical Post-harvest Loss (PHL) and economic Post-harvest Loss (PHL). The average physical PHL at the farm level in Bangarpalli variety was 15.6 percent. This was due to the harvest of immature and small fruits. It was observed that physical PHL at market level was virtually zero. On an average about 128 fruits out of 1440 fruits were found to be damaged due to poor handling.

Subramanyam and Mrityunjaya (1978), based on their study on marketing of fruits and vegetables in Bangalore suggested the following;

1. Regulation of marketing of fruits and vegetables through fixing reasonable commission by the middle men and strict supervision.
2. Creation of vegetable marketing organization units with assembling centers located at growing areas.
3. Arrangements to provide the financial assistance and the other essential inputs
4. Creation of commodity marketing boards for each or a group of similar fruits and vegetables to take care of both supply and marketing of the same.
5. Providing cold storage facilities to the farming community and establishment of retail outlets to protect the interests of farming community and consumers.
6. Organizing market surveillance and intelligence activities and dissemination of the above information through all possible means of communication for improving the marketing efficiency of fruits and vegetables.

Nagaraj *et. al.,* (1985), in their study on market appraisal of fruits and vegetables documented the problems and remedies for vegetable producers and intermediaries. The problems documented were lack of storage facilities, delay in getting the sales proceeds from the intermediaries, higher rates of commission, improper weighment, wide fluctuation in prices, higher handling costs at the market, etc. However retailers and commission agents complained about congestion in the market yards. The remedial measures suggested by the participants were;

1. Regulation of markets and equipping with a network of infrastructure facilities ranging from scientific storage to transportation and processing.
2. Regulation of futures trading.
3. Spreading the tentacles of cooperative marketing and reducing their procedural formalities involved to encourage producers.
4. Providing financial assistance to purchase well ventilated vehicles/temperature controlled vehicles and fruit and vegetable storing plastic crates/cartons, which are to be used for transporting and marketing of perishables.

3 Chapter

Research Design and Methodology

Any research by its core meaning is an organized set of activities aimed at studying and developing a model/procedure/technique to find the solutions to a realistic problem, supported by literature and data, such that its objectives are optimized and help the researcher in making valid recommendations/inferences for implementation. Thus a good piece of research work should start with setting clear-cut objectives. Objectives set for this research include;

Research Objectives

1. To study the production pattern of fruits in general and mango in particular of the entire world and also the countries of interest, i.e., India and Brazil over the past years.
2. To study the Agrarian structure, population distribution structure, key economic indicators including FAO indices, imports and exports of major group related to FPI (Fruit Processing Industry) of both countries, i.e., India and Brazil over the past years.
3. To study the exports and imports pattern (configuration) of fresh fruits and major processed fruit products in general and exports of mangoes and processed mango products (complete range of products) in particular of India over the past years. Also to study country wise contribution and CGR (Compound Growth Rate) of each of the processed mango products exported, in great detail.
4. To assess the availability of necessary infrastructure to the farming community (mango cultivators) and the fruit processsing industry (fruit processors) of India and also to study the problems facing these two groups.

5. To study the investment pattern, extent of adoption of advanced technology, penetration level of co-operative movement, financial viability and profitability, amongst both groups, i.e., mango cultivators and mango processors of India.
6. To study the various processes involved like procurement, storing, grading, cleaning, packing, etc., and also to study the management practices followed by both the groups i.e., mango cultivators and mango processors of India.
7. To study the functioning of concerned nodal agencies/ Government departments/other concerned institutions, of both countries, i.e., India and Brazil.
8. Lastly to suggest recommendations to all the stake holders involved, i.e., mango cultivators, mango processors, all concerned nodal agencies/Government departments/other concerned institutions, and lastly to Ministry of Agriculture, Government of India for the healthy growth of the fruit processing industry of India.

Research Plan

Broadly, the research work undertaken can be classified as descriptive and diagnostic type of research.

The research project undertaken is a descriptive study because it is a fact finding investigation with adequate interpretation. Moreover it is more specific than exploratory study, as it has focus on particular aspects or dimensions of the problem studied. It is designed to gather descriptive information and provides information for formulating more sophisticated studies.

The research project undertaken is a diagnostic study also because the research is aimed at discovering; what is happening in fruit processing industry, why is it happening, and what can be done about it, etc., i.e., identifying the causes of a problem and the possible solutions to it. Moreover it is more actively guided by hypotheses that are being formulated at the outset.

The research work undertaken involves both primary research as well as secondary research. Primary research involves collecting first hand information directly from the cultivators and processors through structured interviews guided by detailed interview schedules. Once collected, information is put to analysis using MS-Excel and SPSS software packages. Two separate chapters titled ‘primary research pertaining to cultivators’ and ‘primary research pertaining to processors’ will cover entire discussion about this particular part of the research.

Whereas secondary research consists of, gathering required secondary information through exploring various secondary sources. Various credible sources have been explored to gather the required information. Once gathered, information is put to analysis using various statistical and computational tools and techniques. A separate chapter titled 'Secondary Research' will cover entire discussion about this particular part of the research.

Description about Primary Research

Primary description about this particular part of the research includes;

Geographic Region Covered

Entire Karnataka state and adjacent districts of neighboring states, i.e., Tamil Nadu, Andhra Pradesh and Maharashtra has been chosen as the geographic region for this particular research project.

Sampling Method

Single stage cluster sampling coupled with non probabilistic convenience based selection within the cluster has been used where-in Karnataka state has been chosen as a cluster. The reason behind choosing Karnataka state as a cluster is, it is a leading producer of fruits next only to Maharashtra. Maharashtra ranks first with its dominant share of 17.08 percent, whereas Karnataka ranks second with its share of 12.37 percent. Moreover Karnataka ranks fourth in mango cultivation next only to Andhra Pradesh (17.98%), Uttar Pradesh (17.15%) and Bihar (11.00%), representing 8.83 percent of total mango cultivation of India. Thus Karnataka is a major mango growing state and has a strong mango processing industry that best represents the entire nation, as a good cluster. Within the cluster, the non probabilistic convenience based sampling scheme is used to facilitate the researcher to draw required samples from various strata within a cluster. Stratum in this case is nothing but the different scales of operations of both cultivators as well as processors, i.e., tiny scale, small scale, medium scale, and large scale.

Sample Size

Considering the feasibility of the study and the limitations of resources including time, sample size of fifty mango cultivators (Those who have grown minimum of fifty plants and more) and twenty-five mango processors spread across the entire state of Karnataka and also the adjacent districts of neighboring states (Andhra Pradesh, Tamil Nadu and Maharashtra) has been decided.

Method of Data Collection

In depth interviewing mechanism guided through structured interview schedules, prepared separately for cultivators as well as processors, is being used to gather the first hand information about the farming community (mango cultivators) as well as fruit processing industry (mango processors). Wherever we had difficulty in reaching the respondents, especially the processors, responses were being collected through mail with ongoing clarifications if necessary.

Tools used for Collecting Data

Well structured interview schedules, for both groups, i.e., mango cultivators and mango processors, designed carefully, were being used to gather primary information. Interview schedules once prepared were being tested for appropriability for the research.

Tools used for Data Analysis

Various statistical, mathematical and computational tools and techniques including; Pearson correlation, Pearson chi-square test, tabulation analysis, etc., are being used, using MS-Excel and SPSS software packages for primary data analysis. The detailed discussion about the tools and techniques used is covered under chapter titled 'Primary research pertaining to cultivators'.

Hypotheses

After careful considerations and intense discussions with the experts, following hypotheses (four in number) were being framed;

Hypothesis 01

(Ho-01): Null hypothesis 01: Indian fruit processing industry especially mango processing industry is not at all affected by non availability of high yield and high pulp containing varieties of mangoes that also have high resistance towards pest attack, which are ideal for processing.

(Ha-01): Alternate hypothesis 01: Indian fruit processing industry especially mango processing industry is affected by non availability of high yield and high pulp containing varieties of mangoes that also have high resistance towards pest attack, which are ideal for processing.

Alternate hypothesis Ha-01 further mean that; the problem is due to non-availability of quality seedling/sapling of desired variety and the lack of adequate extension support to farmers from the concerned nodal agencies. So farming community should be provided with the required extension support with respect to; providing right variety quality seedling, careful monitoring of the growth, effective and efficient farm management, mode and time of harvesting, post harvest management, seeking the benefits of economies of scale, etc., from the concerned Government departments/nodal agencies/concerned Institutions to change the attitude and mindset of farming community.

Hypothesis 02

(Ho-02): Null hypothesis 02: Indian fruit processing industry, especially mango processing industry is not at all plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging, marketing of the output, etc. This is not a serious bottleneck for this industry.

(Ha-02): Alternate hypothesis 02: Indian fruit processing industry, especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging, marketing of the output, etc. This is a serious bottleneck for this industry.

Alternate hypothesis Ha-02 further mean that there lies a tremendous scope to revamp this industry by; adopting well proven strategies, channelizing the funds properly to create the necessary infrastructure that is required, extending necessary support to the farming community as well as fruit processing industries by the concerned departments and institutions, etc. Traditional practices need to be replaced with ultra modern practices that encompass technological advancements together with sound management skills which will bring down the post harvest loss to more reasonable levels.

Hypothesis 03

(Ho-03): Null hypothesis 03: Lack of cooperative effort amongst farming as well as processing community is not at all a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition.

(Ha-03): Alternate hypothesis 03: Lack of cooperative effort amongst farming as well as processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition.

Alternate hypothesis Ha-03 further mean that smallness of individual cultivator and processor is the sole cause for their exploitation and is also a prime cause for non-exploitation of the huge potential of this industry. Hence, a cooperative movement amongst farming as well as processing community will strengthen their position with regard to the following;

1. Creating necessary infrastructure like; well developed nurse-ries, laboratories, storage facilities including cold storage, pre cooling centers, and freeze drying facilities, cargo airports in the vicinity of cultivation centers, state of the art packaging and processing facilities, sound marketing, sales, and extension networks, GIS facility, etc., will become possible.
2. Reaping the benefits of larger economies of scale and higher value addition will become possible.
3. Adopting an integrated approach right from the farm gate till final consumer encompassing all the activities like; planting the right variety quality seedling, harvesting at right time, proper grading, proper storing, in time processing, innovative packaging, effective and efficient marketing and selling, etc., will become possible.
4. Enjoying higher power to bargain in the market will lead to fetching better prices for their output, which in turn will improve the financial condition of the farmers and the processors.

Enchanting success of 'green revolution' and 'white revolution' in India has already set the trend. A similar approach needs to be followed to turn around this industry and making 'horticulture revolution' a successful one.

Hypothesis 04

(Ho-04): Null hypothesis 04: Lack of integration of all the activities starting from farm gate till final consumers, because of ill functioning of the Government departments/nodal bodies/concerned Institutions with no clear direction and goals doesn't prohibit the farming community and processing industry of India from attaining the desired growth.

(Ha-04): Alternate hypothesis 04: Lack of integration of all the activities starting from farm gate till final consumers, because of ill functioning of the Government departments/nodal bodies/concerned Institutions with no clear direction and goals prohibit the farming community and processing industry of India from attaining the desired growth.

Alternate hypothesis Ha-04 further mean that there lies a most promising scope to import the 'Brazilian Model' where in a single nodal agency 'EMBRAPA'(Brazilian Agency for Agriculture Research and Animal Husbandry), takes complete care of both farming community (cultivators) and processing industry (processors) by having a fool proof mechanism/system in place to address all their concerns/problems and working in an integrated fashion, with more clearer objectives, strategies and policies, to sort out the contemporary upcoming issues. This is the secret of the success of Brazilian fruit processing industry.

Following facts and figures about 'EMBRAPA' prove this.

1. There is one and only one APEX Govt. nodal body for entire agriculture and animal husbandry industry of Brazil, unlike in India where we have many nodal bodies catering to specific industries like horticulture, cotton, sugar, food processing, fisheries, poultry, dairy, etc.
2. It takes complete care of interests of farmers, keep them aware about latest developments, provide them the necessary inputs in terms of knowledge, expertise, infrastructure, facilities, technology, etc.
3. It employs 120,000 Farmer Agro Technology Extension Agents who work shoulder to shoulder with the farmers in the field using a 'bottom up' approach, innovating all the time, as opposed to our 'top down' approach where the office loving agricultural scientists dish out recommendations and vanish. Indian agriculture extension network is the most inefficient in the world (*Times of India*; November 20, 2006 edition).
4. EMBRAPA doesn't distribute grants and subsidies to farmers like India. Rather it builds necessary state-of-the-art infrastructure like;
   (i) Cargo airports in remote areas to facilitate zero time transfer of perishables to processing centers (Total number of airports in Brazil: 4,276, compared with 341 in India),
   (ii) Gene banks to store seed samples,

(iii) Cold chain facility throughout the country to minimize post harvest loss,

(iv) New state-of-the-art technologies to bring down the cost,

(v) Ongoing continuous research in the field of sustainable and organic agriculture to lead the world in agriculture and animal husbandry,

(vi) Developing better varieties to enhance the yield, etc.

Gathering and Analyzing Primary Information

Accordingly data was collected through intense personal interviews with the farmers and processors spread across the geographical region set for the purpose of research.

Data collected was then being checked thoroughly to trace out the missing part and later collected the same through ongoing follow up with the respondents via telephonic conversation/mail/email.

Once assured that all the responses are complete, the entire information was coded as per the requirement of SPSS and fed in to the computer system. Entire information was then put to analysis using various statistical, mathematical, and computational techniques. Findings were then discussed in the light of recent developments based on which hypotheses were tested and conclusions were drawn.

Description about Secondary Research

Primary description about this particular part of the research includes;

Method and Sources of Secondary Data Collection

FAO commodity year books, International trade statistics from www.trademap.com, FAO Production year books, FAO statistical year books, the little green and red data book series of WB (World Bank), etc., for the past years have been explored to avail the required data. Export import data bank from the official website of the Directorate General of Foreign Trade (DGFT) under ministry of commerce and industry has been explored to a great depth to get the required information about the exports and imports configuration of India. Relevant research papers and articles published in various journals of both nations, news papers, magazines, etc., have all been explored to get the required information. Nevertheless, official websites of UNCTAD, DGFT, ITC, WB, FAO, etc., have been explored deeply to get hands on the required information.

Tools used for Collecting Secondary Data

Tabulation techniques are used for collecting secondary information.

Tools used for Secondary Data Analysis

Various statistical, mathematical and computational tools and techniques including Average percent increase or decrease analysis, Average percent contribution analysis, CGR (Compound Growth Rate) analysis, independent t-test, etc., using MS-EXCEL are being used to analyze the secondary information. The detailed discussion about the sources explored, information gathered, tools used, and the presentation of the findings is covered under chapter titled 'Secondary Research'.

4 Chapter

Secondary Research

Brief Description about the Secondary Data Collected

At the outset, information pertaining to total fruit production of the world as well as total mango production of the world, with a country wise break-up, over the past years was collected using various available sources like; FAO production year books, official website of FAO, etc., and tabulated in the desired order. Tables numbering I and II contain this particular information and the same have been publicized under appendix (Appendix I and II). This information is intended to help the researcher in analyzing the global trend related to fruit production in general and mango production in particular.

In the second phase of data collection, following information about India, the home country and Brazil, the benchmarking partner was collected:

1. Other important recent economic, agronomic, and demographic related parameters of both the countries (table 1).
2. Agrarian structure of both the countries.
3. Population distribution structure of both the countries based on their primary activity.
4. FAO indices on various production parameters of both the countries.
5. Imports configuration of major groups related to FPI (Fruit Processing Industry) of both the countries.
6. Exports configuration of major groups related to FPI (Fruit Processing Industry) of both the countries.
7. Major fruit production pattern of both the countries

Various available resources including; FAO commodity year book series, FAO production year book series, and FAO statistics year book series published by UN, the little green and red data book series of World Bank, International trade statistics from www. trademap.com [the official website of ITC (International Trade Center), the official websites of Governmental departments of both the countries, etc. have been explored to collect the required information and later tabulated in the desired order. Tables numbering 1 till 7 contain this information and the same have been publicized under appendix (Appendix III to VIII). This information is intended to enable the researcher to conduct a detailed in-depth comparison study between the two countries, i.e., India and Brazil.

In the third phase of data collection, information pertaining to imports and exports configuration of major fruits as well as major processed fruit products of India was collected through exploring various available sources, especially the official website of DGFT (Directorate General of Foreign Trade) under ministry of commerce and industry of India. The information so collected has been tabulated in the desired order. Tables numbering I1 to I8 contain this particular information and the same have been publicized in appendix (Appendix IX to XII). This information is intended to help the researcher in analyzing the Indian fruit processing industry in general, critically.

In the fourth phase of data collection attempt has been made to collect information pertaining to exports of mango and the various processed mango products from India over the past years using various available sources, especially the official website of DGFT (Directorate General of Foreign Trade) under ministry of commerce and industry of India. The information so collected has been tabulated in the desired order. Tables numbering i to xiii contain this particular information and the same have been publicized under appendix (Appendix XIII to XXV). This information is intended to help the researcher in analyzing the mango processing industry of India in particular, critically.

Method of Data Collection and Sources of Data

Desk top research method has been used to gather the secondary information. Following sources have been explored in great depth to gather the required information:

1. FAO production year book series published by UN.

2. FAO commodity book series published by UN.
3. FAO statistics year book series published by UN.
4. Other FAO periodicals published by UN.
5. The little green and red data book series of WB publications.
6. Other WB periodicals.
7. FAO portal.
8. WB portal.
9. Export Import data bank maintained by DGFT (Directorate General of Foreign Trade) under ministry of commerce and industry of India.
10. International trade statistics from www.trademap.com, the official website of ITC.
11. The official websites of Governmental departments of both the countries.
12. Various reliable websites and portals.

The data so collected has been tabulated systematically for further analysis.

Data Analysis Tools/Techniques Used

Following statistical tools and techniques were used to analyze the secondary data that was gathered;

1. Tabular Presentation Techniques

The data collected was being presented in tabular form to facilitate easy comparisons and simple calculations like;

(i) Average percentage contribution of each country/fruit/processed fruit product to total value of the parameter that is being analyzed

(ii) Average percentage increase or decrease in the value of the parameter that is being analyzed

These were later interpreted to obtain meaningful results.

2. Compound Growth Rate (CGR) Analysis

Growth rate of production of fruits and processed fruit products, processing of fruits, imports of fruits and processed fruit products, exports of fruits and processed fruit products, imports and exports of all

major groups involved in FPI (Fruit Processing Industry), etc., were computed using the past years data for both the countries, i.e., India and Brazil and also for the entire world, using this technique. Growth rate of key economic indicators like; FAO indices on various parameters related to FPI (Food processing Industry), etc., were also computed using the past years data, using this technique.

The linear, log-linear, exponential, and power functions are some of the important functional forms employed to study the growth rates. Different functional forms were tried in the past for working out the growth rates in area, yield, production, imports, exports, etc. by various researchers. Some of the important forms that were tried include;

(i) Linear growth model represented by mathematical function of the type:

$$Y = a + b\,t$$

(ii) Exponential function represented by $Y = ab^t$

(iii) Quadratic function represented by $Y = a - bt - ct^2$

However, it was found that exponential from of the growth function represented by $Y = ab^t$ is being used most frequently.

Hence the similar kind of growth function of the form (1) shown below is used; $Yt = ab^tUt$ ….(1)

Where-in;

Yt: Dependent variable for which growth rate was estimated like; production (quantity and value), imports (quantity and value), exports (quantity and value), etc., in year 't'.

a: Intercept

b: Regression coefficient

t: Year which takes value 1,2,……. n.

Ut: Error term or disturbance term in year 't'

Equation (1) was transformed in to log linear function as

$$Ln\,Y = Ln\,a + t\,Ln\,b + Ln\,Ut \quad \text{….(2)}$$

Equation (2) was estimated by using OLS (Ordinary Least Square) technique. $\hat{g}$ $(\hat{b}$ 1) 100

The compound growth rate (CGR) (g) was then estimated by using following equation.

Where-in;

$\hat{G}$ = estimated compound growth in percentage per annum

$\hat{b}$ Anti log of log b

3. t-Test for Independent Samples

The t-test is the most commonly used method to evaluate the differences in means between two groups. For example, the t-test can be used to test for a difference in test scores between a group of patients who were given a drug and a control group who received a placebo. Theoretically, the t-test can be used even if the sample sizes are very small (e.g., as small as 10; some researchers claim that even smaller n's are possible).

The p-level reported with a t-test represents the probability of error involved in accepting our research hypothesis about the existence of a difference. Technically speaking, this is the probability of error associated with rejecting the hypothesis of no difference between the two categories of observations (corresponding to the groups) in the population when, in fact, the hypothesis is true. Some researchers suggest that if the difference is in the predicted direction, you can consider only one half (one "tail") of the probability distribution and thus divide the standard p-level reported with a t-test (a "two-tailed" probability) by two. Others, however, suggest that one should always report the standard, two-tailed t-test probability.

$$t = \frac{\left|\bar{x} - \mu_0\right|}{S/\sqrt{n}}$$

Where,

$\bar{x}$ = sample mean

μ_o = population mean

n = sample size

S = standard deviation

This tool, i.e., independent t-test under equal variance, has been applied to various parameters like;

(i) Agronomic parameters including arable land, arable land under temporary crops, arable land under permanent crops, forest cover, etc., over past years for both the countries

(ii) Demographic parameters including; population distribution, population growth rates, growth in EAP (Economically Active Population), growth in EAPEIA (Economically Active Population Eng-aged. In Agriculture), etc., over past years for both the countries

(iii) Key Economic indicators including; exports, imports, growth imports and exports, net exports, etc., over past years for both the countries.

The outcome of such t-test will reveal the level of difference between India and Brazil at desired significance level. (Refer appendix XXVIII for detailed independent t-test application and results).

Presentation of Research Findings and Discussion

As discussed in the beginning of this chapter, secondary information was collected in four phases and the same was being presented systematically as described below;

1. Information about the Total fruit production of the world as well as total mango production of the world, with a country wise break-up, over the past years was presented vide tables numbered as I and II. (Appendix I and II)

2. Agronomic, demographic, economic and other relevant information like; imports configuration, export configuration, etc., related to India and Brazil, over the past years was presented vide tables numbered as 1 till 7. (Appendix III to VIII)

3. Information pertaining to imports and exports configuration of major fruits as well as major processed fruit products of India over the past years was presented vide tables numbered as I1 to I8. (Appendix IX to XII)

4. Information pertaining to exports of mango and the various processed mango products from India over the past years was presented vide tables numbered as i to xiii. (Appendix XII to XXV)

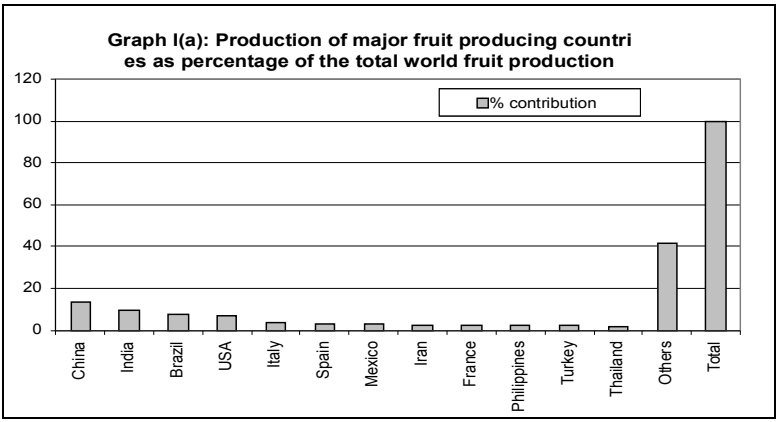
Each of the tables listed above were analyzed, critically, using various statistical, mathematical and computational tools and techniques and the final table together with a bar graph was displayed for every table

mentioned above. Each final table together with the graph is then discussed critically to reveal some of the hidden or implied aspects pertaining to fruit processing industry of India as well as Brazil.

Research Findings and Discussion

1. Table I(a): Average Percentage contribution of major fruit producing countries towards total fruit production of the world

Countries	*% contribution*
China	13.60
India	9.54
Brazil	7.75
USA	6.66
Italy	3.76
Spain	3.31
Mexico	2.89
Iran	2.54
France	2.38
Philippines	2.29
Turkey	2.28
Thailand	1.61
Others	41.39
Total	**100.00**

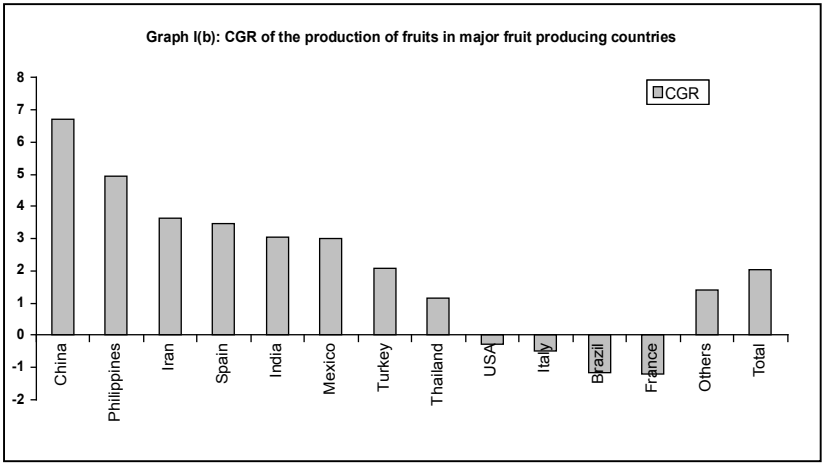


The table and graph shown above clearly rank China, India, Brazil and USA as the top four producers of fruits in the world. Percentage contribution of India and Brazil, towards total fruit production of the world, is comparable. Both India and Brazil enjoy the significant share of the total fruit production, which is next only to China.

But when it comes to fruit processing, India is lagging far behind Brazil. Brazil processes around 70 percent of the total fruit production, whereas India processes just around 5 percent. India has to strengthen its fruit processing industry with a strategic re-orientation and integrated approach, in order to exploit the huge potential.

2. Table I(b): CGR of the production of fruits in major fruit producing countries

Countries	***CGR***
China	6.70
Philippines	4.95
Iran	3.63
Spain	3.48
India	3.04
Mexico	3.00
Turkey	2.07
Thailand	1.16
USA	-0.29
Italy	-0.50
Brazil	-1.16
France	-1.18
Others	1.41
Net	**2.05**

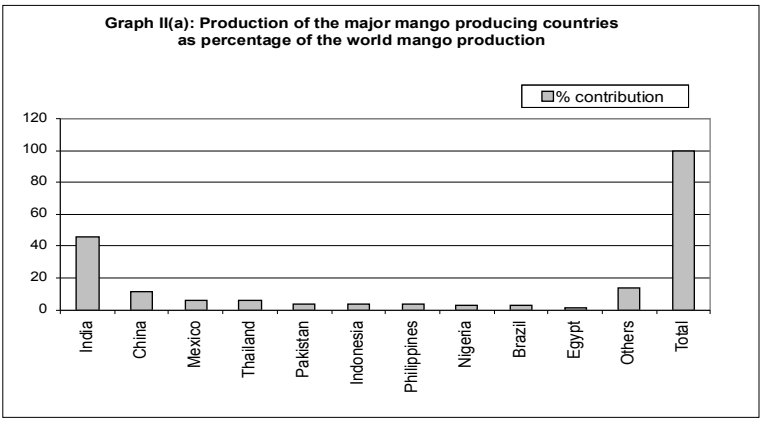


The table and graph displayed above reveal that China and Philippines are the countries which are growing significantly when it comes to total fruit production. This clearly indicates the fact that China has realized the tremendous potential that is being hidden in this sector and is trying to exploit the same before any other country does. CGRs of Iran, Spain, Mexico and India are more or less comparable.

Brazil, the benchmarking partner of India, has experienced a negative growth of -1.16 percent like that of many other countries. This is a cause of concern for Brazil, which should be addressed.

3. Table II(a): Average Percentage contribution of major countries producing mango towards total mango production of the world

Country	*% Contribution*
India	45.47
China	11.34
Mexico	6.21
Thailand	5.75
Pakistan	3.97
Indonesia	3.63
Philippines	3.52
Nigeria	2.87
Brazil	2.63
Egypt	1.16
Others	13.45
Total	**100.00**



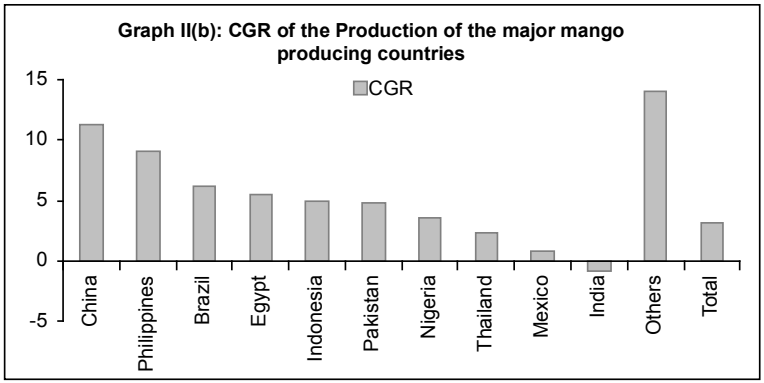
The table and graph shown above, undisputedly, rank India as the top most producer of mango in the world, contributing to nearly 46

percent of the total world production. China, Mexico, Thailand and Pakistan together account for nearly 28 percent of the total world production. Brazil stands at ninth position with a contribution of 2.63 percent.

India has an edge over other countries when it comes to mango production. India has the right soil, climatic condition and other required resources to produce mango. In fact the Indian 'Alphonso' is the most sought after fruit in the world – known popularly as the 'king of all fruits'. There is a great demand for Indian mangoes and also the processed mango products, especially the mango pulp, pickles, chutneys, juices, jams, slices in brine, etc., in the international markets. This should be seen as a great opportunity to be exploited by Indian mango processors.

4. Table II(b): CGR of the production of mango in major mango producing countries

Country	*CGR*
China	11.3
Philippines	9.08
Brazil	6.18
Egypt	5.54
Indonesia	4.88
Pakistan	4.85
Nigeria	3.55
Thailand	2.32
Mexico	0.85
India	-0.86
Others	14.05
Net	**3.16**

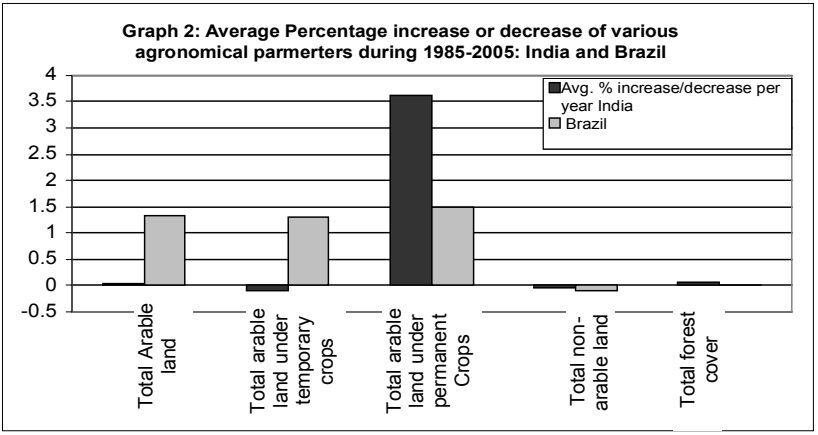


The table and graph depicted above reveals that China and Philippines have experienced highest growth rate, even in the mango production also. This clearly indicates the fact that China has realized the tremendous potential that is being hidden in this specialized sector, i.e., mango processing industry, and is trying to exploit the same before any other country does. Brazil, Egypt, Indonesia, Pakistan and Nigeria are the countries that are experiencing significant growth between 4 and 6 percent.

India, unfortunately, is the only country that has experienced a negative growth of -0.86 percent, in spite of her being the topmost producer of mango. This indeed is a matter of grave concern for India, which needs to be addressed.

5. Table 2: Average Percentage increase/decrease of important agronomical parameters

Agronomical parameters	*Average % increase/ decrease per year*	
	India	***Brazil***
Total Arable land	0.04	1.33
Total arable land under temporary crops	-0.09	1.31
Total arable land under permanent Crops	3.62	1.48
Total non-arable land	-0.05	-0.09
Total forest cover	0.06	0.01



Total arable land in India has increased marginally when compared with Brazil. This indicates that much of the non arable land is being transformed in to arable land through human efforts in Brazil. India

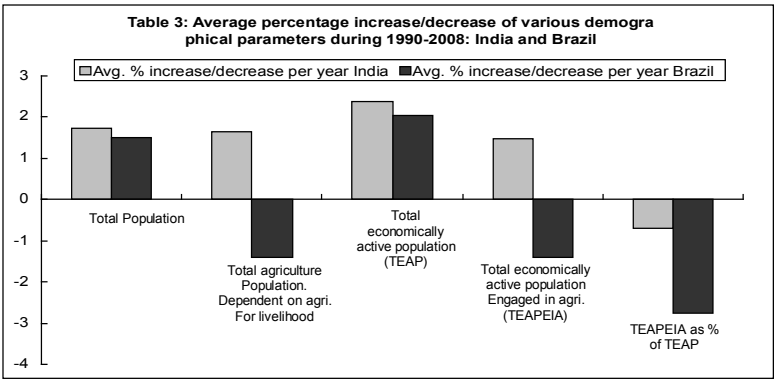
should make serious attempts to transform huge tracts of non arable land available in to arable one, like Brazil.

The total arable land under temporary crops has experienced negative growth in India. But the total arable land under permanent crops, which is area of interest for this research, has increased by 3.62 percent during 1985-2005 in India compared to 1.48 percent for Brazil. The total non arable land and the total forest cover have shown no major changes for both the countries.

In spite of Brazil being nearly 2.6 times bigger than India w.r.t. total area, total arable area of Brazil remains very small compared to India (nearly 40 percent of that of India). The total area under permanent crops of Brazil also remains small compared to India (nearly 77 percent of that of India). This is primarily due to huge forest cover (56.5 percent of total land area), surrounding Amazon in Brazil compared to India (22.8 percent of total land area). As confirmed by t-test, there is no significant difference between the two countries when we compare the per capita arable land (refer appendix-XXIX).

6. Table 3: Average Percentage increase/decrease of important demographical parameters during 1990-2008: India and Brazil

Demographic Parameters	***Average % increase/decrease per year***	
	India	***Brazil***
Total Population	1.73	1.50
Total agriculture Population. Dependent on agri. for livelihood	1.65	-1.41
Total economically active population (TEAP)	2.37	2.03
Total economically active population Engaged in agri. (TEAPEIA)	1.48	-1.40
TEAPEIA as % of TEAP	-0.69	-2.76

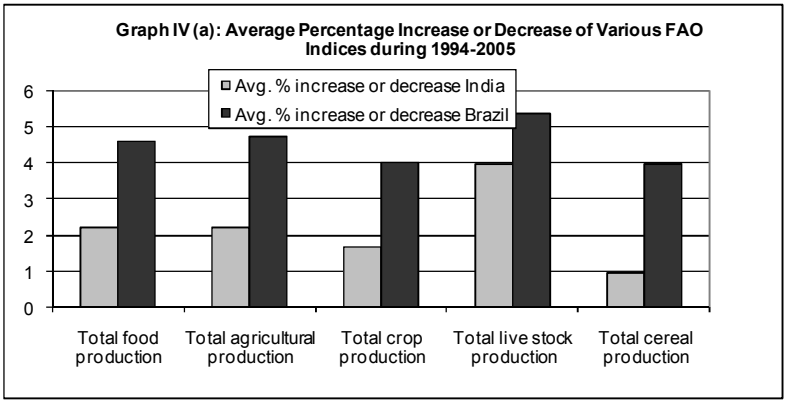


As revealed from the above table and graph the population of India was increasing at the rate of 1.73 percent compared to 1.50 percent in Brazil. But when we compare the total agricultural population dependent on agriculture for their livelihood, India has experienced growth of 1.65 percent where as Brazil has shown decline by 1.41 percent. This coupled with the fact that nearly 72 percent of the total Indian population is dependent on agriculture for their livelihood compared to just 18 percent in Brazil, reveals that Indian economy to a great extent is dependent on agriculture than Brazil. Thus India is expected to be much aggressive, superior and advanced in the agriculture sector than Brazil, but it is not. The above argument remains valid when we compare the percentage of total economically active population engaged in agriculture (which is 58.70 percent for India and just 15.60 percent for Brazil).

The study becomes more relevant and important for India than Brazil as much larger chunk of the total population of India is dependent on agriculture.

7. Table 4(a): Average Percentage increase or decrease of various FAO indices during 1994-2005

Various FAO indices	*Average % increase or decrease*	
	India	***Brazil***
Total food production	2.22	4.58
Total agricultural production	2.2	4.74
Total crop production	1.67	4.02
Total live stock production	3.96	5.36
Total cereal production	0.95	3.98

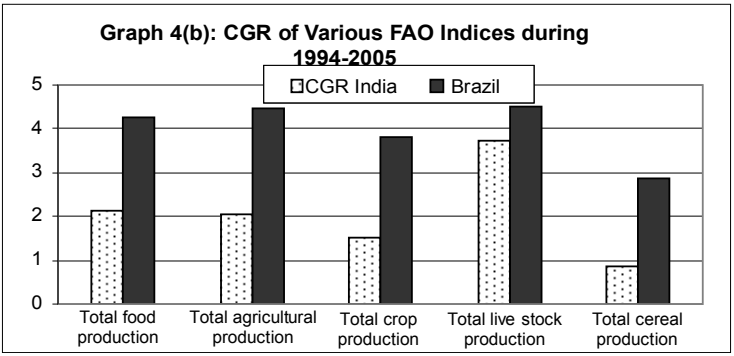


It becomes evident from the above table and graph that Brazil has fared better in all the areas mentioned above compared to India. Average percentage increase in total food production and total agricultural production of Brazil is more than 2.0 times that of India. Average percentage increase for Brazil is nearly 2.4 times that of India for total crop production and 4.2 times that of India for total cereal production. The average percentage increase in total live stock production of Brazil stands at 1.35 times that of India.

The overall performance of Brazil in the agriculture sector including livestock production is much superior to India. India has to learn a lot from Brazil, especially in this sector.

8. Table 4(b): CGR of various FAO indices during 1994-2005: India and Brazil

Various FAO indices	*CGR*	
	India	*Brazil*
Total food production	2.12	4.28
Total agricultural production	2.06	4.48
Total crop production	1.51	3.81
Total live stock production	3.73	4.51
Total cereal production	0.88	2.85



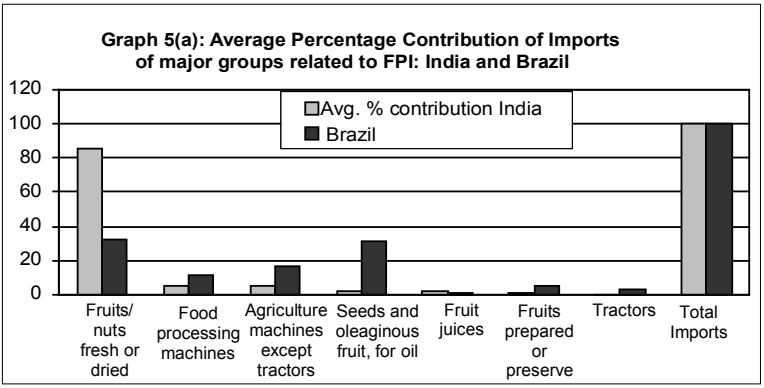
The above table and graph reveal some important findings pertaining to CGR of; total food production, total agricultural production, total crop production, total live stock production and also the total cereal production of both countries.

Brazil has fared better in all the areas mentioned above, compared to India. CGR of total food production and total agricultural production of Brazil is nearly 2.0 times that of India. CGR of Brazil is nearly 2.4 times that of India for total crop production and 3.2 times that of India for total cereal production. Total live stock production of Brazil is growing at CGR of 4.51, which is nearly 1.2 times that of India. CGR of cereal production of Brazil is much higher than that of India.

Thus it can be concluded that Brazil, in the agriculture sector as a whole, is growing much faster than India. India has to benchmark the best practices followed by Brazil in this sector and try to adopt the same with tailor made modifications and fine tunings.

9. Table 5(a): Average Percentage contribution of imports of major groups related to FPI to total imports

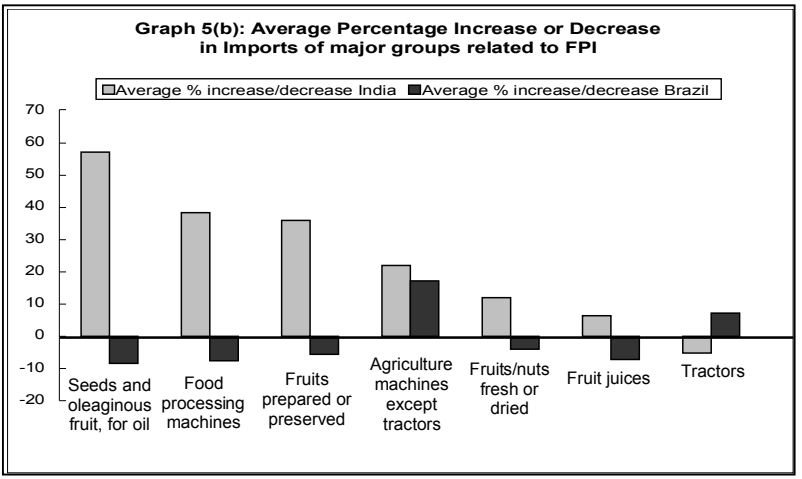
Imports of major groups related to FPI	*Average % contribution*	
	India	***Brazil***
Fruits/nuts fresh or dried	85.87	32.45
Food processing machines	5.23	11.15
Agriculture machines except tractors	4.75	16.48
Seeds and oleaginous fruit, for oil	1.83	31.65
Fruit juices	1.67	1.02
Fruits prepared or preserved	0.36	4.60
Tractors	0.28	2.65
Total Imports	**100.00**	**100.00**



The table and graph shown above explains the composition of total imports, related to FPI (Fruit Processing Industry), of both the countries. India is importing mainly (86%) the fruits/nuts (fresh or dried) and to some extent (around 5% each) the food processing machines and agricultural machines except tractors. Whereas Brazil is importing food processing machines and agricultural machines and tractors, which collectively account for around 30 percent of total imports. This clearly indicates the fact that Brazil is keen on upgrading technology on continuous basis and hence it is importing capital technological goods from the advanced countries. The domestic demand for imported fruits/nuts (fresh or dried) is quiet significant and is increasing. This is primarily due to sharp rise in the income levels of middle class population and also due to steep increase in the middle-class population itself.

10. Table 5(b): Average Percentage increase or decrease in imports of major groups related to FPI

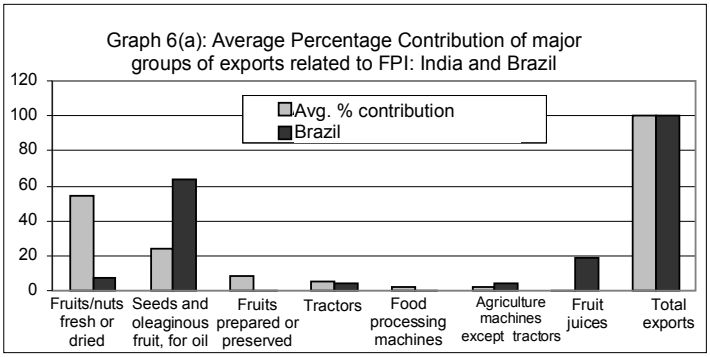
Imports of major groups related to FPI	*Average % increase/decrease*	
	India	***Brazil***
Seeds and oleaginous fruit, for oil	57.14	-8.46
Food processing machines	38.46	-7.43
Fruits prepared or preserved	36.05	-5.56
Agriculture machines except tractors	21.78	17.17
Fruits/nuts fresh or dried	11.85	-4.08
Fruit juices	6.43	-7.10
Tractors	-5.32	7.30
Total Imports	**13.56**	**-2.86**



The table and graph shown above reveal that except Agri. Machines and tractors, Brazil has experienced decrease in the imports of all the major groups pertaining to FPI, whereas India has experienced significant increase (ranging from 6 to 57%) in the imports of all the major groups related to FPI (Fruit Processing Industry) except tractors. The total imports of all the major groups related to FPI stands at 74 million US$ for India, which is much higher compared to Brazilian imports worth 47 million US$. The average percentage increase in total imports related to FPI stands at 13.56 percent for India whereas the same is -2.86 percent for Brazil. This clearly means India is more dependent on imports than Brazil and is steadily increasing. Brazilian imports over the past years had shown a small fluctuation (from 47 to 54 million US$), whereas Indian imports revealed a wide fluctuation (from 30 to 74 million US$).

11. Table 6(a): Average Percentage contribution of major groups of exports related to FPI: India and Brazil

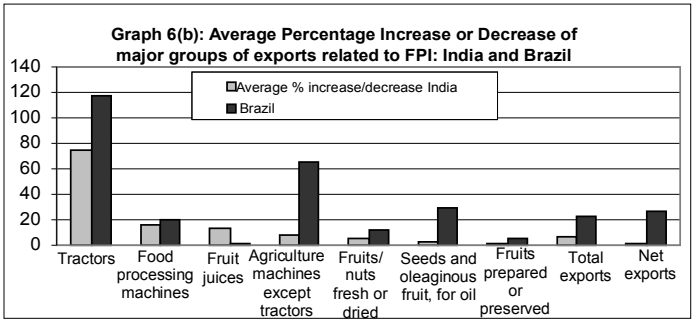
Exports of major groups related to FPI	***Average % contribution***	
	India	***Brazil***
Fruits/nuts fresh or dried	54.86	7.7
Seeds and oleaginous fruit, for oil	24.56	63.36
Fruits prepared or preserved	8.81	0.57
Tractors	6.07	4.13
Food processing machines	2.88	0.51
Agriculture machines except tractors	2.29	4.18
Fruit juices	0.53	19.54
Total exports	**100**	**100**



The table and graph shown above reveal the composition of total exports of major groups related to FPI (Fruit Processing Industry), of both the countries. Indian exports constitute of; the fruits/nuts (fresh or dried) (55%), seeds and oleaginous fruit for oil (25%) and the preserved and prepared fruits (9%). Whereas Brazilian exports constitute of; the seeds and oleaginous fruit (63%), fruit juices (20%) and the fruits/nuts (fresh and dried) (8%). This clearly gives the signal that Brazil is keen on exporting value added processed fruit products like fruit juices than simply the fresh fruits/nuts, which India is doing. Moreover the byproducts of fruits like seeds have been put to waste in India, whereas Brazil is earning significant FOREX through exporting the same. So India has to shift her attention from exporting basic fruits to exporting the value added processed fruit products, which in turn will strengthen the BoP (Balance of Payments) position of India and generate more employment. Moreover the byproducts of fruits like seeds shouldn't be wasted.

12. Table 6(b): Average Percentage increase or decrease of major groups of exports related to FPI

Exports of major groups related to FPI	***Average % increase/decrease***	
	India	***Brazil***
Tractors	75.43	117.12
Food processing machines	16.28	20.02
Fruit juices	14.01	0.94
Agriculture machines except tractors	8.63	65.91
Fruits/nuts fresh or dried	5.63	12.07
Seeds and oleaginous fruit, for oil	3.5	29.63
Fruits prepared or preserved	2.11	5.15
Total exports	6.84	22.35
Net exports	1.04	26.46

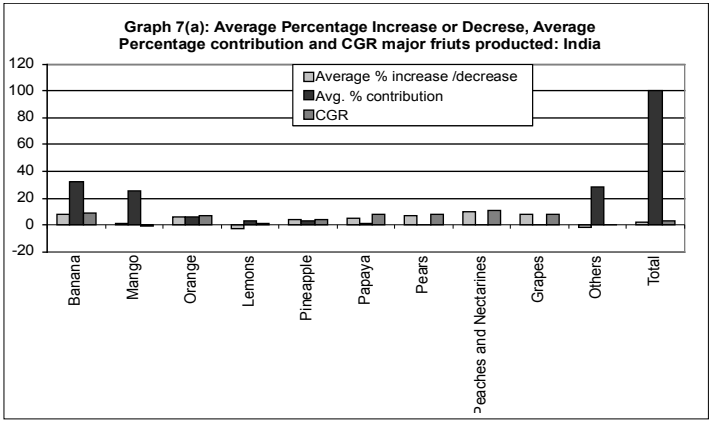


As revealed by the above table and graph shown above, exports of tractors and food processing machines have shown a tremendous growth, collectively, for both India and Brazil. India has experienced significant increase as far as exports of fruit juice is considered. Whereas in all the other groups including; fruits/nuts (fresh or dried), agricultural machines except tractors, and seeds and oleaginous fruits, Brazil has experienced significant increase in their exports than India. Brazil has experienced significant growth compared to India, when we consider the total exports of major groups related to FPI and also the net exports (because total Brazilian imports of major groups related to FPI has shown decline). It can be concluded that there lies tremendous scope for exports in this sector.

As the independent t-test reveals, there is a significant difference (t-critical = 2.306; t-stat = -5.55) between India and Brazil, when we consider total exports and net exports of each nation. Mean value of Brazilian exports is US$ 508 million, whereas mean value of Indian exports is US$ 55 million (Refer t-test table from Appendix XXIX). Value of Brazilian exports is nearly ten fold as that of India.

13. Table 7(a): Important parameters pertaining to major fruits produced in India

Major fruits produced	*Average % increase /decrease*	*Avg. % contribution*	*CGR*
Banana	8.2	32.33	8.45
Mango	0.63	25.4	-0.86
Orange	6.13	6.05	7.31
Lemons	-2.43	3.02	1.12
Pineapple	4.27	2.51	3.86
Papaya	5.36	1.37	7.37
Pears	6.73	0.39	7.68
Peaches and Nectarines	9.56	0.27	10.5
Grapes	8.04	0.26	8.11
Others	-1.45	28.4	0.17
Total/Net	**2.14**	**100**	**3.04**

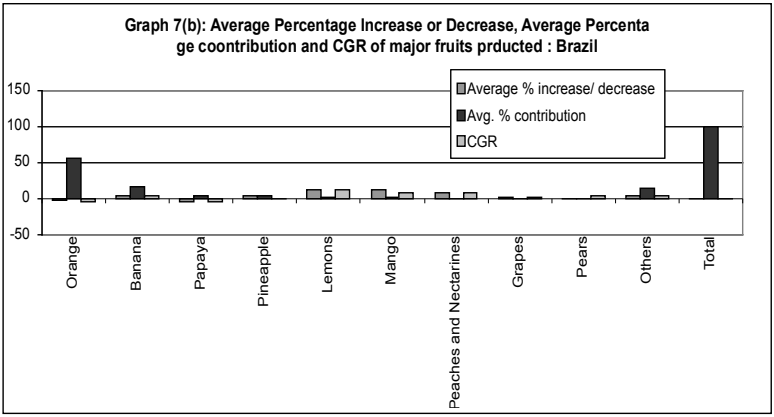


It can be noticed from the above table and graph that Mango accounts for nearly 25 percent of the total fruit production in India, next only to Banana which accounts for nearly 33 percent of total fruit production. Orange, lemon, pineapple and papaya occupy the next slots, accounting, collectively, for around 13 percent of total fruit production.

It can be further noticed that banana, orange, papaya, pears, peaches and nectarines, and grapes have all experienced a healthy growth trend (CGR of 7-9 percent). Surprisingly, mango has shown marginal negative growth. This is in fact a cause for concern for mango processing industry of India and needs to be addressed. When we compare the growth rate of the total fruit production, India is well placed with a CGR of 3.04 percent compared to -1.16 percent of Brazil.

14. Table 7(b): Important parameters pertaining to major fruits produced in Brazil

Major fruits produced	*Average % increase/decrease*	*Average % contribution*	*CGR*
Orange	-2.79	56.15	-4.29
Banana	3.29	16.5	3.68
Papaya	-3.99	4.7	-3.93
Pineapple	4.2	4.08	0.38
Lemons	11.49	1.93	13.27
Mango	11.78	1.8	9.08
Peaches and Nectarines	7.41	0.49	8.97
Grapes	1.01	0.18	1.19
Pears	0.66	0.05	3.01
Others	3.12	14.11	3.14
Total/Net	**-0.65**	**100**	**-1.16**

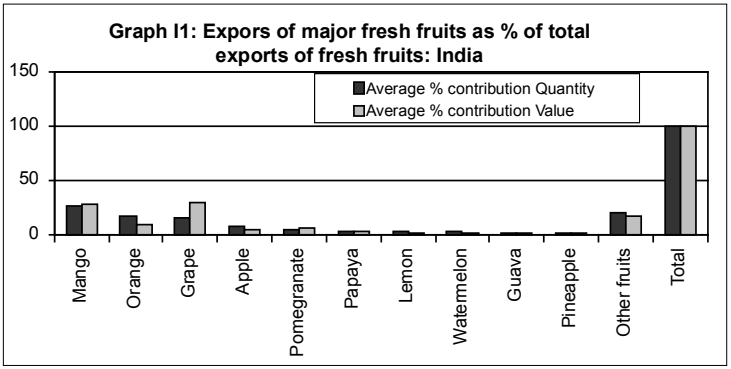


From the above table and graph, it can be noticed that Mango accounts for just 1.8 percent of the total fruit production in Brazil. Oranges and Banana, collectively, account for nearly 73 percent of total fruit production. Papaya, pineapple, and lemon occupy the next slots accounting, collectively, for around 11 percent of total fruit production.

It can be further noticed that lemon, mango, and peaches and nectarines have all experienced a healthy growth trend (CGR of 9-13%). Situation is apparently favorable for the mango processing industry of Brazil. But marginal negative growth rate (-1.16%) of the total fruit production of Brazil is definitely a cause of concern for the fruit processing industry of Brazil.

15. Table I1: Average Percentage contribution of exports of major fresh fruits: India

Fruit	*Average % contribution Quantity*	*Average % contribution Value*
Mango	26.24	27.29
Orange	16.56	8.95
Grape	14.55	29.70
Apple	7.99	5.08
Pomegranate	4.65	5.85
Papaya	2.78	2.18
Lemon	2.72	1.85
Watermelon	2.16	0.83
Guava	1.05	1.06
Pineapple	0.62	0.48
Other fruits	20.68	16.73
Total	**100.00**	**100.00**

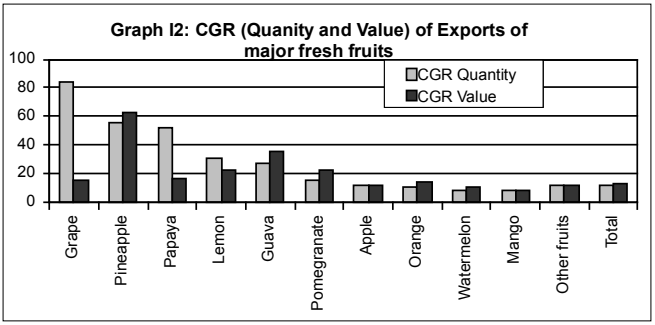


It becomes clear from the table and graph shown above that mango accounts for nearly 27 percent (both value wise and quantity wise) of total fresh fruits exports from India. Orange and grapes together account for nearly 31 percent (38% value wise) of total Indian exports of fresh fruits. So it can be concluded that mango, orange, grape, apple and pomegranate are the key fruits as far as exports of fresh fruits are considered. India exports nearly 240000 Metric Tons (MT) of fresh fruits out of 45911000 MT produced, which is just 0.52 percent of total production.

Instead of exporting fresh fruits, if India can process these fresh fruits in to value added processed fruit products and export these value added processed fruit products, she can definitely bring down the total post harvest loss within international limits, i.e., around 20 percent, from the current level of 35-40 percent. Moreover there is lot of risk involved in exporting fresh fruits due to stringent quality norms.

16. Table I2: CGR of exports of major fruits: India

Fruit	*CGR Quantity*	*CGR Value*
Grape	84.30	15.80
Pineapple	55.66	63.41
Papaya	52.34	16.77
Lemon	31.49	22.44
Guava	26.86	35.13
Pomegranate	15.65	22.09
Apple	11.93	12.47
Orange	10.72	13.87
Watermelon	8.80	11.20
Mango	8.03	8.29
Other fruits	12.63	11.87
Net	**12.50**	**13.09**



It is evident from the graph and table shown above that export of Grape has grown beyond expectations. Whereas growth in the exports of; pineapple, papaya, guava, lemon and pomegranate is also phenomenal. In general the exports of fresh fruits have grown significantly. India enjoys the advantage of having right blend of natural resources for growing almost all varieties of fruits. So India should freeze this opportunity and thrive in this sector.

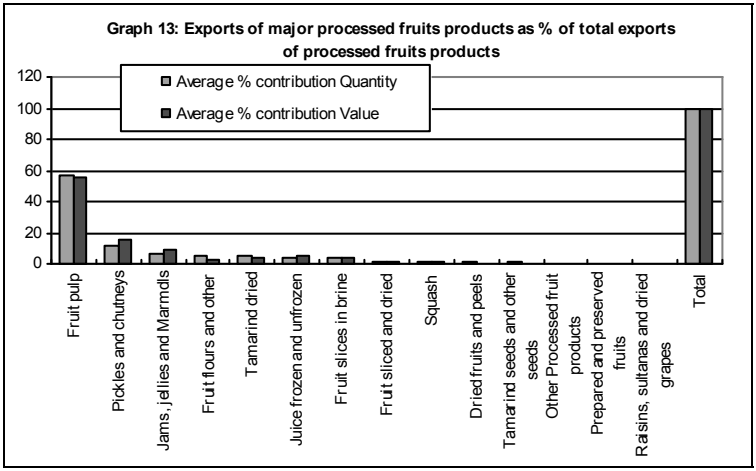
India has to focus on exporting processed fruit products than fresh fruits as it will bring along the following benefits which India is badly in need of;

- Higher value addition and hence higher earnings of FOREX
- Bringing down the post harvest loss to reasonable levels
- Generating employment and other economic benefits

17. Table I3: Average contribution of exports of major processed fruit products: India

Major processed fruit products	*Average % contribution Quantity*	*Average % contribution Value*
Fruit pulp	56.72	56.07
Pickles and chutneys	12.19	14.92
Jams, jellies and Marmdls	6.96	8.45
Fruit flours and other	5.05	2.96
Tamarind dried	4.95	3.29
Juice frozen and unfrozen	4.24	4.94
Fruit slices in brine	3.67	4.04
Fruit sliced and dried	1.60	1.09
Squash	1.36	1.91
Dried fruits and peels	1.33	0.54
Tamarind seeds and other	1.00	0.46

seeds		
Other Processed fruit products	0.41	0.57
Prepared and preserved fruits	0.38	0.48
Raisins, sultanas and dried grapes	0.14	0.28
Total	**100.00**	**100.00**



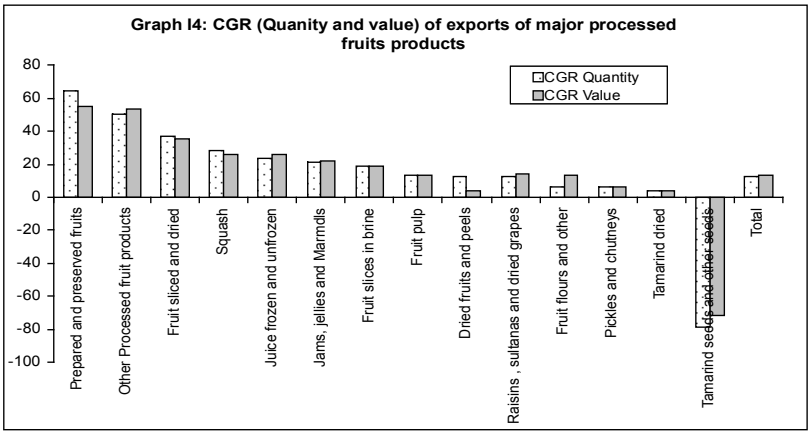
From the table and graph shown above, it becomes evident that fruit pulp accounts for highest percentage (56%) of exports of processed fruit products. Pickles and chutneys together account for nearly 12 percent of total exports. The other processed fruit products, collectively, account for the rest.

Fruit Pulp Manufacturing Industry has received a lot of attention in India because of ever increasing export demand for Indian fruit pulp in the international markets. This particular industry is dominated by few big players, whereas Pickles and Chutney Manufacturing Industry is dominated by MSEs (Medium and Small Enterprises).

18. Table I4: CGR of exports of major processed fruit products: India

Major processed fruit products	*CGR Quantity*	*CGR Value*
Prepared and preserved fruits	64.78	54.99
Other Processed fruit products	50.54	53.21
Fruit sliced and dried	37.45	35.50
Squash	28.12	25.77

Juice frozen and unfrozen	23.37	25.79
Jams, jellies and Marmdls	21.46	21.75
Fruit slices in brine	18.60	18.68
Fruit pulp	13.10	13.10
Dried fruits and peels	12.74	4.34
Raisins, sultanas and dried grapes	12.31	14.30
Fruit flours and other	6.73	13.83
Pickles and chutneys	6.53	6.33
Tamarind dried	4.10	3.82
Tamarind seeds and other seeds	-78.54	-71.52
Net	**12.87**	**13.70**

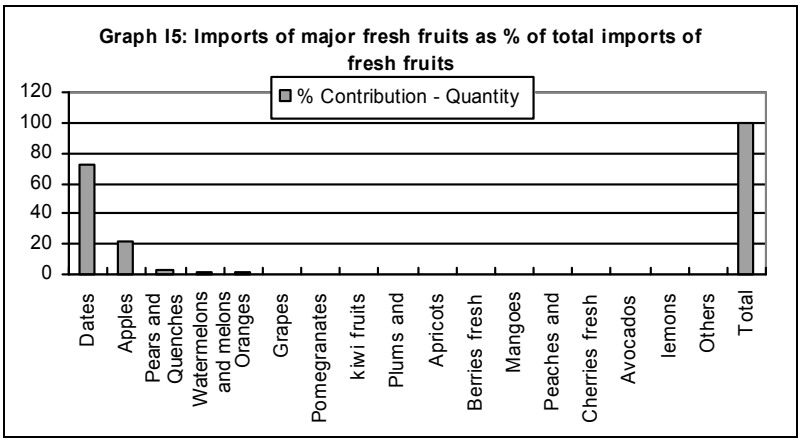


From the graph and table shown above, it becomes clear that exports of prepared and preserved fruits are growing at a very high rate. Even the fruits sliced and dried, squash, juice, and jams – jellies were growing at a phenomenal rate (20-40%). whereas pulp, dried fruits and peels, and raisins were growing at a high rate (10-15%). In total, the export of processed fruit products, except tamarind seeds is growing at a significant rate. This in fact is a very healthy sign for India and signals a greater export demand for processed fruit products. Indian Fruit Processing Industry should grab this opportunity and exploit the same before any other country like China does.

19. Table I5: Average Percentage contribution of imports of major fresh fruits: India

Major fresh fruits	*% Contribution - Quantity*
Dates	72.85
Apples	20.99

Pears and Quenches	2.53
Watermelons and melons	0.81
Oranges	0.73
Grapes	0.70
Pomegranates	0.43
kiwi fruits	0.29
Plums and sloes	0.12
Apricots	0.06
Berries fresh	0.04
Mangoes	0.02
Peaches and nectarines	0.02
Cherries fresh	0.01
Avocados	0.01
lemons	0.01
Others	0.38
Total	**100.00**

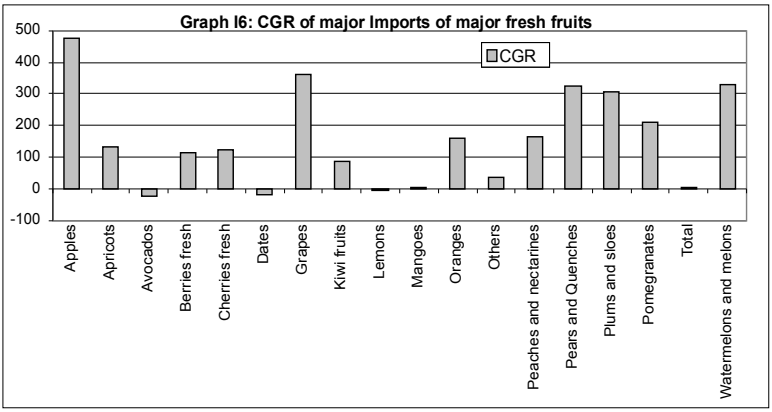


Dates account for nearly 73 percent of total imports of fresh fruits. Apples fall in the second place with a contribution of 21 percent. This is primarily because of the fact that Dates are produced by a very few countries like; Iran and Afghanistan, only. The other fruits, collectively, account for the rest 6 percent.

It is a good sign that India is more or less self reliant when it comes to fruit production. India can grow almost all varieties of fruits due to favorable climatic conditions and her vast bio diversity. This is a unique advantage for India.

20. Table I6: CGR of imports of major fresh fruits: India

Major fresh fruits	*CGR - Quantity*
Apples	473.85
Grapes	361.54
Watermelons and melons	330.97
Pears and Quenches	322.81
Plums and sloes	306.10
Pomegranates	209.88
Peaches and nectarines	164.94
Oranges	159.04
Apricots	131.87
Cherries fresh	122.09
Berries fresh	112.69
Kiwi fruits	88.57
Mangoes	5.89
Lemons	-3.02
Dates	-16.59
Avocados	-24.69
Others	36.12
Net	**3.49**



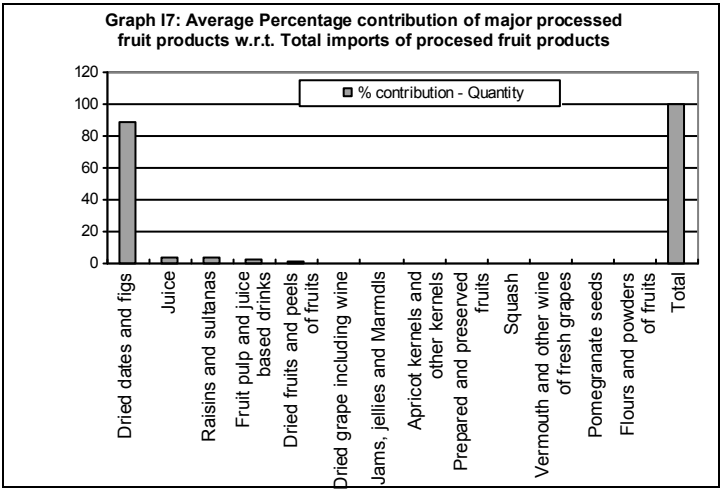
From the table and graph shown above, it is clear that imports of majority of the fresh fruits are growing at a very high rate, even though their percentage contribution is significantly less.

This is primarily due to the fact that disposable income of the Indian middle class population has increased significantly in the recent years and hence the standard of living of this segment has improved a lot. This segment has become more health conscious and spending

generously on fruits. More so ever this segment is growing at a very high rate.

21. Table I7: Average Percentage contribution of imports of major processed fruit products: India

Major processed fruit products	*% Contribution - Quantity*
Dried dates and figs	88.37
Juice	3.40
Raisins and sultanas	3.26
Fruit pulp and juice based drinks	3.07
Dried fruits and peels of fruits	1.11
Dried grape including wine	0.24
Jams, jellies and Marmdls	0.22
Apricot kernels and other kernels	0.15
Prepared and preserved fruits	0.10
Squash	0.05
Vermouth and other wine of fresh grapes	0.01
Pomegranate seeds	0.01
Flours and powders of fruits	0.01
Total	**100.00**

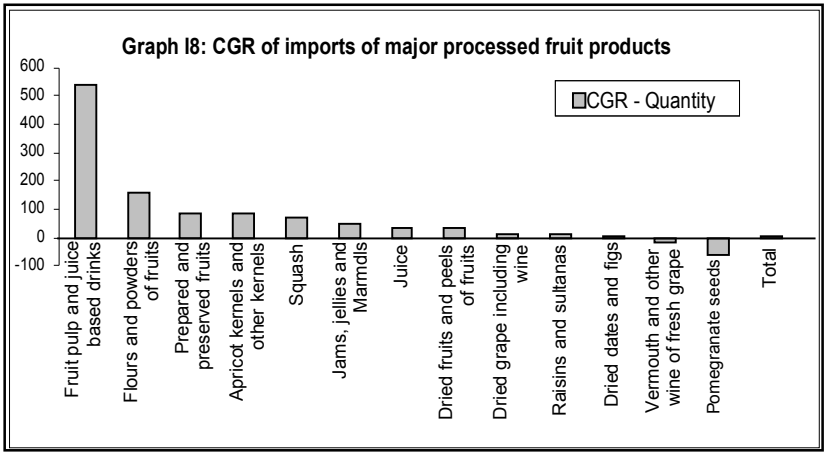


Dried dates account for nearly 88 percent of total imports of processed fruit products. Juices, pulp and raisins of selected fruits fall in the second place with a collective contribution of 10 percent. The other processed fruit products, collectively, account for the remaining 2 percent.

It is a good sign that India is more or less self reliant when it comes to processed fruit products production also. As India can grow almost all varieties of fruits, it can produce wide range of processed fruit products also. India need not have to depend on imports, except few processed fruit products like dried dates.

22. Table I8: CGR of imports of major processed fruit products: India

Major processed fruit products	*CGR - Quantity*
Fruit pulp and juice based drinks	537.51
Flours and powders of fruits	156.46
Prepared and preserved fruits	89.53
Apricot kernels and other kernels	87.51
Squash	70.36
Jams, jellies and Marmdls	51.89
Juice	37.46
Dried fruits and peels of fruits	32.55
Dried grape including wine	15.24
Raisins and sultanas	14.83
Dried dates and figs	2.81
Vermouth and other wine of fresh grape	-18.6
Pomegranate seeds	-63.78
Total	**5.01**



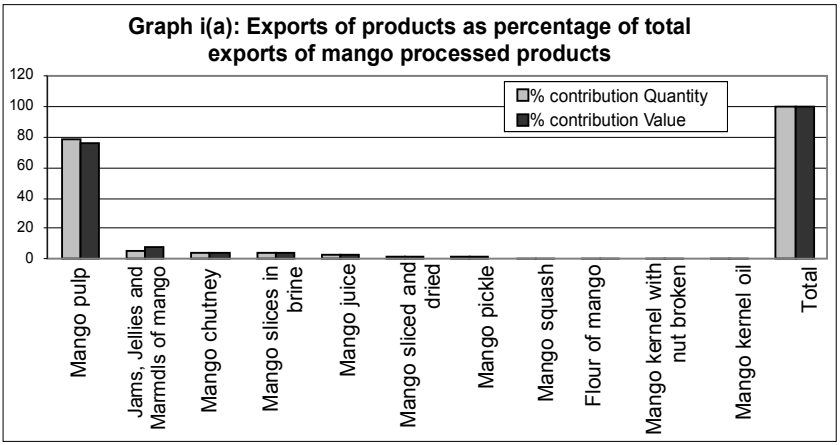
From the table and graph shown above, it is clear that imports of majority of the processed fruit products are growing at a very high rate,

especially fruit pulp, even though their percentage contribution is significantly less.

Middle and upper middle class population, which is growing at a significant rate, want to consume fruits and processed fruit products 365 days a year. Earlier the consumption of fruits and processed fruit products was restricted to seasons only. This implies that the domestic demand for processed fruit products is also increasing. So Indian fruit processors should try and meet the needs of this upcoming buoyant market, comprising of around 500 million people.

23. Table i(a): Exports of major processed mango products as percentage of total exports of processed mango products: India

Processed mango products	*% contribution Quantity*	*% contribution Value*
Mango pulp	78.72	75.84
Jams, Jellies and Marmdls of mango	5.83	7.69
Mango chutney	4.18	4.80
Mango slices in brine	3.76	4.08
Mango juice	2.83	3.15
Mango sliced and dried	2.29	1.50
Mango pickle	1.67	2.10
Mango squash	0.48	0.53
Flour of mango	0.12	0.12
Mango kernel with nut broken	0.08	0.07
Mango kernel oil	0.04	0.12
Total	**100.00**	**100.00**

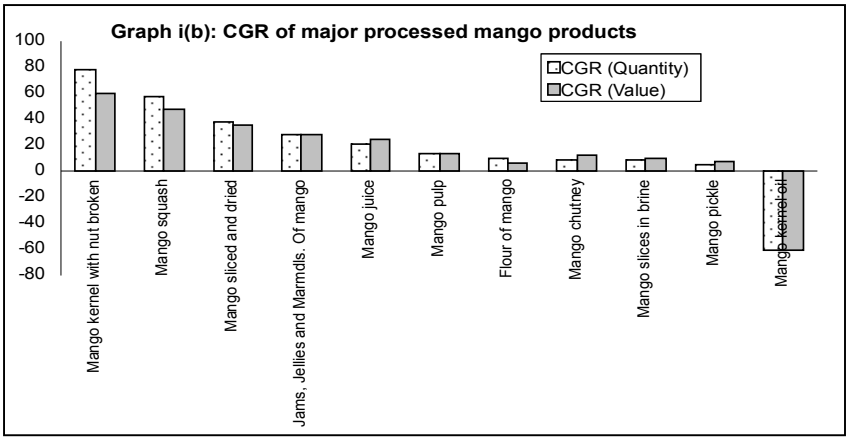


From the table and the graph shown above, it is clear that nearly 79 percent of the exports of processed mango products are constituted of

mango pulp. Jams, chutney, mango slices in brine, and juice account for 3 to 6 percent each towards total exports. This is the reason production of mango pulp has grown many fold. Many big companies like; Jain group of companies, Godrej, Vadilal, etc., have entered in to pulp manufacturing, in a big way. Earlier this sector was primarily composed of numerous Small and Medium scale Enterprises mushroomed around mango growing areas. But now the equations have changed. There appears to be a promising and super natural growth for pulp manufacturing industry of India. Hence all the big food processing companies have focused their attention on this sector.

24. Table i(b): CGR of major processed mango products: India

Processed mango products	*CGR (Quantity)*	*CGR (Value)*
Mango kernel with nut broken	78.56	59.31
Mango squash	57.89	47.32
Mango sliced and dried	37.43	35.50
Jams, Jellies and Marmdls of mango	28.48	28.46
Mango juice	21.23	24.02
Mango pulp	13.86	13.99
Flour of mango	9.76	5.60
Mango chutney	8.84	12.59
Mango slices in brine	8.42	9.64
Mango pickle	4.34	7.08
Mango kernel oil	-61.40	-60.94
Net	**13.25**	**13.18**



It is very clear from the table and graph shown above that exports of mango kernel with nut broken and mango squash have experienced a very

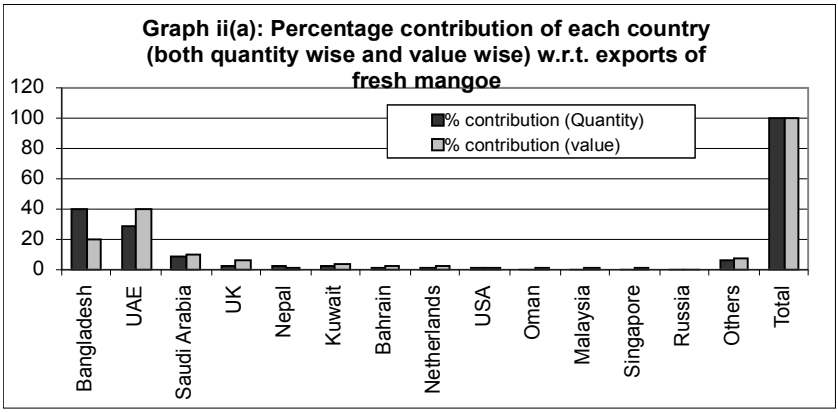
high compound growth of around 79 percent and 58 percent respectively. Mango sliced and dried, jams, juice and pulp have experienced a double digit compound growth ranging from 37 percent to 14 percent, in their respective order. Except mango kernel oil, all the other prominent processed mango products, naming; flour of mango, mango chutney, mango slices in brine and mango pickles, have experienced a significant positive growth.

Different applications of byproducts of mango have been emerged, like; mango kernel is being used to extract oil from it, which is primarily used in manufacturing feed for piggery industry in western countries like US. Pigs will put on weight very fast, if we add substances like mango kernel oil in their feed.

Mango processing industry is a promising and fast growing industry. This was primarily composed of numerous Small and Medium scale Enterprises mushroomed around mango growing areas. But now, it is dominated by big companies like; Jain group of companies, etc.

25. Table ii(a): Average Percentage contribution of each country w.r.t. exports of fresh mangoes: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
Bangladesh	40.40	20.33
UAE	29.30	39.70
Saudi Arabia	9.55	10.16
UK	3.16	6.66
Nepal	2.51	1.25
Kuwait	2.50	3.83
Bahrain	2.04	2.59
Netherlands	1.23	2.38
USA	0.97	1.39
Oman	0.68	0.95
Malaysia	0.63	0.98
Singapore	0.62	1.37
Russia	0.44	0.25
Others	5.97	8.16
Total	**100.00**	**100.00**



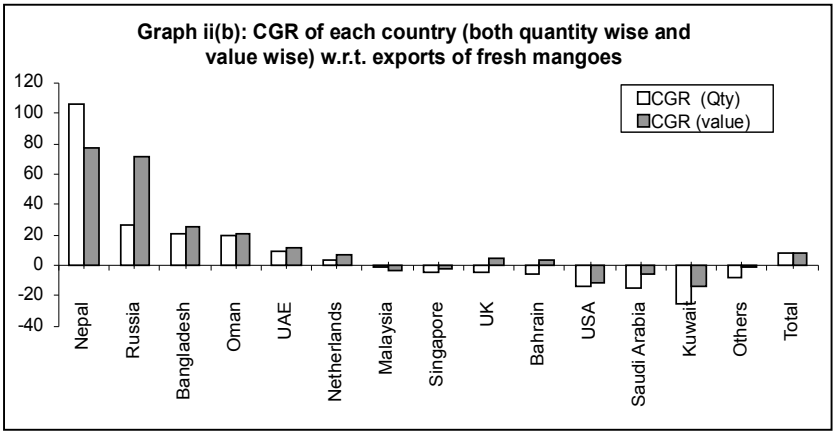
It is clear from the table and graph depicted above, that Bangladesh, UAE and Saudi Arabia, collectively, account for nearly 80 percent of the total exports of fresh mangoes. But it can be noticed that Bangladesh which accounts for nearly 40 percent (quantity wise) of total exports yield value contribution of just 20 percent, whereas UK which accounts for 3.16 percent (quantity wise) of total exports yield a value contribution of 6.66 percent.

So, Indian exporters will be better off, if they export to those countries which yield higher value contribution, like UK than Bangladesh. The other alternative could be to process fresh mango in to high value added processed mango products like mango pulp and then export. The second alternative yields multifold benefits to India like; higher FOREX earnings, higher local employment, higher profits, etc.

26. Table ii(b): Country wise CGR of exports of fresh mangoes: India

Country	*CGR (Qty)*	*CGR (Value)*
Nepal	106.11	77.14
Russia	26.51	71.11
Bangladesh	20.29	24.83
Oman	19.28	20.81
UAE	8.97	11.23
Netherlands	3.03	7.37
Malaysia	-1.35	-3.67
Singapore	-4.12	-1.86
UK	-4.58	4.60
Bahrain	-6.22	3.95

USA	-13.59	-11.36
Saudi Arabia	-14.51	-6.13
Kuwait	-25.85	-13.82
Others	-7.72	-1.28
Net	**8.03**	**8.29**



It is clear from the table and graph depicted above, that exports of fresh fruits to Nepal is growing at a phenomenal rate, i.e., 106 percent. Next in the list are Russia, Bangladesh and Oman, which are growing at 27 percent, 20 percent and 19 percent respectively.

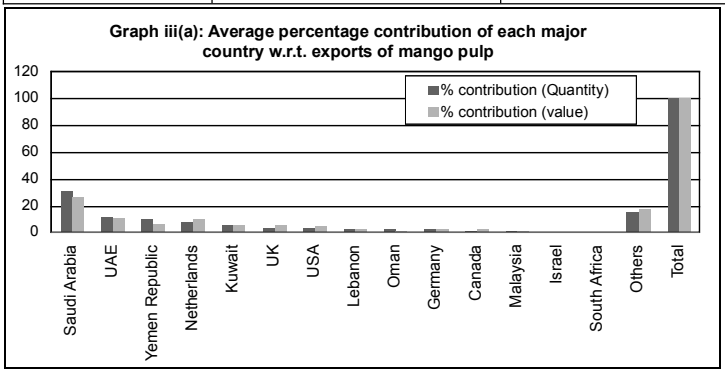
Many countries like; Malaysia, Singapore, UK, Bahrain, USA, Saudi Arabia and Kuwait have all experienced negative growth. This is primarily due to stringent standards set by importing countries (like FDA standards of US) against quality parameters of fresh fruits like; average of pesticide residue, average of deceased fruits, nutritional values, pulp content, etc.

So it has become must for India; to grow fruits in an organic environment, to have the necessary infrastructure to preserve the freshness of fruits for a very long time, to grade and pack the fruits very neatly and properly, and to have facilities like cold chain, air cargo, etc. for enabling quick shipment of fruits.

27. Table iii(a): Average percentage contribution of each major country w.r.t. exports of mango pulp:

Country	*% contribution (Quantity)*	*% contribution (Value)*
Saudi Arabia	31.11	27.3
UAE	11.69	10.84

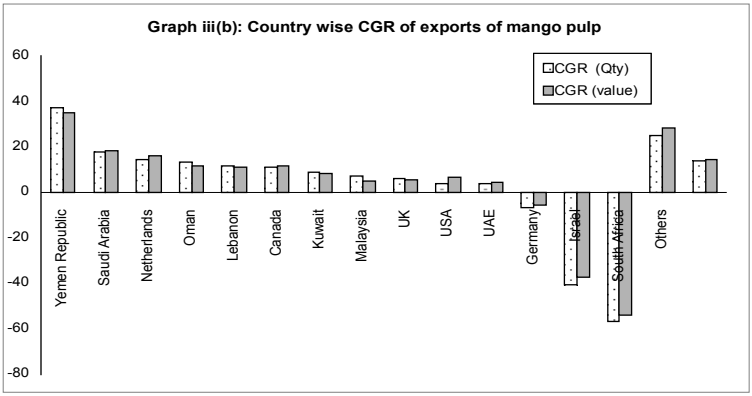
Yemen Republic	10.19	7.01
Netherlands	7.48	10.23
Kuwait	6.15	6.06
UK	3.81	5.35
USA	3.59	4.75
Lebanon	2.64	2.14
Oman	2.23	1.83
Germany	2.07	2.7
Canada	1.55	2.07
Malaysia	1.25	1.01
Israel	0.78	0.86
South Africa	0.47	0.39
Others	14.99	17.46
Total	**100**	**100**



Saudi Arabia accounts for nearly 31 percent of total exports of mango pulp. UAE, Yemen Republic, Netherlands and Kuwait account for 12 percent, 10 percent, 7 percent and 6 percent respectively. Other countries like; UK, USA, Lebanon, Oman, Germany, etc., account for the rest. It can be noticed that value wise contribution of exports are less than quantity wise contribution for major importing countries like; Saudi Arabia, UAE and Yemen. Whereas for some countries like; UK, USA, Netherlands, etc., value contribution is higher than volume wise contribution. This indicates that developed countries, like; US and UK fetch better prices than the Middle East countries. So Indian mango processors should focus on the quality requirements of developed countries like US and UK, and meet those requirements by improving their existing quality standards. The quality standards of developed countries are definitely much stringent than the ME countries, but simultaneously they are much rewarding.

28. Table iii(b): Country wise CGR of exports of mango pulp: India

Country	*CGR (Qty)*	*CGR (Value)*
Yemen Republic	36.92	34.9
Saudi Arabia	17.62	18.17
Netherlands	14.22	16.15
Oman	12.94	11.28
Lebanon	11.58	10.76
Canada	10.73	11.7
Kuwait	8.56	8.24
Malaysia	6.91	5.1
UK	5.74	5.48
USA	3.85	6.47
UAE	3.463	4.43
Germany	-6.81	-5.72
Israel	-40.6	-37.18
South Africa	-57.13	-53.96
Others	24.71	28.1
Total	**13.86**	**14.16**



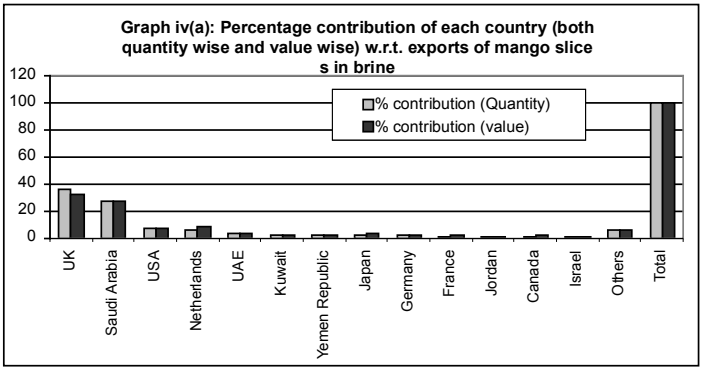
Yemen Republic has experienced the highest growth as far as exports of mango pulp are considered. Saudi Arabia, Netherlands, Oman, Lebanon and Canada have all experienced double digit growth ranging from 18 percent to 11 percent in their respective order. Overall, exports of mango pulp have evidenced highest growth (14%), indicating great export demand for Indian mango pulp.

This is the reason production of mango pulp has grown many fold. Many big companies like; Marico, Godrej, Parle, Pepsico, etc., have entered in to mango pulp manufacturing, in a big way. This sector was

primarily composed of numerous Small and Medium scale Enterprises mushroomed around mango growing areas. There lies a promising and super natural growth for mango pulp manufacturing industry of India. Hence all big food processing companies, even MNCs have set their attention on this sector.

29. Table iv(a): Average percentage contribution of each major country towards exports of mango slices in brine: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
UK	35.84	32.42
Saudi Arabia	27.56	26.94
USA	6.82	7.68
Netherlands	6.41	7.99
UAE	3.83	3.17
Kuwait	2.44	2.37
Yemen Republic	2.36	2.68
Japan	2.27	3.89
Germany	1.65	1.94
France	1.38	1.68
Jordan	1.33	1.07
Canada	1.24	1.6
Israel	1.15	0.99
Others	5.55	5.59
Total	**100**	**100**

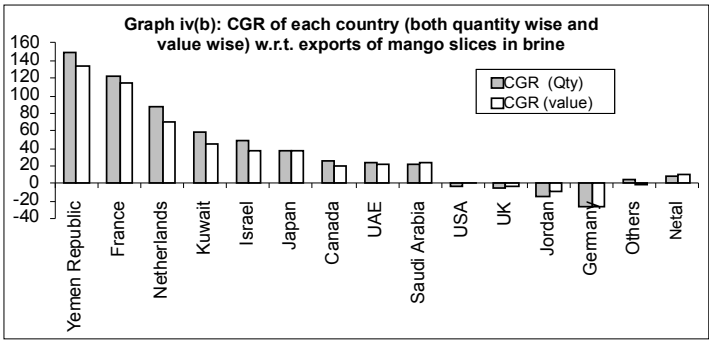


UK and Saudi Arabia are the major importing countries, accounting for nearly 64 percent of total exports of mango slices in brine from India. USA, Netherlands and UAE together account for nearly 17 percent of the total exports. Remaining countries account for the rest.

It is evident from the above pattern that a few countries account for large chunk of exports. Hence Indian processors should focus their attention on the quality requirements of these countries like; UK, Saudi Arabia, US, and Netherlands and try to meet those requirements. These countries in turn process the slices and make final products according to their requirements.

30. Table iv(b): Country wise CGR of exports of mango slices in brine: India

Country	*CGR (Qty)*	*CGR (Value)*
Yemen Republic	148.72	133.68
France	122.87	114.95
Netherlands	87.71	69.6
Kuwait	59.22	45.43
Israel	49.02	37.3
Japan	36.41	36.47
Canada	25.1	19.51
UAE	23.46	21.73
Saudi Arabia	21.22	23.59
USA	-4.23	0.7
UK	-4.75	-3.26
Jordan	-14.33	-9.65
Germany	-27.21	-27.1
Others	3.65	-1.19
Net	**7.88**	**9.65**



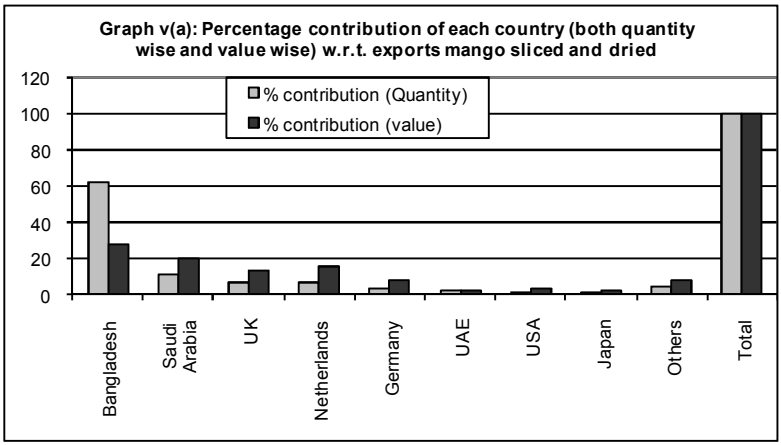
Yemen republic and France have experienced super natural growth as far as imports of mango slices in brine from India are concerned. Netherlands, Kuwait, Israel, Japan, Canada, UAE and Saudi Arabia have all experienced a double digit growth ranging from 88 percent to 21

percent in their respective order. Whereas some countries like US, UK, Jordan and Germany have experienced negative compound growth.

Overall, the growth is significant (7.88%) and hence many new MNCs and SMEs have entered in to this sector. There lies a guaranteed future for Indian fruit processors in this sector. India has tremendous potential, waiting to be exploited, in this sector.

31. Table v(a): Average percentage contribution of each major country w.r.t. exports of mango sliced and dried: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
Bangladesh	61.7	28.14
Saudi Arabia	11.5	20.24
UK	7.06	13.72
Netherlands	7.02	15.73
Germany	3.78	7.31
UAE	2.09	2.45
USA	1.49	3.04
Japan	1.08	1.77
Others	4.28	7.59
Total	**100**	**100**



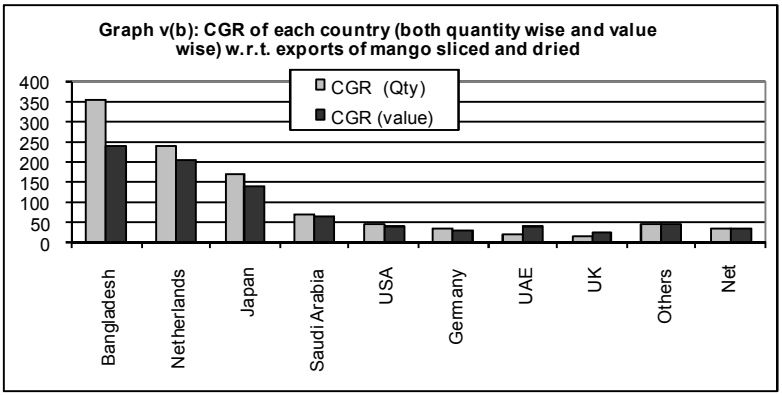
Bangladesh accounts for major portion of exports of mango sliced and dried (62 percent quantity wise and 28 percent value wise). Saudi Arabia, UK and Netherlands, collectively, account for nearly 26 percent of the total exports. It can be seen that relatively few countries import this

particular product than the conventional products like; squash, juice and pulp.

Indian processors will be better off, if they export to those countries which yield higher value contribution, like UK (volume wise contribution is 7 percent whereas value wise contribution is double, i.e., 14 percent) than Bangladesh (value wise contribution -28 percent is much lesser than volume wise contribution -62 percent). The importing countries use this product as an intermediary product and manufacture final product. The Indian processors can themselves process mango slices further and manufacture end products and then export. This will yield multifold benefits to India like; higher FOREX earnings, higher local employment, higher profits, etc.

32. Table v(b): Country wise CGR of exports of mango sliced and dried: India

Country	*CGR (Qty)*	*CGR (Value)*
Bangladesh	353.4	239.35
Netherlands	239.94	204.71
Japan	171.67	139.04
Saudi Arabia	71	64.62
USA	43.99	41.03
Germany	33.62	32.05
UAE	17.59	40.78
UK	14.75	25.58
Others	45.12	47.38
Total	**37.15**	**35.52**



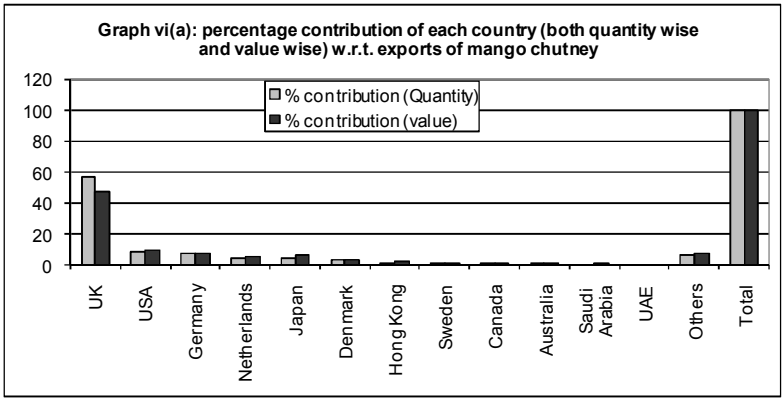
The growth rate is phenomenal for some countries like; Bangladesh (353%), Netherlands (240%) and Japan (172%) whereas, other major countries have also experienced significant compound growth ranging from 15.5 to 71 percent.

The comparison of CGR of exports of different processed products of mango reveals that the growth was highest for this particular product (aggregate CGR of 37 percent), which clearly demonstrates the export demand for this particular product.

The ever increasing export demand for such processed mango products is one of the reasons for the catastrophic growth of this sector and has lured the interests of many MNCs and SMEs to enter in to this sector. This sector has lot more to offer to India in the days to come and Indian fruit processors should realize this and plan accordingly.

33. Table vi(a): Average Percentage contribution of each country w.r.t. exports of mango chutney: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
UK	57.54	48.34
USA	9.10	9.96
Germany	8.05	7.84
Netherlands	5.02	5.98
Japan	4.73	6.52
Denmark	3.03	3.49
Hong Kong	1.71	3.07
Sweden	1.28	1.7
Canada	1.21	1.55
Australia	1.11	1.56
Saudi Arabia	0.63	1.67
UAE	0.34	0.76
Others	6.25	7.56
Total	**100**	**100**

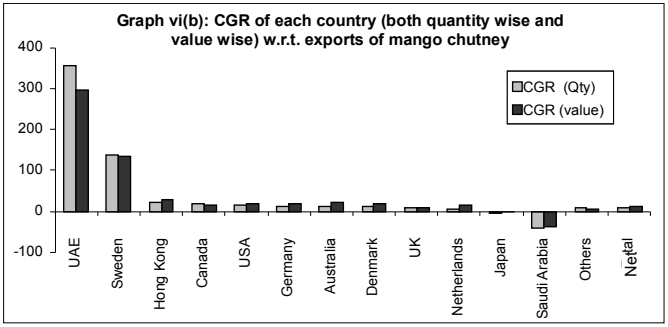


The history of exports of traditional Indian products like spices, go back to eighteenth century, when India used to barter spices and curry powders for other goods like; textiles and machinery with the countries like Great Britain.

These products, i.e., mango pickles and mango chutneys, generally, are consumed by Indians. So countries where-in significant population of Indian origin resides, like UK and USA, will import these traditional Indian products. But due to breaking of national boundaries and national cultures due to globalization, the demand for traditional Indian products has also increased across the world.

34. Table vi(b): Country wise CGR of exports of mango chutney: India

Country	*CGR (Qty)*	*CGR (Value)*
UAE	355.98	295.98
Sweden	137.5	134.4
Hongkong	21.69	27.1
Canada	18.7	16.19
USA	14.26	17.27
Germany	13.14	17.62
Australia	12.4	20.68
Denmark	12.17	17.04
UK	7.39	9.94
Netherlands	5.88	14.68
Japan	-4.86	-1.13
Saudi Arabia	-40.68	-36.69
Others	8.61	7.03
Net	**8.84**	**12.6**

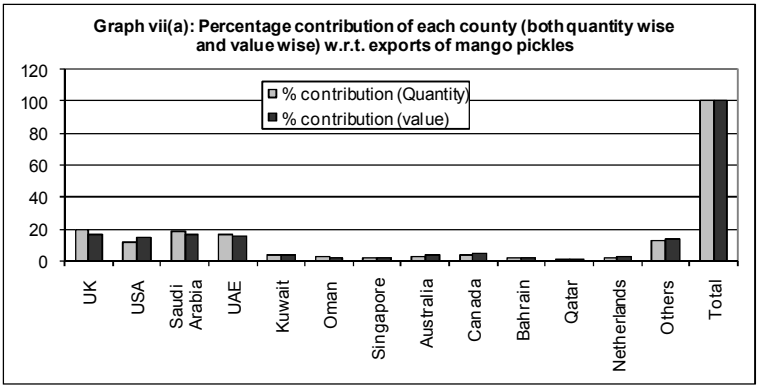


UAE and Sweden have experienced exceptional growth of 356 percent and 137 percent respectively. Whereas other countries like; Hong Kong, Canada, US, Germany, Australia, Denmark, UK and Netherlands have experienced significant growth ranging from 22 percent to 6 percent in their respective order, as shown above.

Overall, growth appears to be significant (8.86%) and hence acts as a catalyst to spur growth in this sector in India. This sector is predominantly comprised of SMEs spread across selected states of India, mainly in Andhra Pradesh, Maharashtra, Tamil Nadu, Karnataka and Kerala.

35. Table vii(a): Average percentage contribution of each country w.r.t. exports of mango pickles

Country	*% contribution (Quantity)*	*% contribution (Value)*
UK	19.58	16.6
USA	11.74	14.88
Saudi Arab	18.6	16.38
UAE	16.68	15.62
Kuwait	4.03	4.36
Oman	2.74	2.26
Singapore	1.88	2.09
Australia	3.31	4.17
Canada	3.67	4.6
Bahrain	1.72	1.5
Qatar	1.17	1.3
Netherlands	2.14	2.46
Others	12.74	13.78
Total	**100**	**100**



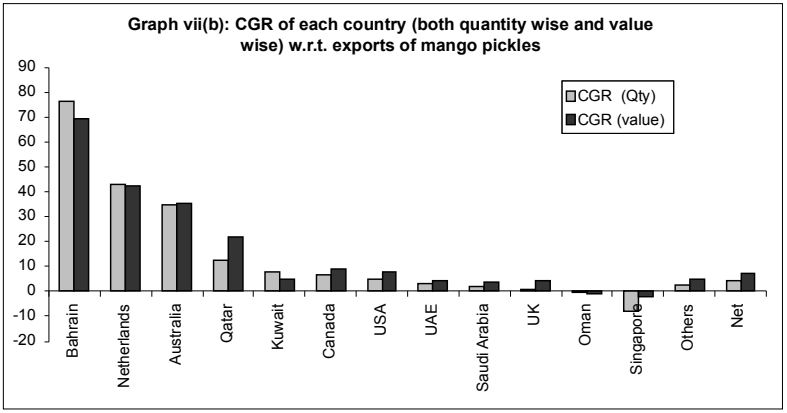
UK, USA, Saudi Arabia, and UAE together account for nearly 67 percent of total exports. Other countries, collectively, account for the remaining 33 percent of total exports.

These products, generally, are consumed by Indians. So countries where-in significant population of Indian origin resides, like UK and USA, will import these traditional Indian products. So the percentage contribution of each country towards total exports is directly proportional to the total population of Indian origin living in that particular country.

But because of breaking of national boundaries and national cultures due to globalization, the demand for traditional Indian products has also increased across the world.

36. Table vii(b): Country wise CGR of exports of mango pickles: India

Country	*CGR (Qty)*	*CGR (Value)*
Bahrain	76.56	69.61
Netherlands	43.26	42.36
Australia	34.92	35.65
Qatar	12.34	22.17
Kuwait	7.56	4.81
Canada	6.48	9.09
USA	4.73	7.91
UAE	2.96	4.51
Saudi Arabia	1.9	3.78
UK	0.69	4.23
Oman	-0.12	-0.83
Singapore	-7.87	-2.16
Others	2.39	4.97
Total	**4.34**	**7.06**



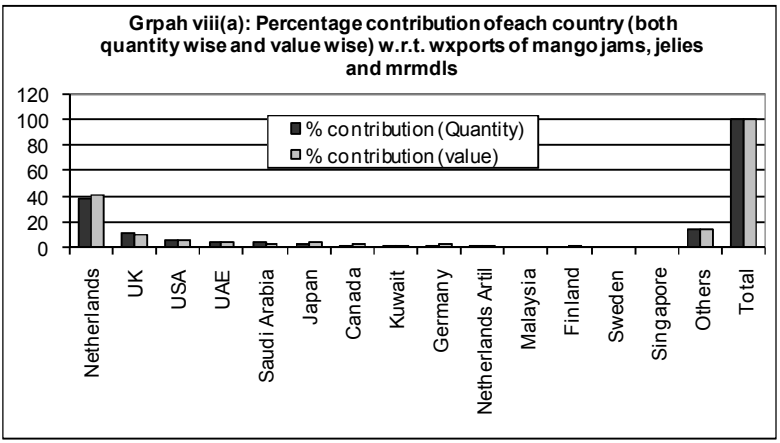
Bahrain, Netherlands and Australia have experienced exceptional growth of 77 percent, 43 percent and 35 percent respectively. Whereas other countries like; Qatar, Kuwait, Canada, USA, UAE, Saudi Arabia, and UK have experienced moderate growth ranging from 8 percent to 1 percent, in their respective order, as shown above.

Overall, growth appears to be significant and hence acts as a catalyst to spur growth in this sector in India. This sector was predominantly comprised of SMEs spread across selected states of India, mainly in; Andhra Pradesh, Maharashtra, Tamil Nadu, Karnataka and Kerala. The growth prospectus has lured big companies like; Hindustan Unilever Limited, Nestle, etc. They have started making huge investments in this particular sector.

37. Table viii(a): Average percentage contribution of each country w.r.t. exports of jams, jellies and Marmdls: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
Netherlands	38.55	40.86
UK	11.64	10.33
USA	6.23	6.35
UAE	5.66	4.65
Saudi Arabia	5.22	3.89
Japan	3.57	5.16
Canada	2.69	3.06
Kuwait	2.55	2.16
Germany	2.53	2.67

Netherlands Artil	1.9	2.59
Malaysia	1.25	1.09
Finland	1.17	1.42
Sweden	0.85	0.9
Singapore	0.83	0.56
Others	15.36	14.31
Total	**100.00**	**100.00**



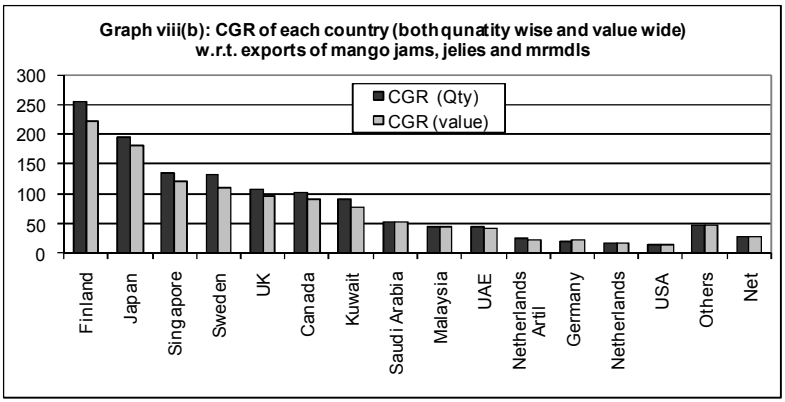
Netherlands and UK account for nearly 39 percent and 12 percent of the total exports of jams, jellies and Marmdls respectively. Other countries including; USA, UAE, Saudi Arabia, Japan, Canada, Kuwait and Germany account for nearly 30 percent of total exports, collectively.

It can be seen from the above tabulation and graph that the demand for these processed and high value added products is wide spread across many countries. This is simply because of the fact that many countries can't grow mango, even if they want to, because of unfavorable climatic conditions. This is a unique competitive advantage which India has in this sector.

38. Table viii(b): Country wise CGR of exports of jams, jellies and Marmdls: India

Country	*CGR (Qty)*	*CGR (Value)*
Finland	255.07	223.29
Japan	196.01	181.3
Singapore	134.91	119.81

Sweden	131.83	110.33
UK	108.27	97.1
Canada	102.18	90.62
Kuwait	91.62	78.31
Saudi Arabia	51.78	51.33
Malaysia	44.96	43.01
UAE	43.94	41.03
Netherlands Artil	23.4	22.15
Germany	19.65	21.5
Netherlands	16.87	17.25
USA	12.93	12.48
Others	45.84	46.81
Net	**28.48**	**28.46**

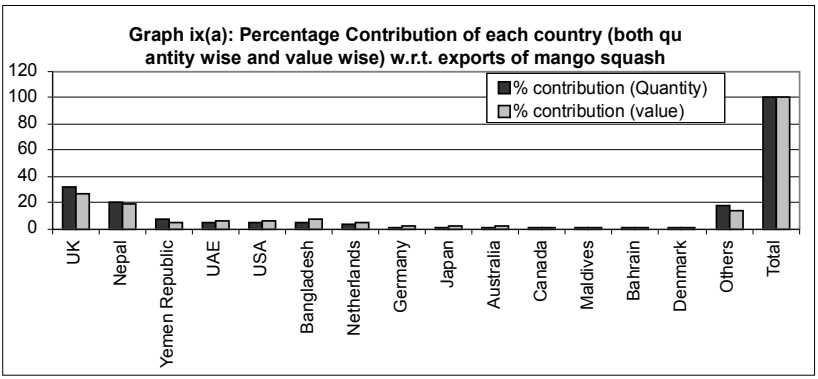


Many countries including Finland, Japan, Singapore, Sweden, UK, and Canada have experienced phenomenal growth, ranging from 255 percent to 102 percent in their respective order, as far as imports of jams, jellies and Marmdls from India is concerned. All the other countries also have experienced a double digit compound growth, ranging from 91 percent to 13 percent, as shown above.

Overall growth appears to be very high (28%). Moreover all the major countries have experienced a significant growth in their imports. Indian processors should capitalize on this phenomenal global demand for the processed mango products and should re-direct or re-allocate the resources to meet this ever increasing global demand.

39. Table ix(a): Average percentage contribution of each country w.r.t. exports of mango squash: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
UK	31.63	27.16
Nepal	19.74	19.49
Yemen Republic	7.23	5.25
UAE	5.07	5.82
USA	4.44	6.26
Bangladesh	4.31	6.97
Netherlands	3.92	5.18
Germany	1.46	1.73
Japan	1.42	2.11
Australia	1.37	2.37
Canada	0.65	1.09
Maldives	0.59	0.84
Bahrain	0.55	0.9
Denmark	0.35	0.64
Others	17.27	14.19
Total	**100.00**	**100.00**



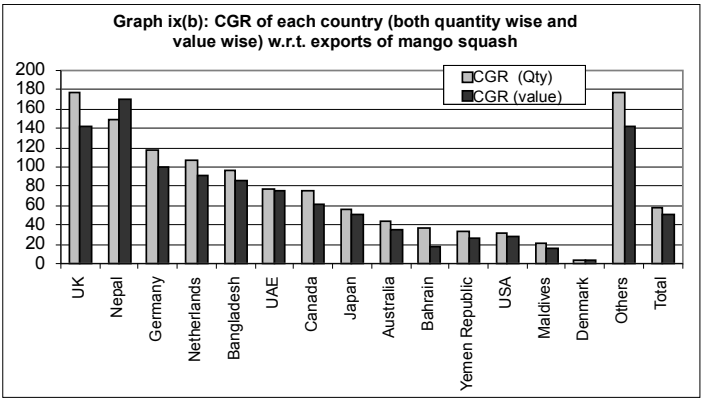
UK and Nepal were the two major countries importing mango squash. These two countries, together, account for nearly 52 percent of total exports of mango squash from India. Other countries of interest include; Yemen republic, UAE, USA, Bangladesh, and Netherlands, which collectively account for nearly 25 percent of total exports of mango squash from India.

The demand for natural fruit drinks has increased dramatically across the globe. People, in general, have become more health conscious

and shifted their consumption from artificial aerated drinks to natural fruit drinks. This is the reason demand for such natural fruit drinks is wide spread across many countries and is growing at a very high rate.

40. Table ix(b): Country wise CGR of exports of mango squash: India

Country	*CGR (Qty)*	*CGR (Value)*
UK	176.72	141.83
Nepal	148.59	169.86
Germany	117.07	99.84
Netherlands	106.79	90.99
Bangladesh	96.87	85.28
UAE	77.66	75.52
Canada	76.21	62.19
Japan	56.85	51.03
Australia	43.88	35.1
Bahrain	36.54	17.21
Yemen Republic	33.19	26.77
USA	31.06	28.53
Maldives	21.00	15.93
Denmark	4.57	4.28
Others	177.81	141.72
Net	**57.77**	**51.53**



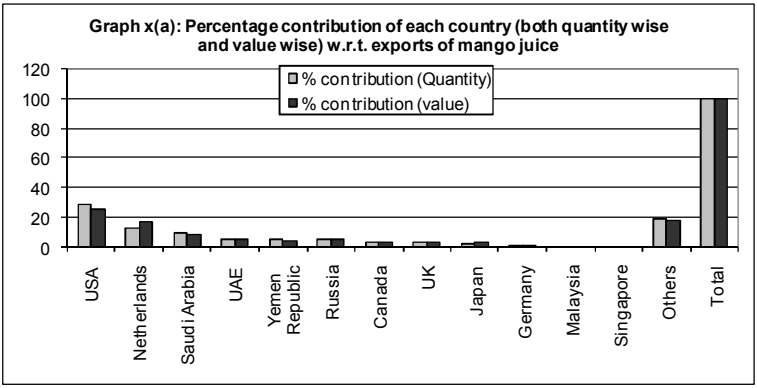
Many countries including UK, Nepal, Germany, and Netherlands have experienced phenomenal three digit compound growth, ranging from 177 percent to 107 percent in their respective order, when we consider imports of mango squash from India. Asll the other countries

also have experienced a double digit compound growth, ranging from 97 percent to 21 percent, except Denmark, as shown above.

Overall growth (58%) appears to be much higher than jams, jellies and Marmdls (28%). Moreover all the countries have experienced a significant growth in their imports. India should re-position itself in the global market as a prime supplier of processed high value added mango products like; squash and juices and should re-direct or re-allocate the resources to meet this ever increasing global demand.

41. Table x(a): Average percentage contribution of each country w.r.t. exports of mango juice: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
USA	28.63	25.89
Netherlands	13.03	17.5
Saudi Arabia	9.57	8.92
UAE	6.14	5.37
Yemen Republic	5.45	4.37
Russia	5.12	5.28
Canada	3.92	4.05
UK	3.39	4.08
Japan	2.32	3.57
Germany	1.78	1.81
Malaysia	0.79	0.6
Singapore	0.35	0.4
Others	19.51	18.16
Total	**100.00**	**100.00**

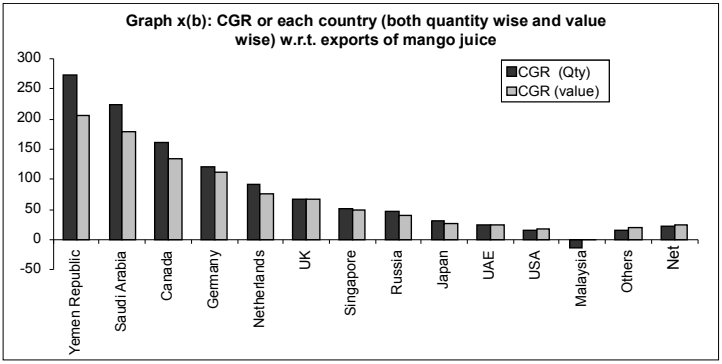


USA and Netherlands are the main countries importing mango juice. These two countries, together, account for nearly 42 percent of total exports of mango juice from India. Other countries of interest include; Saudi Arabia, UAE, Yemen republic, Russia, Canada, UK and Japan which collectively account for nearly 36 percent of total exports of mango juice from India.

The demand for natural fruit drinks, especially fruit squashes and juices, has increased dramatically across the globe. People, in general, have become more health conscious and shifted their consumption from artificial aerated drinks (e.g., 'Coke' and 'Pepsi') to natural fruit drinks. This fundamental shift in demand is seen not only in developed countries but also in the developing countries like; Bangladesh, Nepal, etc. This is the reason demand for such natural fruit drinks is wide spread across many countries and is growing at a very high rate.

42. Table x(b): Country wise CGR of exports of mango juice: India

Country	*CGR (Qty)*	*CGR (Value)*
Yemen Republic	274.27	207.11
Saudi Arab	223.11	179.91
Canada	161.83	133.45
Germany	119.98	111.61
Netherlands	91.64	75.2
UK	67.38	66.04
Singapore	50.23	49.77
Russia	47.02	39.24
Japan	29.97	27.08
UAE	23.44	23.31
USA	16.18	18.35
Malaysia	-13.49	-1.32
Others	14.87	19.3
Total	**21.88**	**24.18**



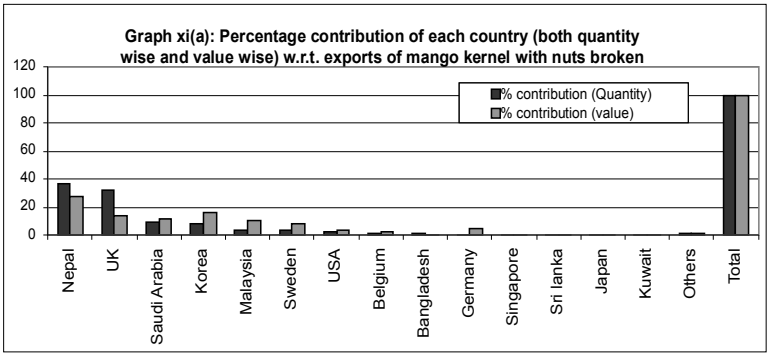
Many countries including Yemen Republic, Saudi Arabia, Canada, and Germany have all experienced phenomenal three digit compound growth, ranging from 274 percent to 120 percent in their respective order, when we consider imports of mango juice from India. All the other countries also have experienced a double digit compound growth, ranging from 92 percent to 16 percent except Malaysia, as shown above.

Overall growth appears to be very high (22%). Moreover all the countries have experienced a significant growth in their imports. This clearly indicate that aerated soft drinks like; 'Pepsi' and 'Coke', have experienced a falling trend and natural fruit drinks have taken over the sales of aerated soft drinks. India has to strengthen its position in the global market as a prime supplier of processed high value added mango products like; squash and juices through increasing the production of the same and simultaneously maintaining international quality standards.

43. Table xi(a): Average percentage contribution of each country w.r.t. exports of mango kernel with nuts broken: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
Nepal	36.84	27.14
UK	32.39	14.09
Saudi Arabia	9.05	11.58
Korea	7.83	16.08
Malaysia	4.06	10.58
Sweden	3.38	8.07
USA	2.17	3.56
Belgium	1.5	2.05
Bangladesh	0.82	0.05
Germany	0.69	4.56

Singapore	0.28	0.55
Sri lank	0.15	0.55
Japan	0.01	0.05
Kuwait	0.01	0.05
Others	0.82	1.04
Total	**100**	**100**



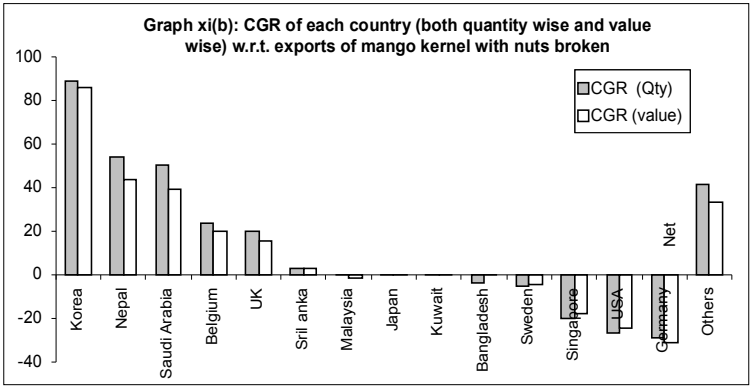
Nepal and UK account for major portion of exports of mango kernel with nuts broken, i.e., 37 percent and 32 percent respectively quantity wise and 27 percent and 14 percent value wise. Saudi Arabia, Korea, Malaysia, Sweden and USA, collectively, account for nearly 26 percent of the total exports quantity wise and 50 percent value wise. It can be seen that value wise contribution is much less for top of the list countries including; Nepal and UK than the other countries in the list including; Saudi Arabia, Korea, Malaysia, Sweden and USA.

So, India will be better off, if it exports to those countries which yield higher value contribution. Other alternative could be to process these mango kernels further and turn them in to still higher value added end products and then export.

44. Table xi(b): Country wise CGR of exports of mango kernel with nuts broken: India

Country	*CGR (Qty)*	*CGR (Value)*
Korea	89.19	86.47
Nepal	54.24	43.99
Saudi Arabia	50.69	39.84
Belgium	23.64	19.91
UK	20.13	15.52
Sri lanka	2.83	2.83
Malaysia	0	-1.56

Japan	0	0
Kuwait	0	0
Bangladesh	-3.8	0
Sweden	-4.63	-4.37
Singapore	-20.13	-17.75
USA	-26.87	-24.26
Germany	-28.75	-31
Others	41.75	33.51
Net	**56.54**	**38.89**



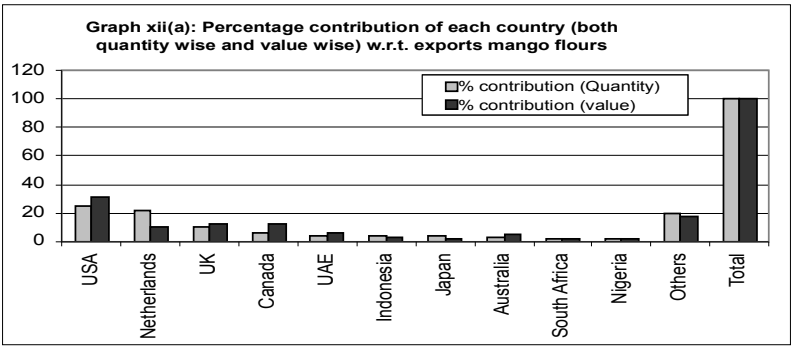
Many countries including Korea, Nepal, Saudi Arabia, Belgium and UK have experienced a very high double digit compound growth, ranging from 89 percent to 20 percent in their respective order, when we consider imports of mango kernel with nut broken from India. Other countries including; Malaysia, Japan, Kuwait, Bangladesh, Sweden, Singapore, USA, and Germany have experienced a zero growth or negative growth.

Overall growth appears to be very high (57 percent volume wise and 39 percent value wise). Indian fruit processors should invest in R&D activities and try to reengineer the business processes involved so that they can undertake vertical integration projects like processing kernels further in to high value added end products like mango butter, which will have a great demand in the global market and fetch higher value.

45. Table xii(a): Average percentage contribution of each country w.r.t. exports of mango flours: India

Country	*% contribution (Quantity)*	*% contribution (Value)*
USA	24.74	30.85
Netherlands	22.11	10.03

UK	10.29	11.91
Canada	5.87	11.64
UAE	4.17	6.23
Indonesia	3.41	2.46
Japan	3.41	1.65
Australia	2.98	4.62
South Africa	2.13	1.92
Nigeria	1.71	1.65
Others	19.21	17.05
Total	**100.00**	**100.00**



USA, Netherlands and UK account for major portion of total exports of mango flours from India. These three countries account for nearly 57 percent of the total exports. Other countries including; Canada, UAE, Indonesia, Japan, Australia and South Africa, collectively, account for 22 percent of total exports.

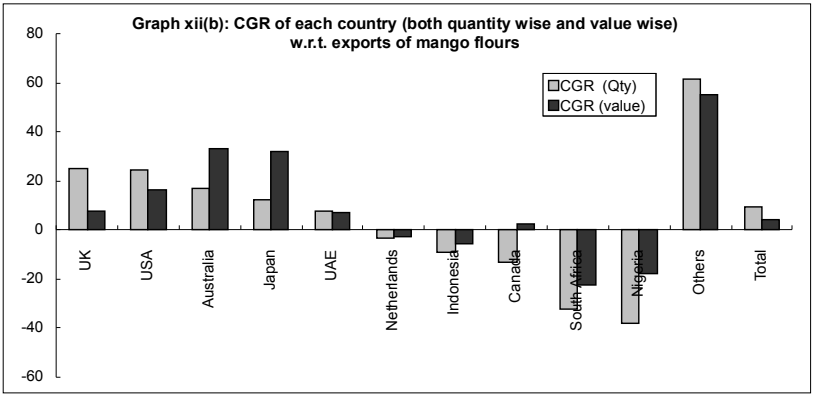
Some countries like USA yield higher value contribution than countries like Netherlands. So India has to choose those countries which yield higher value. In other words what is more important for the exporting country is value wise contribution than volume wise contribution.

Simultaneously, Indian companies should think of producing high value added end products like feed for the piggery industry, where-in these intermediary products are being used.

46. Table xii(b): Country wise CGR of exports of mango flours: India

Country	*CGR (Qty)*	*CGR (Value)*
UK	25.19	7.68
USA	24.55	16.52

Australia	17.31	33.11
Japan	12.21	31.86
UAE	7.92	6.97
Netherlands	-3.31	-2.54
Indonesia	-8.8	-5.5
Canada	-13.27	2.75
South Africa	-32.25	-22.57
Nigeria	-38.12	-17.62
Others	61.75	55.49
Total	**9.63**	**4.45**



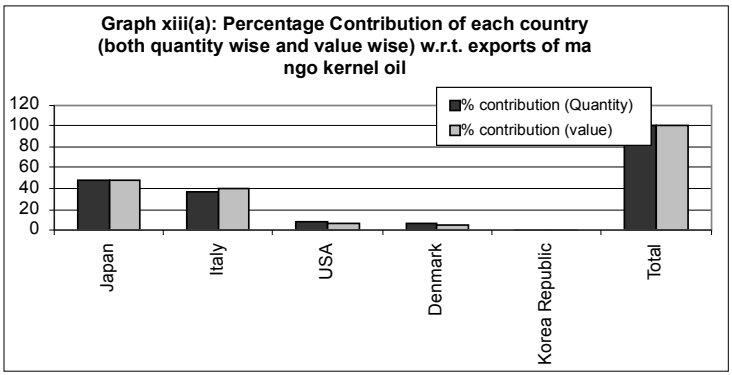
Many countries including; UK, USA, Australia and Japan have experienced a double digit compound growth ranging from 25 percent to 12 percent in their respective order, whereas, other countries except UAE, have experienced negative growth.

The difference between volume wise CGR and value wise CGR is worth noting. Value wise growth is significantly less compared to quantity wise growth. This clearly means exports are fetching lesser price. There is disparity with respect to quantity wise and value wise contribution. So Indian companies have to be choosy while selecting countries, and should choose those countries which yield higher value contribution.

Simultaneously, Indian companies should think of producing high value added end products like feed for the piggery industry, mango butter, mango margarine, cosmetics, etc., where-in these intermediary products are being used.

47. Table xiii(a): Average percentage contribution of each country w.r.t. exports of mango kernel oil

Country	*% contribution (Quantity)*	*% contribution (Value)*
Japan	48.67	47.82
Italy	36.27	39.72
USA	7.64	6.77
Denmark	7.17	4.88
Korea Republic	0.25	0.83
Total	**100.00**	**100.00**



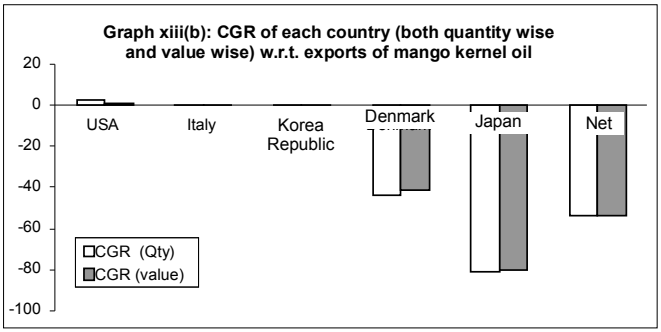
Japan and Italy together account for significant portion of total exports of mango kernel oil from India. These two countries, together, account for nearly 85 percent of the total exports. Other countries including; USA and Denmark together account for 15 percent of total exports.

Relatively few countries (only five) import this particular class of product as it is used in manufacturing very specific end products.

Even though the exports of this particular class of product is not so significant, it indeed is an opportunity for Indian processors to strengthen their R&D wing so that the processors can look for various applications of such intermediary or by products. There lies a most promising scope for Indian processors to come out with different applications in different sectors like; pharmaceutical, cosmetics, food, etc., for such intermediary products.

48. Table xiii(b): Country wise CGR of exports of mango kernel oil: India

Country	*CGR (Qty)*	*CGR (Value)*
USA	2.73	0.86
Italy	0	0
Korea Republic	0	0
Denmark	-43.55	-41.46
Japan	-80.76	-80.25
Net	**-53.34**	**-53.48**



Except USA, all other countries have experienced a zero or significant negative growth. Overall growth is unattractive and discouraging. Indian processors have to look for different applications of this intermediary product. This calls for possessing state of the art R&D facilities. Indian processors should invest heavily in building necessary R&D facilities.

Higher value addition to existing products, strengthening the R&D base, and scouting for various applications for the intermediary products are some of the important critical success factors for Indian fruit processing industry.

Indian fruit processing industry should follow the footsteps of Brazilian fruit processing industry in this regard and turn it in to the most vibrant and fast growing industry of India.

❋ ❋ ❋

5 Chapter

Primary Research Pertaining to Farmers/Cultivators

Research Plan

The detailed research plan to conduct primary research as stated in the Chapter 3, involves the following key elements.

1. Geographic Region Covered: Entire Karnataka state and adjacent districts of neighboring states, i.e., Tamil Nadu, Andhra Pradesh and Maharashtra had been chosen as the geographic region for the purpose of the research.

2. Sampling Method: Single stage cluster sampling coupled with non probabilistic convenience based selection within the cluster has been used, where-in Karnataka state has been chosen as a cluster. The reason being Karnataka is a major mango growing state and has a strong mango processing industry, represents the entire nation, as a good cluster. Within the cluster, the non probabilistic convenience based sampling scheme is used to facilitate the researcher to draw required samples from various strata within a cluster. Stratum in this case is nothing but the different scales of operations of both cultivators as well as processors, i.e., tiny scale, small scale, medium scale, and large scale.

3. Sample Size: Considering the feasibility of the study and the limitations of resources including time, sample size of **fifty** mango cultivators (Cultivators having minimum of 50 plants and more) and **twenty-five** processors, spread across the entire state of Karnataka and the neighboring districts of adjacent states (Andhra Pradesh, Tamil Nadu) has been chosen.

Method of Data Collection

In depth interviewing mechanism guided through structured interview schedules, prepared separately for cultivators as well as processors, is being used to gather the first hand information about the farming community (mango cultivators) as well as fruit processing industry (mango processors). Wherever we had difficulty in reaching the respondents, especially the processors, responses were being collected through mail with ongoing clarifications if necessary.

Tools Used for Collecting Data

Well structured interview schedules, for both groups, i.e., mango cultivators and mango processors, designed carefully, were being used to gather primary information. Interview schedules once prepared were being tested for appropriability for the research.

Tools and Techniqzues used for Analyzing Primary Information

Brief description about the tools and techniques used for analyzing primary information is given below;

1. Correlation

Correlation measures the association between two variables. It gives the direction and strength of association. Correlation coefficient is a unit less number.

Correlation coefficient value varies between –1 and +1. Positive correlation coefficient implies direct relationship between the variables. Negative correlation coefficient implies inverse relationship between the variables.

$$r \quad \frac{\text{cov } X, Y}{\sqrt{\text{var } X \ \text{var } Y}}$$

Where,

r = correlation coefficient

$\text{Var}(X)$ = variance of variable X

$\text{Var}(Y)$ = variance of variable Y

$\text{Cov}(X,Y)$ = covariance of X & Y.

Simple Linear Correlation (Pearson correlation - here after called correlation), assumes that the two variables are measured on least

interval scales and it determines the extent to which values of the two variables are "proportional" to each other. The value of correlation (i.e., correlation coefficient) does not depend on the specific measurement units used; for example, the correlation between height and weight will be identical regardless of whether inches and pounds, or centimeters and kilograms are used as measurement units. Proportional means linearly related; that is, the correlation is high if it can be "summarized" by a straight line (sloped upwards or downwards).

$$r_{x,y} \quad \frac{n \quad xy \quad x \quad y}{\sqrt{n \quad x_2 \; n \quad y_2 \quad y_2}}$$

Where; y = Dependent variable

x = Independent variable

n = Number of pairs of observations

r = the correlation coefficient

Interpretation of the strength of correlation:

0.00 - .20 – Very Weak

.21 - .40 – Weak

.41 - .60 – Moderate

.61 - .80 – Strong

.81 - 1.00 – Very Strong

2. Pearson Chi-square

The Pearson Chi-square is the most common test for significance of the relationship between categorical variables. This measure is based on the fact that we can compute the expected frequencies in a two-way table (i.e., frequencies that we would expect if there was no relationship between the variables).

The value of the Chi-square and its significance level depends on the overall number of observations and the number of cells in the table. Consistent with the principles discussed in Elementary Concepts, relatively small deviations of the relative frequencies across cells from the expected pattern will prove significant if the number of observations is large.

The only assumption underlying the use of the Chi-square is that the expected frequencies are not very small. The reason for this is that, actually, the Chi-square inherently tests the underlying probabilities in each cell; and

when the expected cell frequencies fall, for example, below 5, those probabilities cannot be estimated with sufficient precision.

$$x_2 \quad \sum_{i\ 1}^{k} \frac{(O_i \quad E_i)^2}{E_i}$$

Where,

O_i = observed frequency of ith cell

E_i = expected frequency of ith cell

k = number of cells.

3. Tabular Presentation Techniques

The data collected was being presented in tabular form to facilitate easy comparisons and simple calculations like;

(i) Percent of different responses marked by the respondents

(ii) Total number of similar responses as marked by the respondents.

Such simple tabular analysis together with appropriate statistical/ mathematical/computational tool like Chi-square analysis, etc., will help in arriving at meaningful conclusions.

Presentation of Research Findings

Tabular and graphical analysis coupled with appropriate statistical, mathematical, and computational analysis for each important question that is being asked in the interview, is being used to arrive at meaningful interpretations and conclusions. This section of the research is subdivided in to two separate parts (as separate chapters) namely;

1. Analysis of information gathered from the mango cultivators.
2. Analysis of information gathered from the mango processors.

The first part where-in Primary information gathered from 52 mango cultivators is analyzed in four stages listed as below;

1. Analysis of general/introductory information.
2. Analysis of specific information.
3. Analysis of information pertaining to collaboration and cooperation.
4. Analysis of concluding information and the outcome of the analysis is being discussed at the end of each stage and interpreted critically.

The second part where-in primary information gathered from 25 mango processors is analyzed in the same four stages listed as below;

1. Analysis of general/introductory information
2. Analysis of specific information
3. Analysis of collaborative information
4. Analysis of concluding information

And the outcome of the analysis is being discussed at the end of each stage and interpreted critically in the next chapter, *i.e.* **Chapter 6.**

Part A: Analysis of Introductory Information: Mango Cultivators

Table F01: Land holding pattern of respondents

Sr. No.	*Total land holding*	*Number*	*Percent*
1	1-5 acres	10	19
2	5-10 acres	14	27
3	10-25 acres	15	29
4	25-100 acres	10	19
5	Above 100 acres	3	6
	Total no. of respondents	**52**	**100**

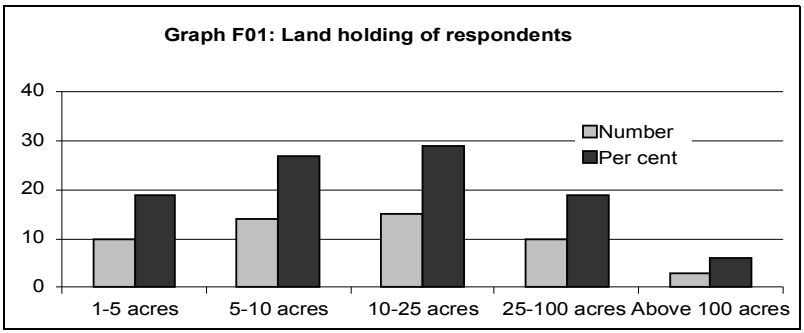


Table F02: Ownership pattern amongst respondents

Sr. No.	*Type of ownership*	*Number*	*Percent*
1	Sole proprietor	43	83
2	Partnership	6	11
3	Short term lease	1	2
4	Family owned	1	2
5	Other form	1	2
	Total	**52**	**100.00**

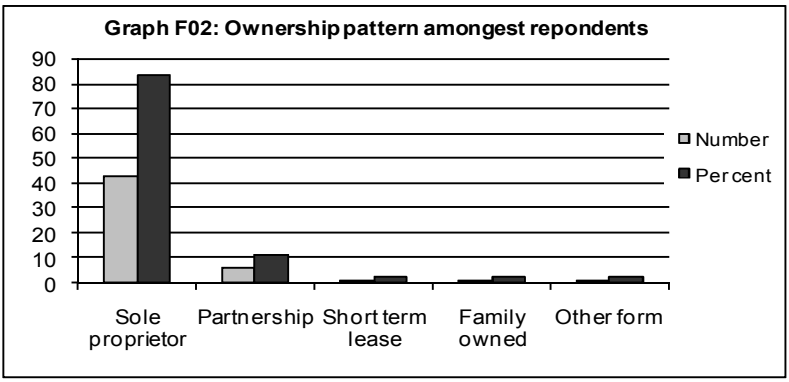
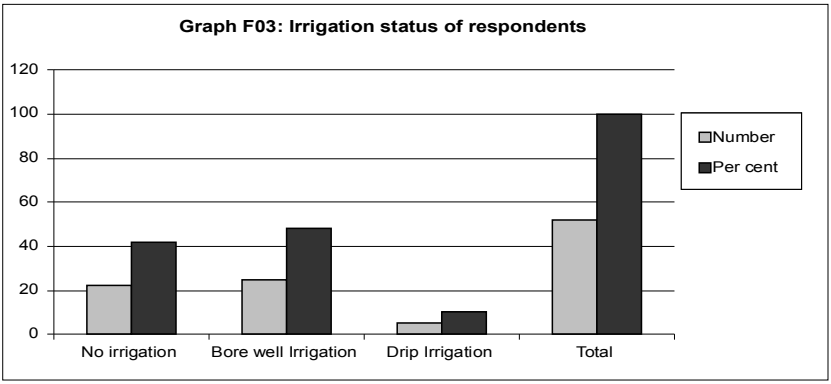


Table F03: Irrigation status of respondents

Sr. No.	*Irrigation status*	*Number*	*Percent*
1	No irrigation	22	42
2	Bore well Irrigation	25	48
3	Drip Irrigation	5	10
	Total	**52**	**100**



Research Findings and Discussion

From the tables (F-01 to F-03) and graphs (F01 to F03) shown above, following inferences can be drawn:

Average land holding is significantly small: Around 46 percent of the total respondents have the land holding of less than 10 acres. Smallness of the Indian growers is the source of all problems that prohibit this industry from flourishing to its desired levels. Being small means sacrificing the benefits of larger economies (Economies of scale, economies of scope and economies of experience). Thus they can't exercise their power in the market place and end up in becoming price

takers. Middlemen (traders between growers and processors) have capitalized on this weakness of growers and exploiting them. This is the reason middlemen have become strong and the growers have become weak in India.

The only solution to this problem is to speed up cooperative movement amongst growers. Growers should come forward, join their hands and form cooperatives and run them successfully. Growers should follow the footsteps of small milk producers, who came forward, formed cooperatives and run them successfully during 1980s. The cooperative movement (popularly known as white revolution) initiated by Dr. Kurien has revolutionized the dairy industry of India and made India the largest producer and processor of milk in the world. Such similar cooperative effort is the need of the hour to turnaround this industry. Some effort has been made in this direction like;

1. Majority of the grape growers of Bijapur district in Karnataka have joined their hands and formed '***Bijapur district* g*rape producers and processors society'*** in 1987. Present membership stroll stand at around 1,300 plus members. This cooperative association functions under the guidelines of national board '***Grape Growers Federation of India***'. Key activities cum achievements of this association includes;

1. Organize seminars and workshops frequently for all the members to familiarize the growers with latest developments that took place in the industry.
2. Publicized '**Draksha Darpan**', a monthly magazine covering all relevant information pertaining to grape cultivation and processing.
3. Help farmers in acquiring new technology.
4. Liaise with NHM (National Horticulture Mission), a nodal agency of India and make various schemes (launched by MHM) and facilities (provided by NHM) available to all its members, like; distribution of crates at subsidized rates to store grapes and process them in to raisins, provide them shade nets, etc., at concessional rates.
5. Invited big companies like;
   (i) Seven star: A subsidiary of MAHYCO, Maharashtra
   (ii) Bhandari Group of Maharashtra
   (iii) Mallya group
   (iv) Basaveshwar group

(v) Other leading exporters and well established wineries like; Chateu Vintage Ltd., etc.

To procure the grapes from Karnataka, especially Bijapur district, directly from the growers which ultimately fetch a higher price to growers and also to set up small and medium scale winery in and around Bijapur district.

1. Exported 150 containers of fresh grapes in 2006 to various European countries, Malaysia and Gulf countries.
2. Launched '***Mahagrape***' a state level brand to market fresh grapes through the association.
3. Establishing cold chain facilities like cold storage units, refrigerated vans, etc., to facilitate growers.
4. Encouraged Establishment of pre-cooling units (like chilling centers in dairy industry), to bring the temp of the fruits to 0 degree Celsius and then shift to cold storage units, so that freshness of the fruit can be retained for many days.
   Precooling units charge reasonable price for this process. The current price is around ₹ 5 to 6 per KG.
5. Established weather stations at major growing centers, to predict the climatic changes for next couple of days, so that growers can plan their activities.
6. Providing extension support to growers, i.e.,
   (i) Which variety to grow
   (ii) How to grow (farming practices)
   (iii) From where to buy the seeds
   (iv) How to cultivate (pruning, feeding, nurturing, watering, etc.)
   (v) Which growth boosters or growth retarders to use
   (vi) From where to buy those growth boosters and growth retarders
   (vii) How to manage the farm (farm management practices)
   (viii) How to control the weeds, pests, insects, etc.
   (ix) When to harvest and how to harvest (harvesting practices)
   (x) How to store (storage practices)
   (xi) How to process (building necessary processing capabilities)
   (xii) How to pack (packaging methods and practices)
   (xiii) How to market (marketing approaches), etc.

2. 'MRDBS (Maharashtra Rajya Draksha Bagayatdar Sangh)' is another strong and active cooperative association with total membership of more than one lakh.

3. 'Pomegranates Growers Association' located at Kaladagi Taluk, Bagalkot district, is another recently formed cooperative association to promote the interests of local pomegranate growers.

4. 'Suvarna Karnataka Mavu Belegarara Sangha (Regd.)' located at Hanagal, a well-known Alphonso growing centre, is the only recently started cooperative association to promote the interests of local mango growers. It was established in February 2007 and has around 50 active members. But lot more needs to be accomplished in this direction.

From the Table F03 and Graph F03, it is clear that 42 percent of the respondents have no irrigation facility and only 10 percent have drip irrigation facility. This clearly envisages the fact that orchards or farms are being treated as an appreciating asset like gold, than a profit making business venture. Farms are not being managed professionally and no tangible investments have been made in the orchards. This is the reason; many of the orchards have gone senile with old trees and hence very less production. Hence the very approach of managing this business has to undergo a radical change. Then only India can realize its potential that is being hidden in this sector.

The above discussions very clearly reject null hypothesis Ho-03 and supports alternate hypothesis **Ha-03** which says "Lack of cooperative effort amongst farming community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition."

A cooperative movement amongst farming community will strengthen their position with regard to the following;

1. Creating necessary infrastructure like; well developed nurseries, laboratories, storage facilities including cold storage and freeze drying facilities, packaging facilities, processing facilities, marketing and sales networks, extension networks, GIS facility, etc., will become possible.
2. Reaping the benefits of larger economies of scale and higher value addition will become possible.
3. Adopting an integrated approach right from the farm gate till final consumer encompassing all the activities like planting the right variety quality seedling, harvesting at right time, proper

grading, proper storing, processing, innovative packaging, marketing and selling, etc., will become possible.

4. Enjoying higher power to bargain in the market will lead to fetching better prices for their output, which in turn will improve the financial condition of the farmers.

Enchanting success of 'green revolution' and 'white revolution' has proved this. A similar approach needs to be followed to turn around this industry and making 'horticulture revolution' a successful one.

Part B(a): Analysis of Specific Information: Mango Cultivators

Table F04: Percentage and number of cultivators growing only one variety

Sr. No.	*Detailed description about varieties grown*	*Number*	*Percent*
1	Growers growing only Alphonso	21	40.38
2	Growers growing only Totapairi	8	15.38
3	Growers growing only Neelam	2	3.85
4	Growers growing only Mallika	1	1.92
5	Growers growing only others (Kalmi)	1	1.92
	Total	33	63.46
1	Growers growing more than one variety	19	36.54

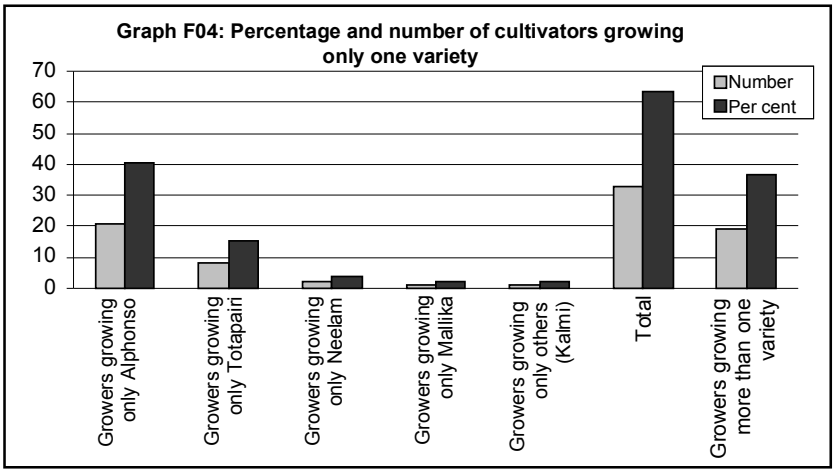


Table F05: Percentage and number of cultivators growing particular variety

Sr. No.	*Particulars*	*Number*	*Percent*
1	Growers growing Alphonso	32	61.54
2	Growers growing Totapairi	17	32.69
3	Growers growing Neelam	12	23.08
4	Growers growing Others (Kalmi)	11	21.15
5	Growers growing Mallika	3	5.77

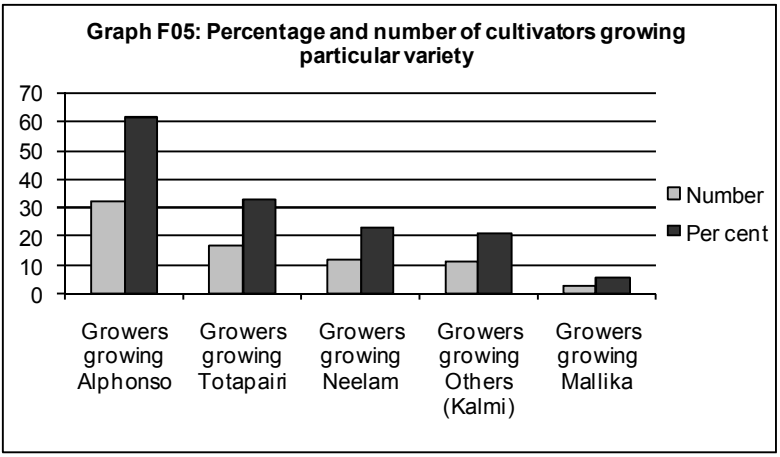


Table F06: Cultivators growing more than one variety

Sr. No.	*Particulars*	*Number*	*Percent*
1	Growers growing one variety	33	63.46
2	Growers growing two varieties	15	28.85
3	Growers growing three varieties	4	7.69
	Total	**52**	**100.00**

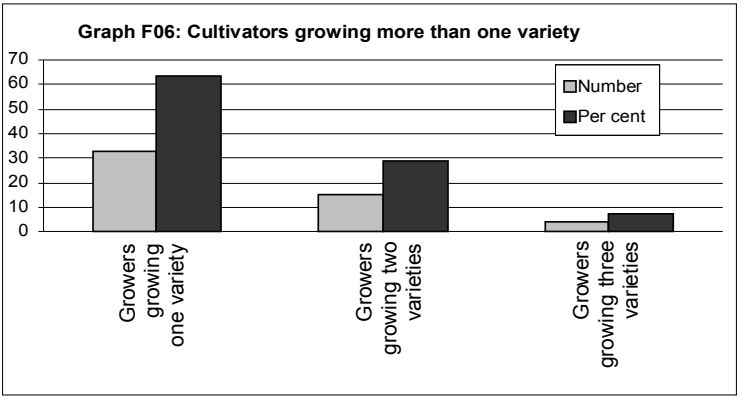


Table F07: Variety wise average yield, Market price and average revenue per plant

Sr. No.	*Variety*	*Avg. yield per plant ('00Kgs)*	*Avg. Market price (2009 season) (₹)*	*Avg. Revenue per plant ('00 ₹)*
1	Alphonso	2.24	19	42.56
2	Others (Kalmi)	2.45	12	29.4
3	Mallika	2.27	10	22.7
4	Neelam	2.01	10	20.1
5	Totapuri	2.73	6	16.38

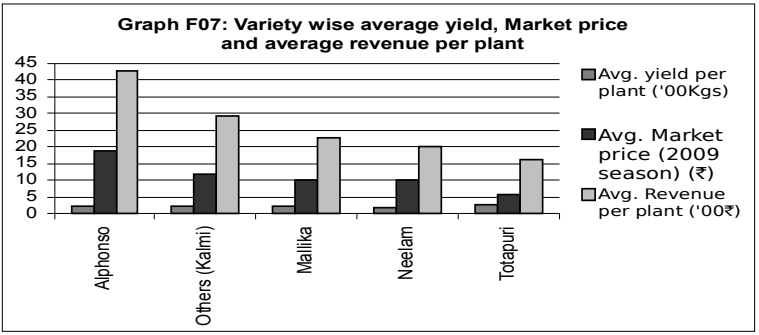


Table F08: Percentage of total no. of plants based on age of the plant

Sr. No.	*Age of the plant*	*Percent*
1	10 Years and above	92
2	5-10 Years	8
3	2-5 Years	0
4	1-2 Years	0
	Total	**100**

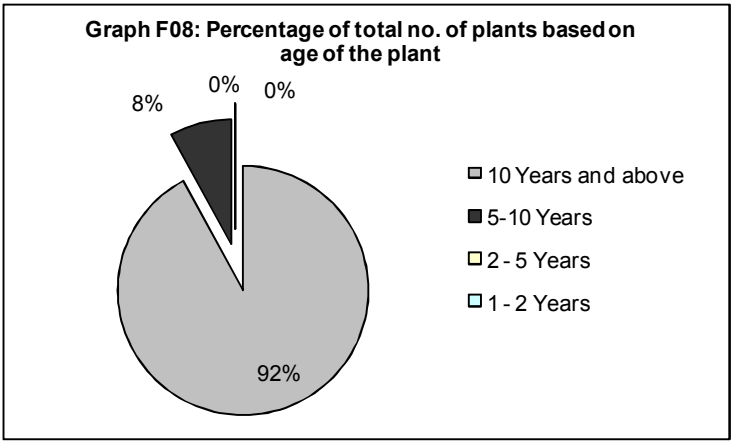


Table F09: % contribution of each variety grown by all the cultivators surveyed

Sr. No.	*Plant Variety*	*Total No. of plants (in '000s)*	*Percent contribution*
1	Alphonso	17.3	34.81
2	Totapuri	14.4	28.97
3	Neelam	13.5	27.16
4	Others (Kalmi)	3.9	7.85
5	Mallika	0.6	1.21
	Total	**49.7**	**100**

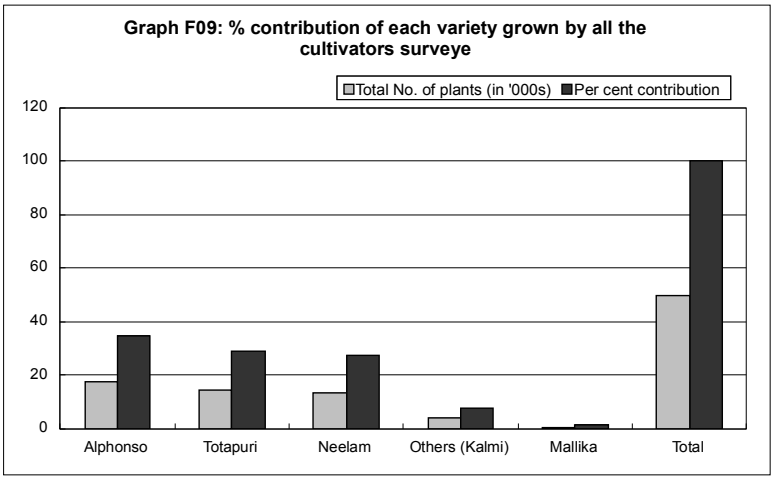


Table F10: Application of fertilizers per plant in a year

Sr. No	*Application of fertilizers Per plant*	*Number*	*Percent*
1	Less than 5 Kgs	5	10
2	Between 5 to 10 Kgs	15	29
3	Between 10-20 Kgs	29	56
4	Above 20 Kgs	3	6
	Total	**52**	**100**

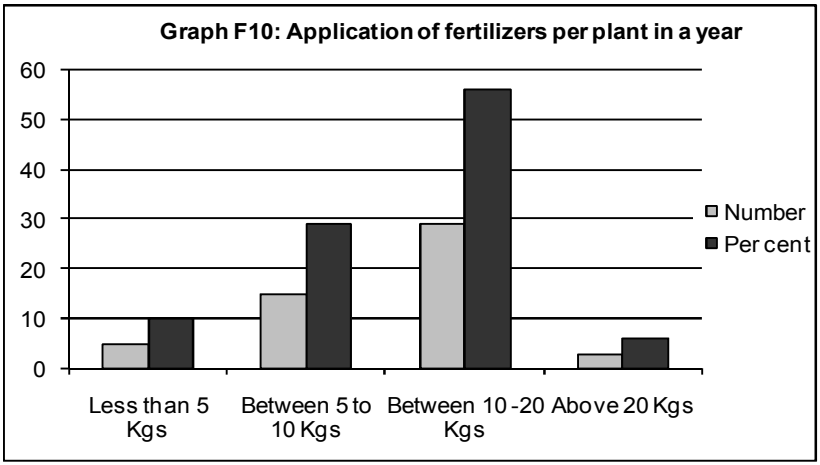


Table F11: Major diseases encountered frequently

Sr. No.	*Major diseases*	*Number*	*Percent*
1	Not known	7	13
2	Black disease	22	42
3	Boodu Roaga disease	2	4
4	Motte disease	1	2
5	Zigi roga	6	12
6	Zigi roga and Boodu roga	5	10
7	Black disease, boodu roga and black spot	1	2
8	Black disease and boodu roga	7	13
9	Black and brown disease	1	2
	Total	**52**	**100**

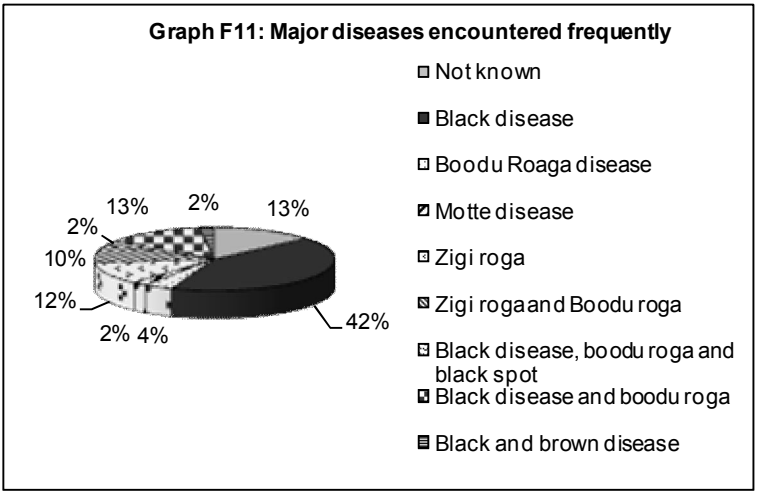
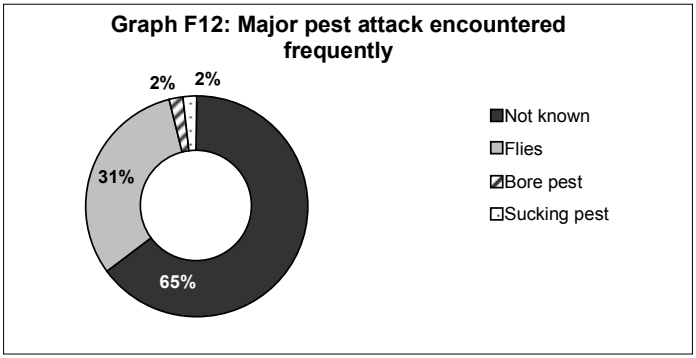


Table F12: Major pest attack encountered frequently

Sr. No.	*Major pest attack*	*Number*	*Percent*
1	Not known	34	65
2	Flies	16	31
3	Bore pest	1	2
4	Sucking pest	1	2
	Total	**52**	**100**



Research Findings and Discussion

From the tables (Table F04 to Table F12) and Graphs (Graph F04 to F 12) depicted above, the following major inferences can be drawn:

1. Following features of Alphonso variety makes it very popular not only in domestic market but also in international markets including developed nations:

(i) Pulp content (pulp recovery) is very high.

(ii) Mouth watering taste, right texture, appealing color, and unique aroma.

(iii) Sucrose and Fructose content is high compared with other varieties.

(iv) Size is neither too big nor too small: Just right for processing.

(v) Comparatively lesser yield but higher market price and hence higher profit.

(vi) Ever increasing demand for Indian Alphonso (both as fresh fruit and processed fruit products, especially pulp and juice).

In spite of all these strong features favouring Alphonso, it was found during the course of research that 62 percent of the respondents grow Alphonso, where-in 40 percent of the respondents grow only Alphonso (out of 62 percent). Remaining 38 percent of the respondents grow other varieties including; Mallika, Totapuri, Neelam and Kalmi. These varieties have specific drawbacks when compared with Alphonso like; less pulp recovery, etc., and hence carry less demand in the market place and ultimately fetch a low price to the cultivator. It can be noted from the table F09 that Alphonso account for 35 percent in total when we consider variety wise total number of plants. Other varieties account for remaining 65 percent.

2. Table and Graph F 07 clearly indicate that Alphonso fetches average revenue of around ₹ 4,256 per plant, which is significantly higher than other varieties. In spite of all these advantages associated with Alphonso, cultivators still grow other varieties. This in fact is a serious cause for concern need to be addressed. The possible reasons for such a behavior by cultivators may include the following:

(i) Cultivators may be choosing a specific variety considering specific benefits like; higher yield, less maintenance, less managerial effort, etc.

(ii) Lack of knowledge, awareness, etc., about the relative advantages of other upcoming varieties.

(iii) They may be considering demand from the local markets only and try to fulfill the same.

(iv) They don't want to replace existing varieties with new varieties when the plants become old (As revealed from the table and graph F 08: 92 percent of the plants were of age 10 years and above. This implies that plants are not being replaced even after 20 years resulting in orchards/farms becoming senile). This in fact is a serious issue which needs to be addressed.

(v) Non availability of seedling/sapling of required variety during the time for plantations.

(vi) Lack of extension support to cultivators from the nodal bodies and institutions like; NHM, NHB, Agriculture Universities, State Horticulture Department, etc. with regard to the following;

(a) Which variety to grow (suitability of the variety)
(b) How to cultivate (farming practices)
(c) From where to buy the seeds/seedling/sapling
(d) How to cultivate (pruning, feeding, nurturing, watering, etc.)
(e) How to manage the farm (farm management practices)
(f) How to control the weeds, pests, insects, etc.
(g) When to harvest and how to harvest (harvesting practices)
(h) How to store and how to process (building necessary processing capabilities)
(i) How to pack (packaging methods and practices)
(j) How to market (marketing approaches), etc.

So attitude and behavior of cultivators and style of functioning of cultivators as well as Govt. departments/nodal bodies/concerned Institutions have to undergo a radical change. They should accept latest developments and try to implement the same. Ongoing improvements have to be made with regard to technology and research and development through continuous investments in the same. Very approach of running the farming activity has to be changed from traditional asset based approach to profit making business venture.

The above discussion clearly rejects null hypothesis H0-01 and accepts alternate hypothesis Ha-01 which says "Indian fruit processing industry especially mango processing industry is affected by non availability of high yield, high pulp containing varieties of mangoes that also have high resistance towards pest attack, which are ideal for processing", and further stresses on the following point;

'Farming community should be provided with the required extension support with respect to providing right variety quality seedling/sapling at

the time of plantations, adopting effective and efficient farm management practices, seeking the benefits of economies of scale, etc., from the concerned departments and nodal agencies to change the attitude and mindset of farming community.'

Pearson's correlation coefficient of 0.408 between Alphonso growers/Non Alphonso growers/mixed growers and annual net profit per plant that too at 0.01 significance level clearly indicate the moderate relationship between growing Alphonso variety and profit per plant.

It can be further noted that 70 percent of the Brazilian cultivators grow only one variety i.e., '**TOM ATKINS**' a variety similar to 'Alphonso', which is ideal for processing.

Part B(b): Analysis of Specific Information Continued

Table F13: Method of harvesting followed by the respondents

Sr. No	*Method of harvesting*	*Number*	*Percent*
1	Manual with no instruments	7	13
2	Using some self made instruments like net and stick	42	81
3	Both mannual and self made instruments	2	4
4	Using self made instrument and specfic and standered instruments	1	2
	Total	**52**	**100**

Graph F13: Method of harvesting followed by the respondents

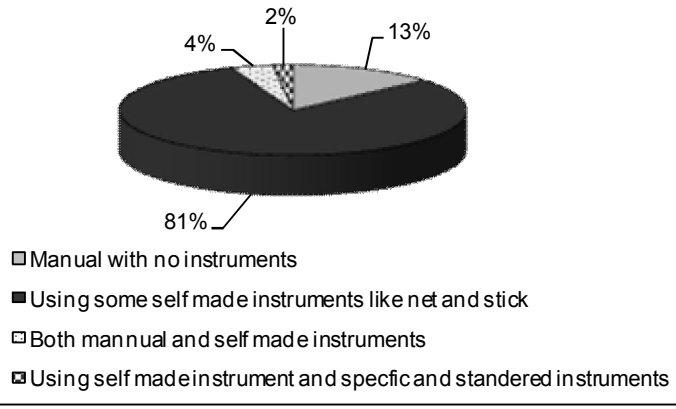


Table F14: Undertaking of grading and packing by respondents

Sr. No.	*Grading and packing process in place or not*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
1	Grading	47	5	90	10
2	Packing	44	8	85	15

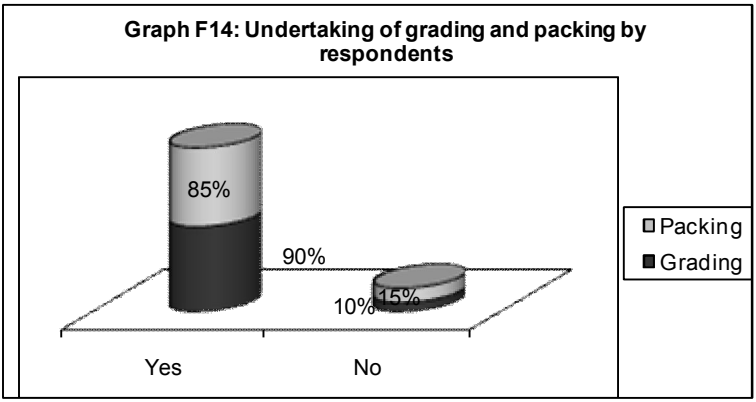


Table F15: Respondents undertake grading based on

Sr. No.	*Grading is based on*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
1	Variety	39	13	75	25
2	Size	44	8	85	15
3	Colour	21	31	40	60
4	Taste	10	42	19	81
5	Diseased fruits	36	16	69	31
6	Other advanced method	0	52	0	100

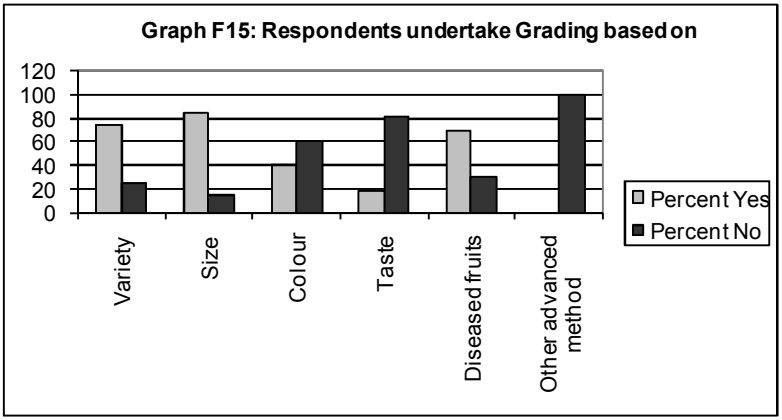


Table F16: Type of packing followed by mango cultivators

Sr. No	*Type of packing*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
1	Bulk packing	11	41	20	79
2	Crates/cartons	43	9	80	17
3	Individual fruit packing	0	52	0	100
4	Any other method	0	52	0	100

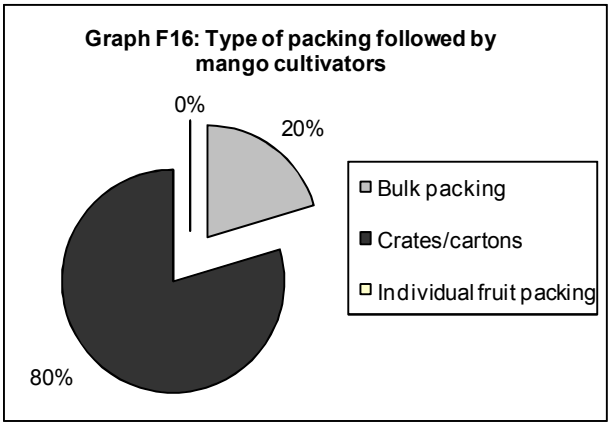


Table F17: Availability of storage facility at respondents' premises

Sr. No	*Is there any storage facility?*	*Number*	*Percent*
1	Yes	17	33
2	No	35	67
	Total	**52**	**100**

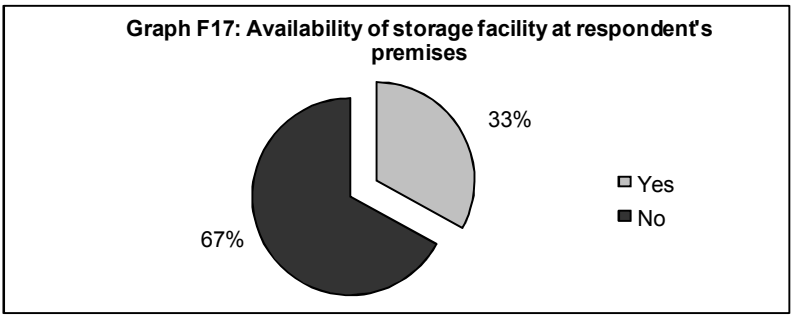


Table F18: Details about the storage facility at respondents premises

Sr. No.	*Types of storage facility*	*Number*	*Percent*
1	No storage facility	35	67
2	Conventional storage (at houses and temporary /permanent godowns)	17	33
	Total	**52**	**100**

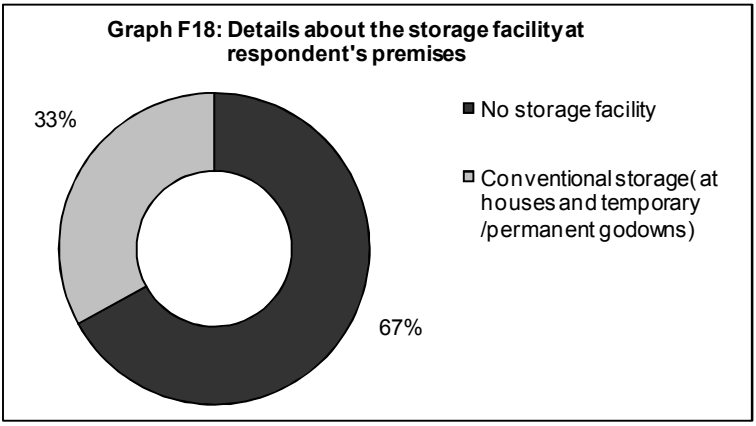
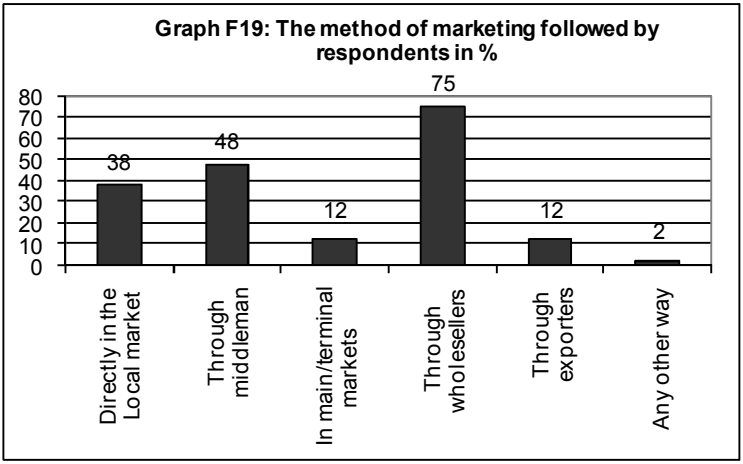


Table F19: The method of marketing/selling followed by respondents

Sr. No.	*Method of marketing/selling*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
1	Directly in the Local market	20	32	38	62
2	Through middleman	25	27	48	52
3	In main/terminal markets	6	46	12	88
4	Through wholesellers	39	13	75	25
5	Through exporters	6	46	12	88
6	Any other way	1	51	2	98



Research Findings and Discussion

From the tables (Table F13 to F19) and graphs (Graph F13 to F 19) shown above, the following inferences can be drawn:

1. From the table and graph F13, it becomes clear that no mechanization or automation of processes of whatsoever type has taken place while harvesting. The respondents still use the traditional self made equipments like net and stick and entire process is 100 percent manual.

The level of mechanization and automation at farm level operations is negligible. Comparison of the operations of Indian cultivators with the Brazilian ones reveal that both groups stand miles

apart when we consider mechanization and automation of processes involved. Brazilian cultivators use advanced technologies not only for harvesting but also for all other operations like; grading, processing, packing, etc. Higher level of mechanization and automation of processes involved enable Brazilian cultivators to reap the benefits of higher economies and compete in the international markets through pricing their produce much below the international price. This will further question the ability of Indian cultivators to compete with countries like Brazil in the international market. Moreover Brazilian companies are targeting potential markets like India, which mean Indian companies might lose their market share in the domestic market as well.

2. From the table and graph F15, it becomes clear that none of the respondents undertake individual fruit packing and small attractive handy packaging. Majority of the respondents (80%) pack there produce in crates and cartons of 2 to 4 dozens. Some respondents (20%) don't even pack and sell their produce in bulk packs like gunny bags, etc.

It becomes evident that Indian cultivators don't give much emphasis on packaging, whereas majority of the Brazilian growers undertake individual fruit packing. Moreover majority of the Brazilian cultivators are so big that they have their own processing units and the processors who don't own farms will enter in to buy back agreement with big cultivators. This means that all cultivators are processors and all processors are cultivators in Brazil, whereas, there lies a huge gap between these two sects in India. They are not as closely tied as in Brazil.

This in fact is a matter of serious concern for India. Combined serious efforts have to be made by all the stakeholders, namely; cultivators, processors, nodal bodies, Government departments, cooperative associations, NGOs, etc., to bridge this gap. Implementation of concepts like "farm gate to customers' plate" calls for dramatic changes at the ground level.

3. It becomes clear from the table and graph F 17 that 33 percent of the respondents have conventional storage facility like small godowns (temporary and permanent) at their farms or a small room in their houses, whereas remaining 67 percent of the respondents don't have any storage facility, not even the conventional storage facility. They store their produce in open yard at their farm. None of the respondents have used state-of-the-art storage facilities like; cold storage facility, pre cooling facility, freeze drying facility, etc., not even the big cultivators.

The calculated Chi-square value: 6.23, being higher than the table Chi-square value: 3.841 (assuming 50 percent of the respondents had necessary infrastructure), clearly rejects null hypothesis Ho-02 and accepts alternate hypothesis Ha-02, which focuses on availability of necessary infrastructure to growers.

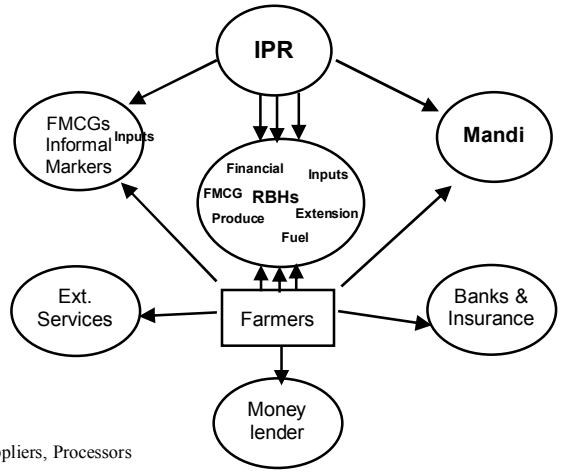
Non availability of advanced storage facilities like cold storage units, refrigerated vans, cold chain, pre cooling centers, etc., is the serious bottleneck of this industry. This directly hinders the performance of this industry. Combined serious and persistent efforts by cultivators, cooperative associations, nodal bodies like NHM, NHB, SHD, etc., and other institutions like Agriculture universities, NGOs, etc., is required to eliminate this bottleneck. Moreover all the efforts have to be well planned, strategic and integrated in order to yield some quick and tangible results.

4. It becomes evident from the table and graph F19 that only 24 percent of the respondents market/sell their produce in the main/terminal markets, either to processors or to exporters. Whereas remaining 76 percent of the respondents market/sell their produce in the local market itself or to wholesellers, either directly or through middlemen.

This indeed is a matter of grave concern that needs to be addressed. The large chunk of the profits is eaten by middlemen, which is popularly known in this industry as 'middlemen menace'. Creating strong rural marketing networks popularly termed as 'rural business hubs' is the need of the hour.

Concept of 'Rural business hubs' as depicted below is aimed at identifying potential rural markets and developing them into business hubs through infusion of critical inputs and services and also providing an assured market for the farmers produce. This idea of RBHs has gone further ahead and what has emerged is 'Rural Agricultural service platform/hub' which will cater to the typical agricultural input requirements, output services, and other daily household consumer needs of the farmers. These are like 'one stop shop' which will provide seeds, fertilizers, pesticides, extension and advisory services, household consumables and durables, etc. to farmers and procure the output from the farmers. There are occasional arrangements for training and counseling too. Services related to credit and insurance are also catered for.

Rural/agribusiness/service hubs: reaching agri. services to farmers



*IPR: Input Suppliers, Processors and Retailers

Source: Ashok Gulati and Gupta, 2008

As observed from above figure, unlike in a traditional arrangement where the farmers have to approach different service providers individually for the inputs and services can now avail under 'one roof', under this initiative of 'Rural Business Hubs'. The advantage that farmers derive out of this new arrangement can be measured in terms of the time he/she saves from not having to run around, and value for money spent on these inputs and services. Also, some of these hubs offer procurement platforms too, which help farmers bypass the government regulated mandis (markets) and have a considerable gain from selling to these private players like; ITC e-Choupal, Godrej-Aadhar, etc. Consumer and other services are the add-on services provided by these hubs. The idea is that a farmer who visits such a store to buy seeds, fertilizers or seek advisory services could also buy the items for his daily needs on his way back home. Most of these outlets are modeled on modern retail formats with large shelf display, self services, discount offers that tend to attract rural masses. In this modern framework, all services converge to a single delivery point and help these service providers increase their outreach to the farmers.

Cultivators should also be equipped with knowledge about market movements through internet and commodity exchanges.

The above discussion clearly reject null hypothesis Ho-02 and accept alternate hypothesis Ha-02 which state 'Indian fruit processing industry especially mango processing industry is plagued with lack of

Necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging, marketing of the output, etc. This is a serious bottleneck for this industry'. It further emphasize on the following point.

'There lies a tremendous scope to revamp this industry by adopting well proven strategies and channelizing the funds properly, to create the necessary infrastructure that is required. This certainly calls for a co-operative effort amongst farming community. Traditional practices need to be replaced with ultra modern practices that encompass technological advancement together with sound management skills, which will bring down the post harvest loss to more reasonable levels.'

Part C: Analysis of Information Pertaining to Collaboration and Cooperation

Table F20: Affiliation of respondents to any co-op society/NGO/association

Sr. No.	*Are you a member of any society*	*Number*	*Percent*
1	Yes	7	13
2	No	45	87
	Total	**52**	**100**

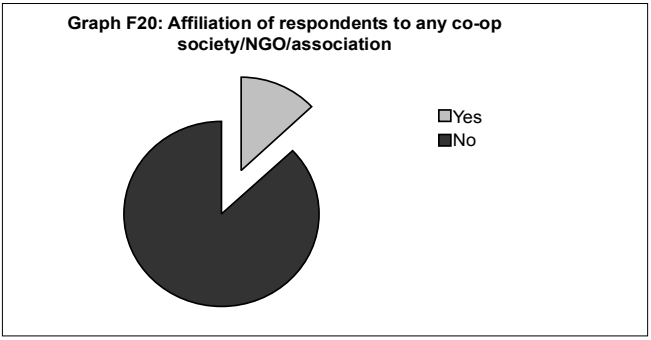


Table F21: Key activities undertaken by association as revealed by respondents

Sr. No.	*Particulars*	*Number*	*Percent*
1	Not Applicable	45	87
2	Training programs for farmers	6	12
3	Given training for internet marketing	1	2
	Total	**52**	**100**

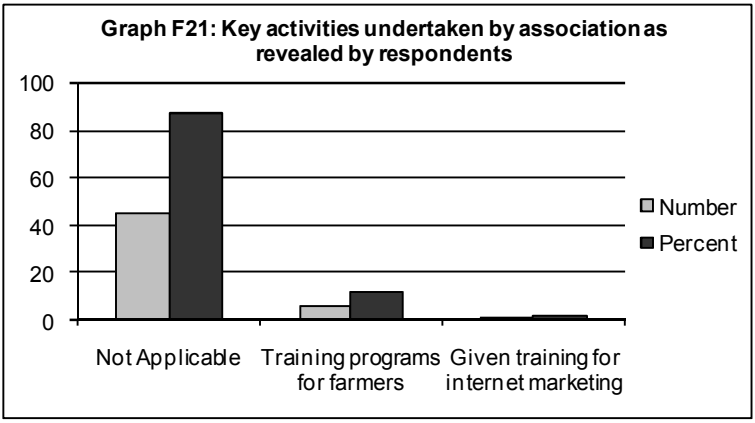


Table F22: Whether the association is supportive or not

Si. No.	*Particulars*	*Number*	*Percent*
1	Not Applicable	45	87
2	Not supportive	0	0
3	Supportive	7	13
	Total	**52**	**100**

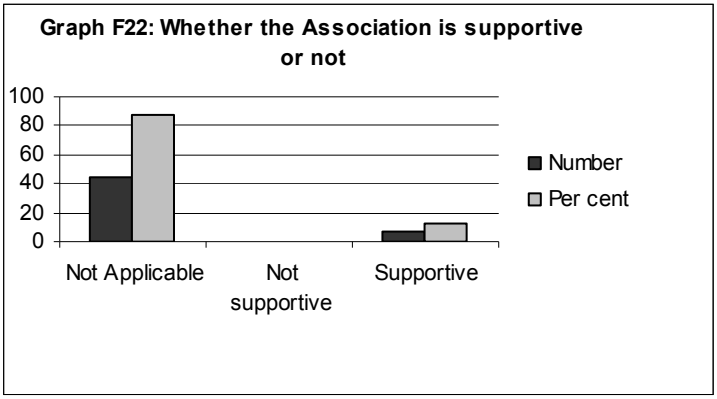
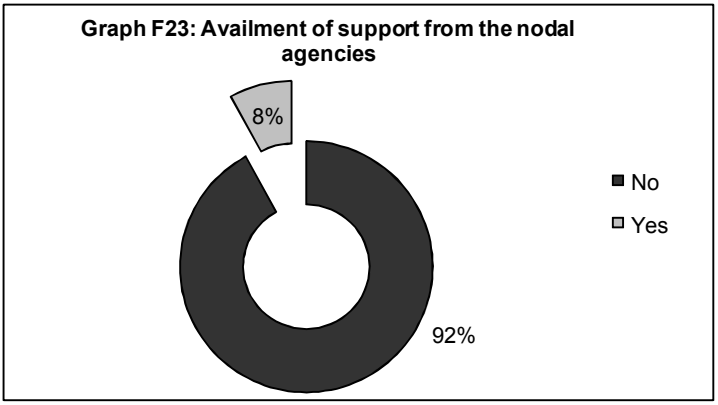


Table F23: Availment of support from the nodal agencies

Sr. No.	*Particulars*	*Number*	*Percent*
1	No	48	92
2	Yes	4	8
	Total	**52**	**100**



Research Findings and Discussion

From the Tables (F20 to F23) and Graphs (F20 to F23) displayed above the following inferences can be drawn.

1. From the Table and Graph F20 it is clear that only 13 percent of the respondents are the members of a cooperative society/ association, whereas remaining 87 percent of the respondents do not belong to any co-operative society/association.

Calculated Chi-square value: 27.8, being much higher than the table value: 3.841, we reject the null hypothesis which state that 50 percent of the farmers are members of the cooperative societies or associations.

The above discussion clearly rejects Ho-03 and accept Ha-03, which states "Lack of co-operative effort amongst farming community is a serious hindrance that prohibit this industry from reaping the benefits of larger economics of scale and higher value addition".

2. From the table and graph F21 and F22, it is evident that cooperative societies to which 13 percent of the respondents belong to, as members, undertake only basic activities like conducting training program for the cultivators, etc. They still have a long way to go. They should act like a good agent between cultivators and nodal bodies/institutions/Govt. departments. Cooperative Societies/Associations should become strong enough to protect and safeguard the interests of all their members. They should create awareness amongst cultivators about upcoming practices and provide the necessary extension support.

3. From the table and graph F23, it is crystal clear that only few growers (8%) have availed support (financial incentives) from the nodal bodies like NHM, NHB and State Horticulture Department.

Governmental nodal bodies have to change their style of functioning. Giving financial incentives and subsidies will not suffice. They should have a vast, strong and dedicated team of extension officers working in the field with the cultivators supporting them throughout.

The organization structure and style of functioning of NHB (National Horticulture Board), the apex Governmental nodal body for promoting horticulture industry in India, proves the above mentioned point.

It came in to existence in 1984. The objectives framed by the board, then by its founder Dr. M.S. Swaminathan (The man behind horticulture revolution in India), were as follows:

1. To encourage and promote development of horticulture industry in the country.
2. To encourage the participation of small and marginal farmers and growers in Horticulture Development Programmes so that they become beneficiaries of the growth of the Horticulture Industry.
3. To assist in establishment of growers' societies to advance the economic and social status of the farmers.
4. To encourage adoption of appropriate post-harvest management technologies which include grading, packing, storage, transportttation, marketing, etc. for maximizing return to the farmers /growers.
5. To provide technological, financial and other assistance to various organizations for the development of horticulture.
6. To assist and organize Udyan Pandit Competition, Fruit/Vegetable/Flower Shows
7. Training of farmers and in-service officials.
8. To prepare feasibility studies on marketing, processing plants, cold storage facility, transportation system, etc., for raw and processed perishable horticultural products and other related fields. To undertake designing, planning and setting up of such kind of projects.
9. To arrange supplies of critical inputs for horticultural development.
10. To promote consumption of fruits/vegetables in fresh and processed form.

The Organization structure of NHB reveals the following facts and figures (as per audited annual report of 2005):

1. It employs 31 directors (majority of them are bureaucrats and politicians) and 1 economic analyst under group A
2. It employs 39 executives under group B
3. It employs 18 clerks under group C
4. It employs 45 unskilled and semiskilled people under group D
5. Altogether, it employs 134 people out of which 32 are directors.

The only activity that NHB has been doing seriously is distribution of grants and subsidies. NHB has distributed grants and subsidies worth ₹ 504 lakhs under various schemes listed below;

(i) Introduction of new technology and concepts in Horticulture
(ii) Establishment of Nutritional gardens in rural areas
(iii) Establishment of market information service centers for fruits and vegetables of commercial importance
(iv) Development of horticulture in tribal and nontraditional areas
(v) Transfer of technology through training and visits
(vi) Techno economic feasibility studies

When we compare the functioning of NHB (the apex Government nodal body of India, established in 1984, with the sole objective of strengthening the horticulture industry of India) with 'EMBRAPA' (Brazilian Agency for Agriculture Research and Animal Husbandry) we note significant differences in their organization structure and style of functioning.

Following facts and figures about 'EMBRAPA' (Brazilian Agency for Agri. Research and Animal Husbandry) prove the above statement.

1. There is only one apex Government nodal body for entire agriculture and animal husbandry industry of Brazil, unlike in India where we have many nodal bodies catering to specific industries like horticulture, cotton, sugar, Food processing, fisheries, Poultry, dairy, etc.
2. It takes complete care of interests of farmers, keep them aware about latest developments, provide them the necessary inputs in terms of knowledge, expertise, infrastructure, facilities, technology, etc.
3. It employs 120,000 Farmer Agro Technology Extension Agents who work shoulder to shoulder with the farmers in the field

using a 'bottom up' approach, innovating all the time, as opposed to our 'top down' approach where the office loving agricultural scientists dish out recommendations and vanish. Indian agriculture extension network is the most inefficient in the world. (30th Nov., 2006 *Times of India*)

4. EMBRAPA doesn't distribute grants and subsidies to farmers like India. Rather it builds necessary state-of-the-art infrastructure like;
   (i) Cargo airports in remote areas to facilitate zero time transfer of perishables to processing centers (Total no. of airports in Brazil: 4,276, compared with 341 in India),
   (ii) Gene banks to store seed samples,
   (iii) Cold chain facility throughout the country to minimize post harvest loss,
   (iv) New state-of-the-art technologies to bring down the cost,
   (v) Ongoing continuous research in the field of sustainable and organic agriculture to lead the world in agriculture and animal husbandry,
   (vi) Developing better varieties to enhance the yield, etc.

Above discussion together with Chi-square test applied to Table F23 whose calculated Chi-square value: 37.2, being much higher than table value: 3.841, we reject null hypothesis which state that at least 50 percent of farmers availed support from the Govt. nodal bodies.

Based on the above discussion we reject null hypothesis Ho-04 and accept alternate hypothesis Ha-04 which state 'Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the government departments/nodal bodies/institutions with no clear direction and goals prohibit the farming community of India from attaining the desired growth' and further state that;

There lies a most promising scope to import the 'Brazilian model' where in a single nodal agency 'EMBRAPA' takes complete care of both farming community and processing industry by having a fool proof mechanism/system in place to address all their concerns/problems and working in an integrated fashion, with more clearer objectives, strategies and policies, to sort out the contemporary upcoming issues. This is the secret of the success of Brazilian fruit processing industry.

Part D: Analysis of Concluding Information

Table F24: Profitability of the mango cultivation activity

Sr. No.	*Whether Profitable or not*	*Number*	*Percent*
1	Yes	52	100
2	No	0	0
	Total	**52**	**100**

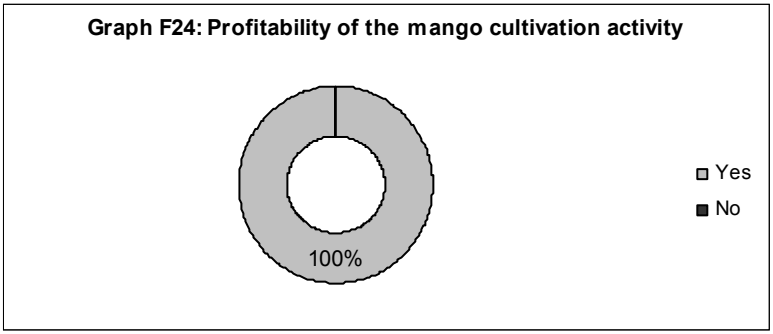


Table F25: Respondents treatment towards this business

Sr. No.	*Treatment towards business*	*Number*	*Percent*
1	Simply an asset	5	10
2	Profit making centre	46	88
3	Not given	1	2
	Total	**52**	**100**

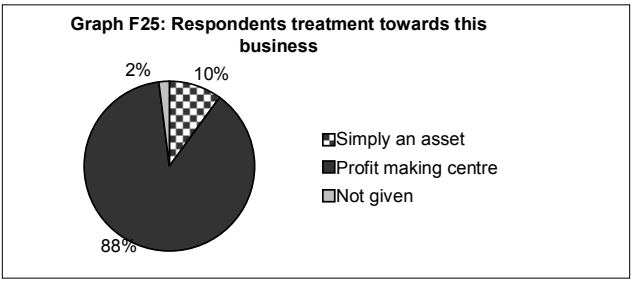


Table F26: Investments made by the respondents in last five years

Sr. No.	*Investment made in last five years*	*Number*	*Percent*
1	Zero	5	10
2	Less than ₹ 10,000	11	21

3	Less than ₹ 50,000	8	15
4	₹ 50,000 – ₹ 99,999	15	29
5	₹ 1.0 lac to 5 lacs	12	23
6	₹ 5 to 10 lacs	1	2
	Total	**52**	**100**

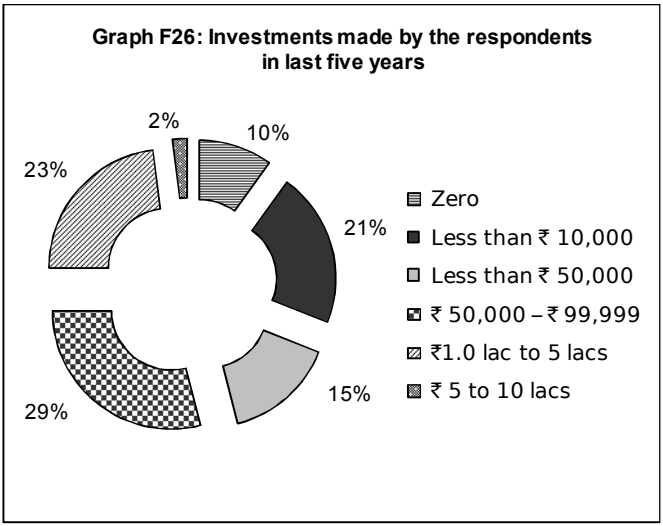


Table F27: Respondents preference to deal with this business in future

Sr. No.	*Respondents preference to deal with this business in future*	*Number*	*Percent*
1	No remarks	7	13
2	Continue with no further tangible investments	23	44
3	Sell it	1	2
4	Develop it with further investments	17	33
5	Both Continue with no further tangible investments and develop it with further investment	2	4
6	Both Continue with no further tangible investments and lease it	2	4
	Total	**52**	**100**

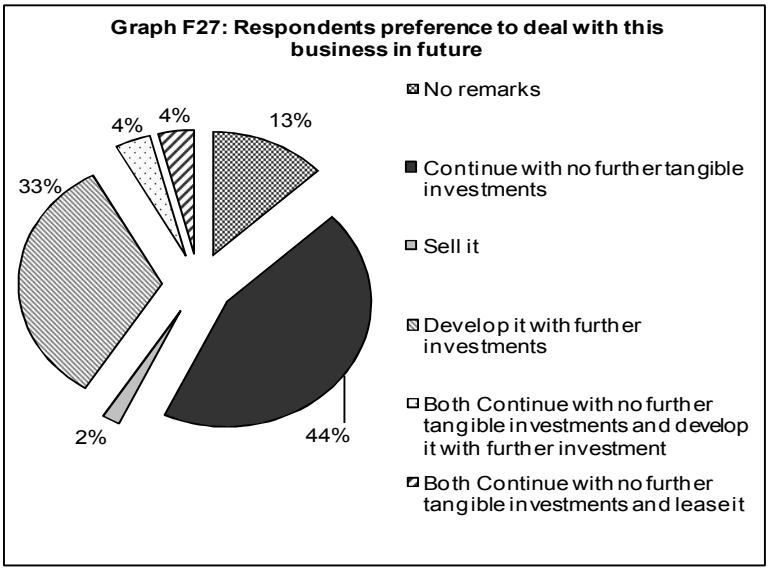


Table F28: Problems pertaining to Availability of certified seedling/sapling

Sr. No.	*Problems pertaining to Availability of seedling*	*Number*	*Percent*
1	No Remarks	43	-NA-
2	Not available	8	89
3	Not available at cheaper rates	1	11
	Total	**52**	**100**

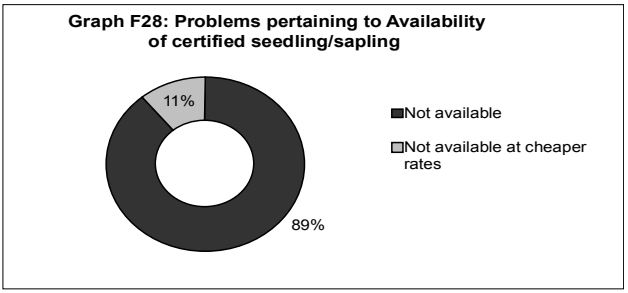


Table F29: Details about the agency from whom seedling or sapling is being purchased

Sr. No.	*Particulars*	*Number*	*Percent*
1	University	5	10
2	State Hoticulture Dept	1	2
3	Established nursery	2	4
4	Other sources	40	77
5	self grafted	2	4
6	Agriculture department	2	4
	Total	**52**	**100**

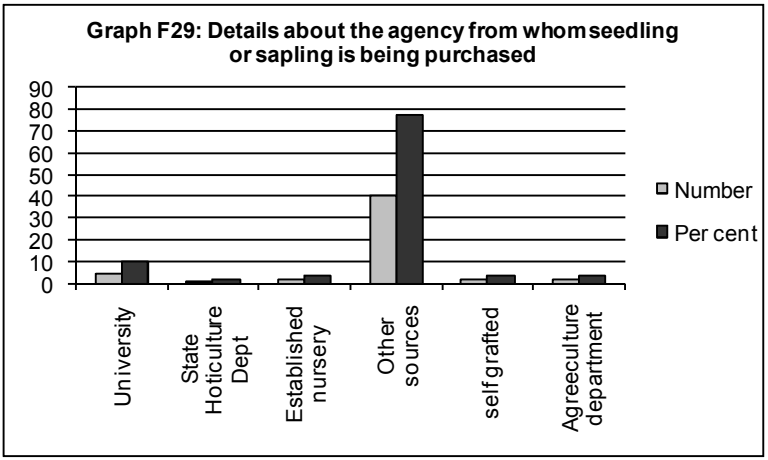


Table F30: Certification of the sapling/seedling

Sr. No.	*Whether sapling was certified*	*Number*	*Percent*
1	No	40	77
2	yes	12	23
	Total	**52**	**100**

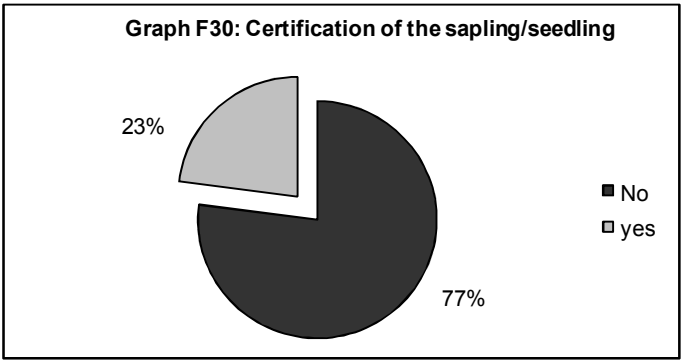


Table F31: Problems faced by respondents during cultivation/production

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	27	-NA-
2	Labour shortage	4	16
3	Fertilizers	10	40
4	Pest and diseases attack	9	36
5	No problems	1	4
6	Both financial and labour	1	4
	Total	**52**	**100**

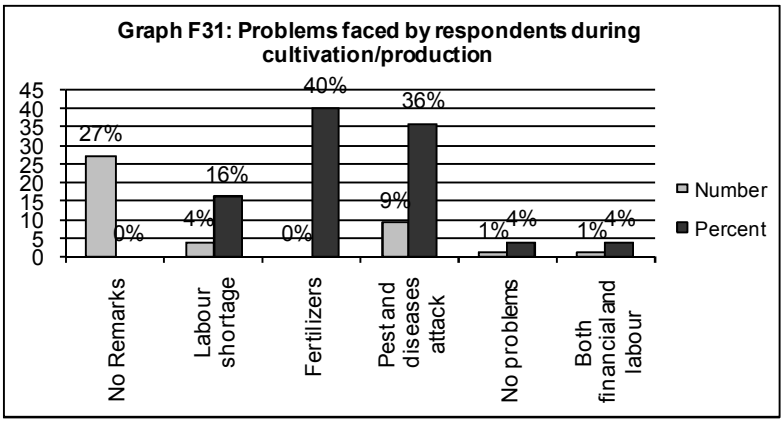


Table F32: Problems faced by respondents during harvesting

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	31	-NA-
2	Labour shortage	19	90
3	Raining starts late	1	5
4	Financial problem	1	5
	Total	**52**	**100**

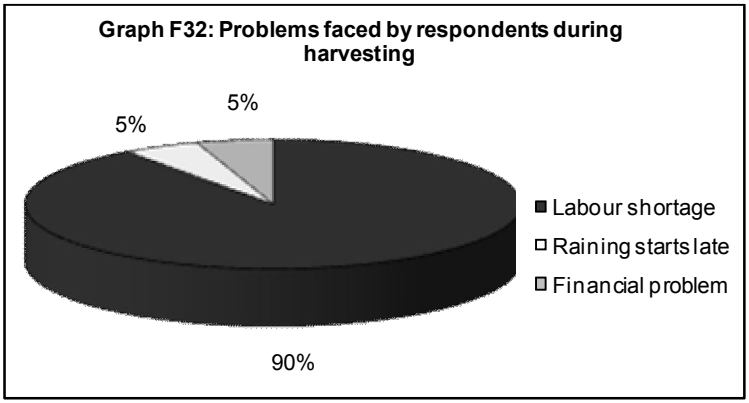


Table F33: Problems faced by respondents during grading

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	50	-NA-
2	Labour shortage	1	50
3	No problem	1	50
	Total	**52**	**100**

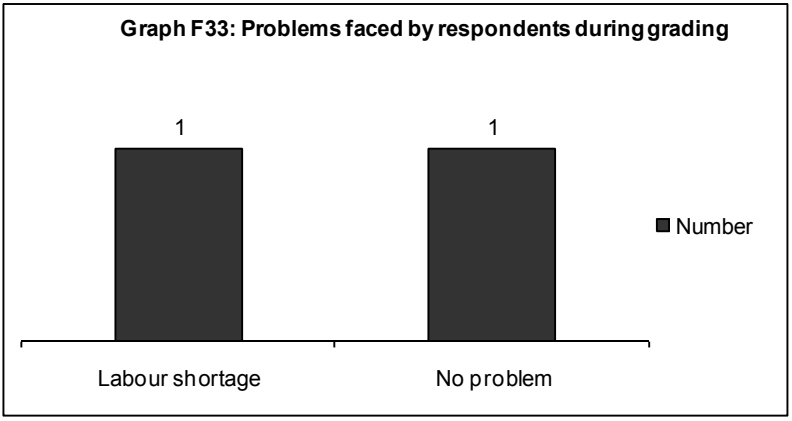


Table F34: Problems faced by respondents during storage

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	37	-NA-
2	Inadequate or lack of storage facility	14	93
3	No problem	1	7
	Total	**52**	**100**

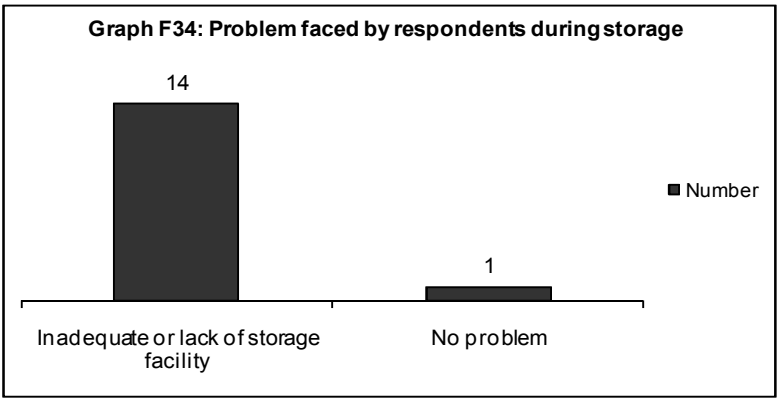


Table F35: Problems faced by respondents during packaging

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	49	-NA_
2	No problem	1	33
3	Problems related to packaging	2	67
	Total	**52**	**100**

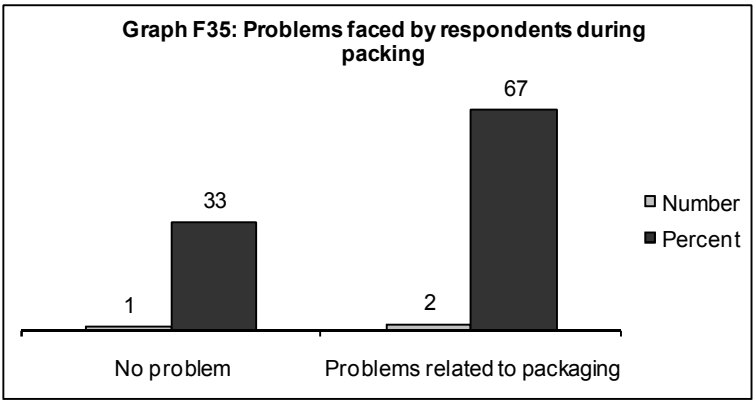
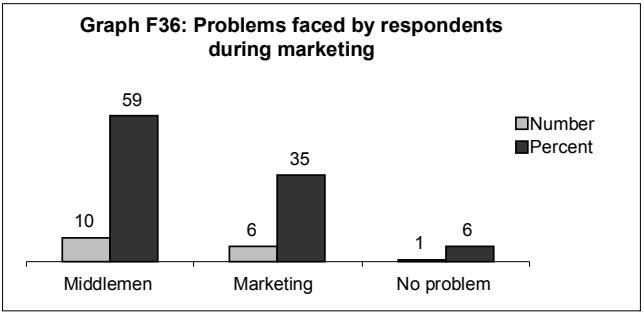


Table F36: Problems faced by respondents while marketing his/her produce

Sr. No.	*Major Problems*	*Number*	*Percent*
1	No Remarks	35	-NA-
2	Middlemen	10	59
3	Marketing	6	35
4	No problem	1	6
	Total	**52**	**100**



Research Findings and Discussion

From the tables (Table F24 to F36) and Graphs (Graph F24 to F36) shown above, the following inferences can be drawn:

1. It becomes clear from the table and graph F24 that mango cultivation is a profit making activity.
2. It can be inferred from the table and graphs F25 and F26 that majority of the respondents (88%) would like to treat their farming activity as a profit making centre, whereas remaining (12%) respondents would like to treat it simply as an asset.

But the investments made by the respondents in the last five years reveal that around 46 percent of the respondents had invested less than ₹ 50,000, which questions the above finding about the treatment of farming activity in general. Investment of around ₹ 50,000 over five years is not a huge investment. Moreover every profit making activity calls for ongoing investment in different types of assets. To qualify as a profit making activity one has to invest continually and reap the benefits out of it. So, cultivators have to invest continually in; building the necessary infrastructure and facilities, replacing the old trees with new seedling/sapling of good variety which is ideal for processing, etc.

3. It can be inferred from the table and graph F27 that 51 percent of the respondents have shown no interest in developing the farm through making tangible investments continually. They want to continue, as it is, with no further tangible investments. It will be difficult to revitalize this industry if the cultivators possess such kind of attitude. The efforts of Government departments/nodal bodies/institutions alone can't turnaround this industry. Rather it requires the collective effort (integrated effort) by all the stakeholders in a strategic and integrated manner that too in the right direction.
4. It is evident from the table and graphs (F28 to F30) that non availability of the quality seedling or sapling is the major problem faced by the respondents. Hence cultivators end up in buying the seedling/sapling that is available during the time of plantation. Moreover 77 percent of the respondents have bought the seedling/sapling from unreliable sources (roadside nurseries for e.g.), which are not certified by reputed institutions. This is a major problem facing this industry as the future production from the seedling/sapling planted over years is being held at stake.

Based on the above discussion, we can reject Ho-01 and accept Ha-01 which states "Indian fruit processing industry, especially mango processing industry is affected by non-availability of high yield, high pulp containing varieties that also have high resistance towards pest attack which are ideal for processing" and further state that this is due to lack of adequate extension support to cultivators from the concerned nodal agencies.

5. From the tables and graphs (F31 to F36) following inferences can be drawn:
   (i) Non-availability of fertilizers and acute shortage of labors are the key problems faced by respondents during cultivation. Pest and insect attack is another important problem faced by the respondents.
   (ii) Acute labor shortage is a serious problem faced by 90 percent of the respondents during harvesting. There were times when the cultivators decided not to harvest the crop as he/she will be better off by not harvesting the crop due to involvement of high labor and transportation cost and very less market price. The revenue that he/she would have generated through selling the produce would not cover the labour and transportation cost involved. Cultivators of India face such scenarios quite often and have to live with

that till they become more entrepreneurial, be at the front seat of their venture, and stop relying on Govt. aid/support.

(iii) Lack of storage facility is ano ther grave problem facing this industry. Nothing can stop the exploitation of cultivators till they possess the necessary infrastructure including storing. If they have an access to the necessary state-of-the-art storage facility, they can avoid selling their produce under pressure (desperate selling) at a throw away price. Government departments/nodal bodies/institutions should also come forward and take a lead role in building such state-of-the-art infrastructure facilities.

(iv) Middlemen menace is another serious problem facing this industry. As discussed before, the middlemen eat away significant chunk of profits leaving marginal returns for cultivators. Cooperative movement across the villages, talukas, districts, states and lastly entire nation, can only stop this menace. Strong cooperative movement amongst cultivators is the need of the hour for Indian mango growing industry.

From the above discussions we can reject null hypotheses Ho-02, Ho-03 and Ho-04 and accept alternate hypotheses Ha-02, Ha-03 and Ha-04 which are re-stated as follows:

(Ha-02): "Indian fruit processing industry, especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging and marketing of the output, etc. This is a serious bottleneck for this industry."

(Ha-03): "Lack of cooperative effort amongst farming community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition."

(Ha-04): "Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the govern-ment departments/nodal bodies/institutions with no clear direction and goals prohibit the farming community of India from attaining the desired growth."

.

❋ ❋ ❋

6 Chapter

Primary Research Pertaining to Processors

Part A: Analysis of Introductory/General Information

Table P1: Classification of respondents based on the type of business activity

Sr. No.	*Type of business activity*	*Number*	*Percent*
1	Juices and pulps	2	8
2	Pickle manufacturing	14	56
3	Pickles and spices	3	12
4	Pickle and syrup (kokum)	3	12
5	Pickle, syrup, pulp, and juices	1	4
6	Pickle, sauce	1	4
7	Pickle, pulp, and syrups	1	4
	Total	**25**	**100**

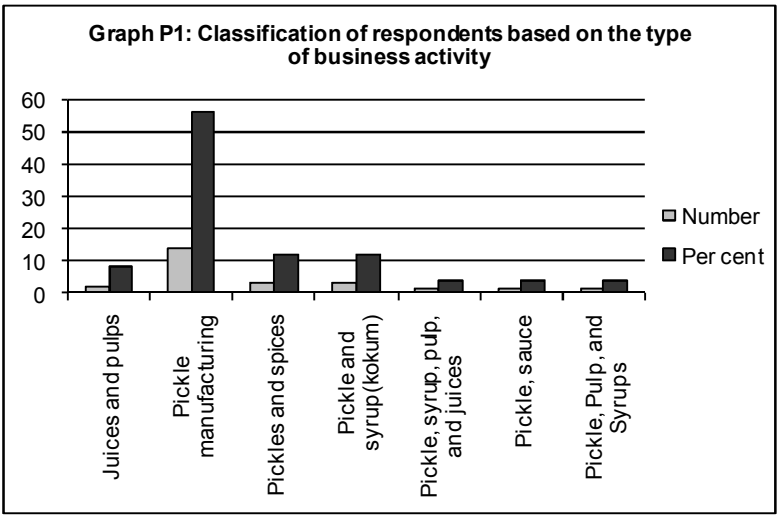


Table P2: Classification of respondents based on the scale of operations

Sr. No.	*Scale of the unit*	*Number*	*Percent*
1	Tiny	3	12
2	SSI	19	76
3	LSI	3	12
	Total	**25**	**100**

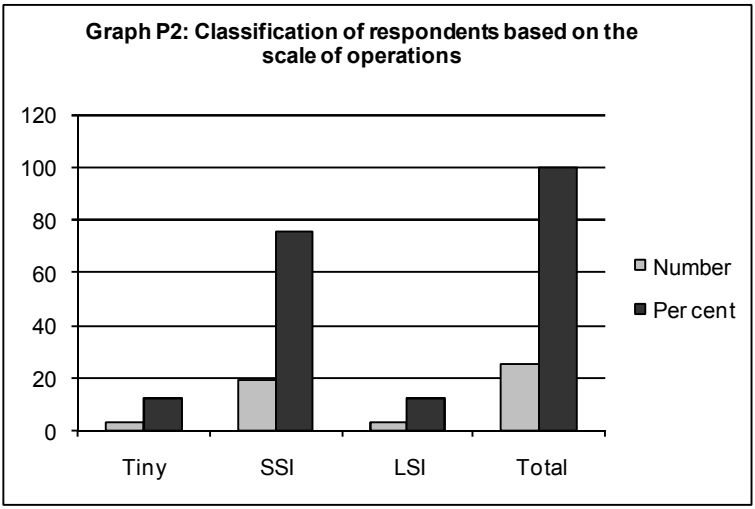


Table P3: Average capacity utilization of the respondents as % of installed capacity

Sr. No.	*Average capacity utilization*	*Number*	*Percent*
1	Between 50 and 60%	1	4
2	Between 60 and 70%	2	8
3	Between 70 and 80%	2	8
4	Between 80 and 90%	11	44
5	90% and above	9	36
	Total	**25**	**100**

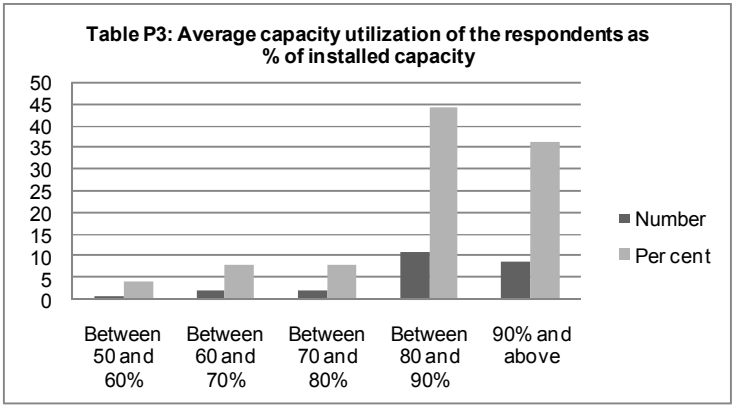
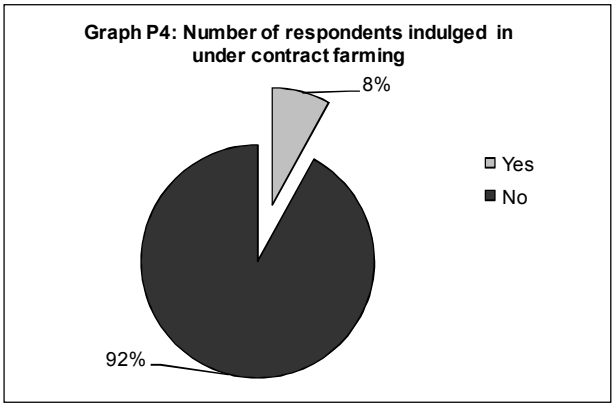


Table P4: Number of respondents indulged in under contract farming

Sr. No.	*Whether indulged in under contract farming or not*	*Number*	*Percent*
01	Yes	2	8
02	No	23	92
	Total	**25**	**100**



Research Findings and Discussion

From the tables (Table P01 to P04) and Graphs (Graph P01 to P04) shown above, the following inferences can be drawn:

1. As shown in Table P01 and displayed in Graph P01, Fruit processing industry of India as a whole can be categorically

divided into following main business activities, ranked based on their contribution as follows;

(i) Pulp manufacturing
(ii) Juice manufacturing
(iii) Pickle manufacturing
(iv) Syrup manufacturing
(v) Sauce manufacturing

2. As shown in Table P02 and displayed in Graph P02, Fruit processing industry, especially mango processing industry of India is dominated by large number of SSIs (Small Scale Industries) (76%) spread all across the nation. Tiny industries account for 12 percent and LSIs (Large Scale Industries) account for remaining 12 percent. Even though the no. of LSIs is less, contribution wise or production wise, it stands first. A good example is; only one company, i.e., 'Jain group of companies' (Jain Irrigation) of Maharashtra consume around 35 percent of total mango production of India. Similarly one can identify big companies like 'Vadilal', 'Godrej', 'Marico', 'Cleanfoods', 'Pepsico', 'Parle', etc., contributing significantly to total production of the country. Many of these big giants have entered in to this industry or expanded their operations to a large scale recently, i.e., in last ten years. This clearly shows the vast potential which this sector has in store for India.
3. As shown in Table P03 and displayed in Graph P03, 80 percent of the respondents have utilized their capacity to, 80 percent and above, the installed capacity. This clearly indicates that the installed capacity is being utilized to a maximum level and there is tremendous scope to create new facilities and also to expand the capacity. In management terms, there lies huge scope for integration, i.e., both horizontal and vertical (forward and backward) integration. Many companies have laid out a detailed plan for integration and some are at the implementation stage.
4. As shown in Table P04 and displayed in Graph P04, only 8 percent of the total respondents have indulged in some kind of under contract farming. This is a serious cause for concern, which is going to impose serious limitations on the growth of this sector. The Indian fruit processing industry can flourish only when it becomes fully integrated, i.e., concept of 'from the farm gate to customers' plate' will become a reality. This requires backward integration. So, possible mechanisms, which will facilitate this integration process, have to be followed.

When we compare Indian fruit processing industry with the Brazilian one, we find that majority of the cultivators (or group of cultivators) of Brazil are so big that they have their own processing units. Those processors who don't own farms enter into buy back agreement with cultivators (or group of cultivators). This clearly means that all cultivators are processors and vice-versa, whereas in India we find huge gap between these two sections. They are not as closely tied-up as in Brazil. The gap can be bridged through combined integrated efforts from all the stake holders.

The above discussion clearly rejects Ho-04 and accept Ha-04 which state "Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the Government departments/nodal agencies/institutions with no clear direction and goals prohibit the mango processing industry of India from attaining the desired growth".

Part B (a): Analysis of Specific Information Pertaining to Procurement and Storing

Table P5: Procurement method adopted by respondents

Sr. No.	*Procurement Method*	*Number*	*Percent*
01	Directly from the market through bidding	14	56
02	Through middlemen/broker/ bagban	3	12
03	Directly from the market through middlemen and directly from farmers and from adjacent state	8	32
	Total	**25**	**100**

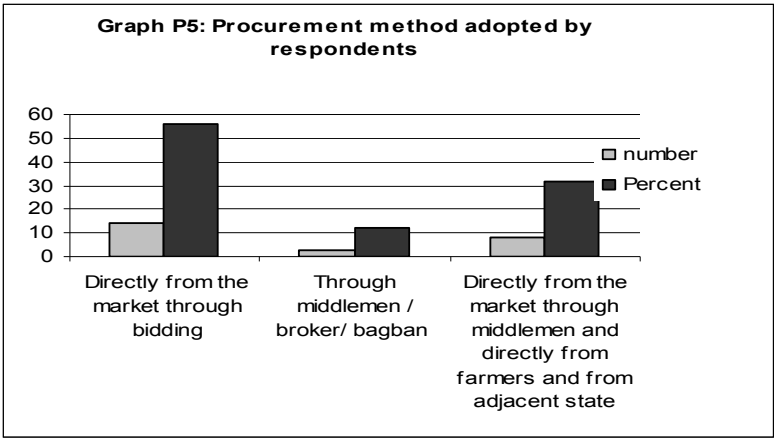


Table P6: Procurement criteria followed by respondents

Sr. No.	*Procurement criteria*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
01	Price	25	0	100	0
02	Transportation cost	18	7	72	28
03	Variety	21	4	84	16
04	Size	23	2	92	8
05	Pulp content/recovery	5	20	20	80
06	Fiber content	10	15	40	60
07	Citric acid content	18	7	72	28
08	Sucrose content	3	22	12	88
09	Skin thickness	3	22	12	88
10	Size of the seed	12	13	48	52
11	Color	19	6	76	24
12	Smell	21	4	84	16
13	Taste	6	19	24	76
14	Other	0	25	0	100

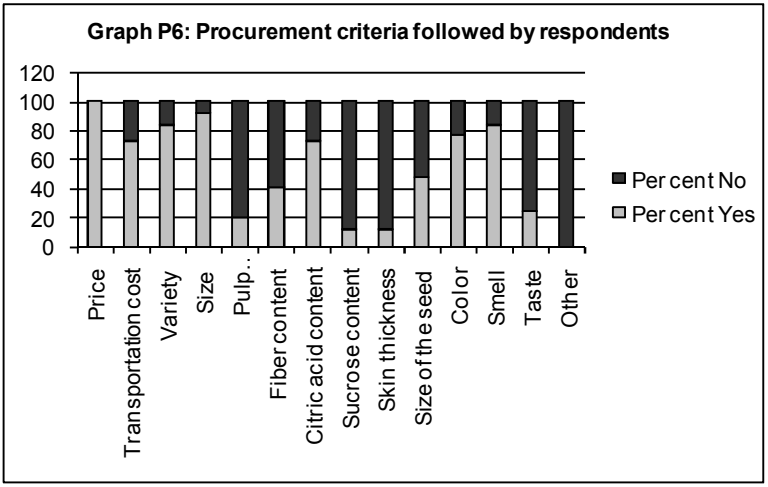


Table P7: Training facility to procurement officials/agents

Sr. No.	*Whether necessary training given or not*	*Number*	*Percent*
01	No	20	80
02	Yes: Basic training given by the owner and trained workers	5	20
	Total	**25**	**100**

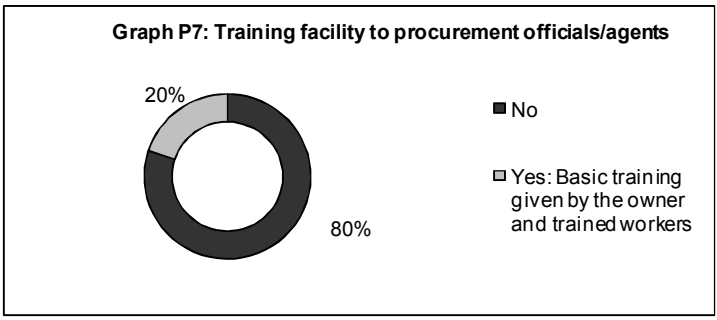


Table P8: Availability of necessary infrastructure like cold chain during procurement phase

Sr. No.	*Availability of the infrastructure*	*Number*	*Percent*
01	No	25	100
02	Yes	0	0
	Total	**25**	**100**

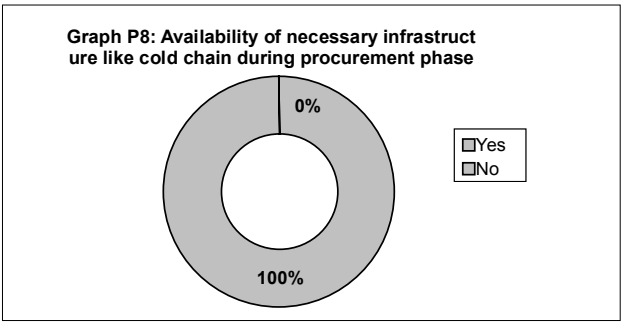


Table P9: Application of computer software packages by the respondents for procurement

Sr. No.	*Usage of computer software packages like SAP, ERP, etc. in any of the processes*	*Number*	*Percent*
01	No	22	88
02	Yes	3	12
	Total	**25**	**100**

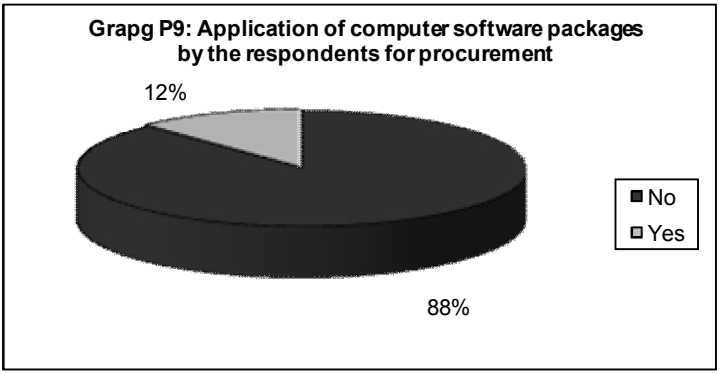


Table P10: Type of the Storage facility at the respondents' units

Sr. No.	*Type of storage facility*	*Number*	*Percent*
01	Conventional storage system (open space and in godown)	24	96
02	Advanced storage system	1	4
03	Ultra modern state-of-the- art storage system	0	0
	Total	**25**	**100**

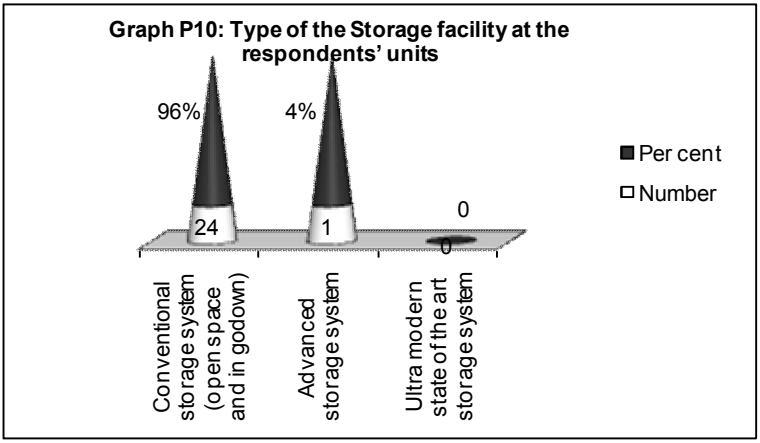


Table P11: Duration of raw material storage by the respondents

Sr. No.	*Duration of raw material storage*	*Number*	*Percent*
01	Less than one day	4	16
02	1-2 days	15	60
03	2-5 days	3	12
04	5-10 days	3	12
05	Above 10 days	0	0
	Total	**25**	**100**

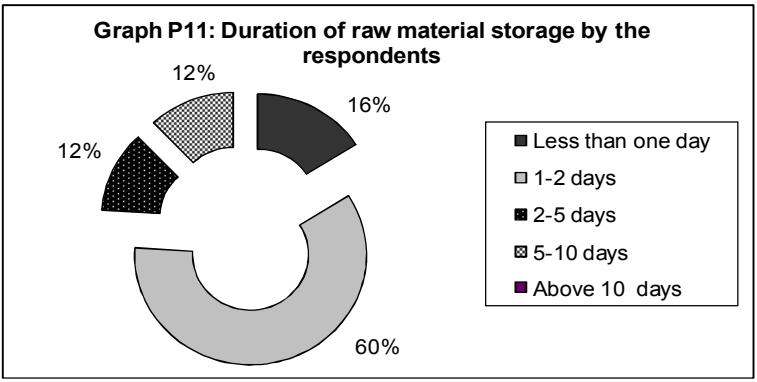
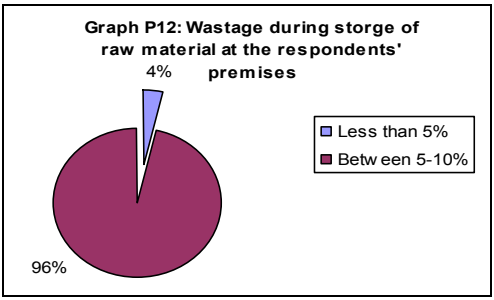


Table P12: Wastage during storage of raw material at the respondents' premises

Sr. No.	*Wastage during Storage of raw material*	*Number*	*Percent*
01	Less than 5%	1	4
02	Between 5-10%	23	96
	Total	**24**	**100**



Research Findings and Discussion

From the tables (Table P05 to P12) and graphs (Graph P05 to P12) shown above, following inferences can be drawn:

1. From the Table P05 and corresponding Graph P05 shown above, it is clear that nearly 44 percent of the total respondents procure the fruits through middle men. Remaining 56 percent of the respondents procure the fruits directly from the terminal markets through bidding process. But it is also true that the middle men/bagbans/brokers undertake bidding in terminal markets too. They are the sole people who dominate and control the terminal markets as well. They indulge in all sorts of price fixation/stock hoarding arrangements with the farmers as well as processors. Such practices create unhealthy competition in the market and disturb the entire equilibrium of the market, which will put both the farmer and processor to disadvantage.

Need of the hour is to create a common platform for both farmers and processors where-in they can interact freely and do the business. They both can enter in to arrangements like; under contract farming, buy back agreements, both forward as well as backward integrations, etc. Both parties will get benefited through such a kind of reciprocative arrangement between them. The role of the middlemen, if at all required, will be just to act as facilitator and nothing else. As discussed in the previous chapter (Chapter 5) concept of "Rural Business Hubs" should be implemented.

2. From the Table P06 and the corresponding Graph P06 shown above, it becomes clear that pulp content (recovery), sucrose content, skin thickness, and taste are the key criteria followed by processors while procuring the fruits. Whereas fiber content and the size of the seed are the next important criteria.

Farmers will be better off financially and otherwise also if they grow varieties which are rich in the following attributes:

(i) High pulp content (recovery)
(ii) High sucrose content
(iii) Lesser skin thickness
(iv) Mouth watering taste
(v) Fiber content
(vi) Smaller seed size

These are the attributes demanded by the processors as they result in higher yield, higher productivity, better taste, and higher profits. Varieties having the above listed features like 'Alphonso' (which has all the above attributes) need to be grown. Such varieties will fetch better price in the market for farmers. Moreover there is great export demand for such varieties (both as a fresh fruit and also as processed fruit product in the form of pulp, squash or juice) in the international markets and fetch higher price to processors. But unfortunately such varieties, collectively, account for 5 percent (approx) of total national production of mangoes and contribute to 95 percent (approx) of total exports.

The above discussion clearly rejects Ho-01 and accepts Ha-01 which states "Indian fruit processing industry especially mango processsing industry is affected by non-availability of high yield, high pulp containing varieties of mangoes that also have high resistance towards pest attack, which are ideal for processing".

Thus growing such varieties will strengthen the overall position, including financial position of cultivators as well as processors.

3. From the Table P07 and corresponding Graph P07 shown above, it becomes evident that 80 percent of the respondents do not impart training of any kind to the procurement officers, where as remaining 20 percent of the respondents give the necessary in house, on the job training to procurement officials.

Calculated Chi-square value: 9.00, being higher than table value: 3.84, we reject the null hypothesis which state that 50 percent of the processors impart necessary training to procurement officials.

This gives a signal that fruit processors of India are running their business in a traditional manner. They need to become more professional and providing necessary training to people involved is one key step in this direction.

4. From the Table P08 and corresponding Graph P08 shown above, it can be inferred that Indian fruit processors lack the necessary infrastructure like; cold chain facility which includes cold storage units, pre-cooling units, refrigerated vans, etc., adequate processing capacity, full-fledge transportation facilities, etc.

Calculated Chi-square value: 25.00, being much higher than the table value: 3.84, we reject the null hypothesis which state that 50 percent of the processors have the necessary infrastructure pertaining to procurement.

Having necessary infrastructure at the disposal of fruit processors is one of the critical success factors (CSFs) of this business. So all the stake holders of this industry should come together and join their hands and work on a common agenda of building the required infrastructure. In simpler words, it calls for integrated movement encompassing all the stake holders naming;

(i) Government departments, nodal bodies, and institutions like; NHB, NHM, Agricultural Universities, State horticultural departments, CFTRI, APEDA, NABARD, MOFPI, etc.

(ii) Private and Public fruit processors

(iii) Fruit cultivators

(iv) Cold chain members

(v) The State and the Central Government (Agriculture ministry)

(vi) Cultivators Co-operative organizations, Processors Co-operative organizations, other Associations, NGOs, etc.

(vii) Middlemen

(viii) Retailers, whole-sellers, super markets, and other channel members.

From the above discussion we can clearly reject Ho-04 and accept Ha-04 which states "Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the Government departments/nodal bodies/Institutions, with no clear direction and goals prohibit the fruit processing industry of India from attaining the desired growth".

5. From the Table P09 and corresponding Graph P09, it is clear that only 12 percent of the respondents use the computer software packages that too 'Tally' accounting software package only. Remaining 88 percent of the respondents don't use any kind of computer software packages like; TALLY, SAP, ERP, MRP, etc.

Calculated Chi-square value: 14.4, being much higher than the table value: 3.84, we reject the null hypothesis which state that 50 percent of the processors use the computer software packages like SAP, ERP, MRP, etc.

This indeed is a serious cause for concern and need to be addressed. Usage of computer software packages like SAP, MRP, ERP, etc. will equip the firm with real time information, quick processing of the

information, enhanced productivity, better decision quality, fool proof networking, negligible duplication efforts, etc.

The fruit processors have to embrace the technological advancements made in this particular sector and reap the benefits associated.

6. From the Tables P10 to P 12 and corresponding Graphs P10 to P12 shown above, the following inferences can be drawn;
    1. Almost all respondents except one have traditional /conventional storage facility (Open space and godowns). None of the respondents possess ultramodern or state-of-the-art storage facility.

Calculated Chi-square value: 44.3, being much higher than the table value: 5.99, we reject the null hypothesis which state that 33.33 percent of the processors possess the advanced storage facility and the same no. of respondents possess the ultramodern storage facility.

2. 76 percent of the total respondents store the fruits for less than two days, due to lack of necessary storage facility, whereas 12 percent of the remaining respondents could store the fruits for 2 to 5 days and the balance 12 percent could store the raw material for 5 to 10 days as they have an access to advanced storage facility.
3. Almost all processors except one waste around 5 to 10 percent of total fruits during storage phase due to inadequate storage facility at their end and inaccessibility to sophisticated state-of-the-art storage facility elsewhere.

Thus storage facility is another key area that needs substantial improvements. Fruit processors are tolerating huge loss of fruits, to an alarming levels of 5 to 10 percent, due to non availability of advanced storage facilities like;

(i) Cold storage units
(ii) Pre-cooling centers
(iii) Refrigerated transportation facilities
(iv) Freeze drying units
(v) Vapor Heat Treatment (VHT) facilities, etc.

Above discussion clearly reject Ho-02 and accept Ha-02 which states "Indian fruit processing industry, especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing

and packing, marketing of the output, etc. This is a serious bottleneck for this industry".

This again calls for the joint effort by all the stakeholders as discussed above. Co-operative movement is another promised solution for this problem. All regional processors have to come together and form a Co-operative society/association like; 'All Karnataka Pickle Manufacturing Association' (APKMA), a pickle manufacturers association, formed in the year 2006. AKPMA has a total membership of around 60. Membership fee is ₹ 1,000 every year. All the members meet frequently at different places or member's manufacturing premises and discuss the upcoming issues and problems facing them like;

1. Modifications in the FPO (Fruit Processing Order) regulations as laid by MOFPI (Ministry of Food Processing Industries), India. Entrepreneurs who want to enter in to this industry will get all the support from the association and the association will make them aware of all the norms/regulations of FPO and liaise with FPO till they get the FPO license.
2. Changing tax structures. Recently the association succeeded in convincing the State Government to bring down the VAT (Value Added Tax) from 12.5 percent to 4 percent during 2007 and later from 4 percent to 0 percent during 2008.
3. Upcoming legislational issues pertaining to this industry. Recently the association succeeded in convincing the State Government and the Karnataka State Pollution Control Board (KSPCB) to treat this industry as a green industry which means Pickle manufacturers of Karnataka need not have to take the clearance from KSPCB.
4. The Association arranges seminars, conferences, lectures, visits, etc., so that all the processors get benefited in terms of added knowledge and skills. It also provides escort services to the processors who are facing problems in dealing with the Government offices.

From the above discussions we can reject null hypotheses Ho-03 and accept alternate hypotheses Ha-03 which states, "Lack of cooperative effort amongst processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition".

Part B (b): Analysis of specific information pertaining to grading, cleaning, processing and packing

Table P13: Whether Grading process followed or not by the respondents

Sr. No.	*Grading process followed or not*	*Number*	*Percent*
1	No	20	80
2	Yes	5	20
	Total	**25**	**100**

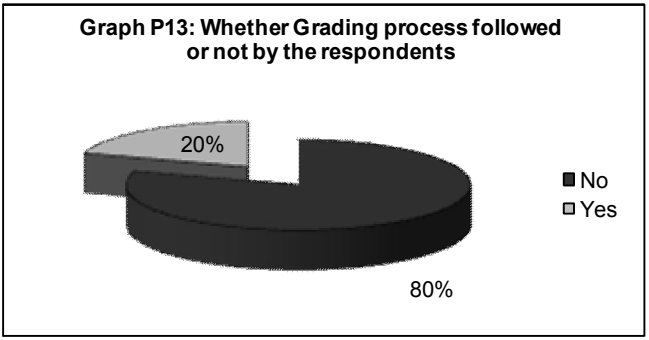


Table P14: Level of mechanization employed during cleaning, grading, Processesing and packing

Sr. No.	*Level of mecha-nization*	*Number*				*Percent*			
		Gra-ding	*During clean-ing*	*Proc-esses-ing*	*Pac-king*	*Gra-ding*	*Dur-ing clea-ning*	*Proc-esses-ing*	*Pac-king*
1	Do not undertake	20	0	0	0	80	0	0	0
2	100% manual	4	24	20	18	16	96	80	72
3	Partly mecha-nized	1	1	5	6	4	4	20	24
4	Fully autom-ated	0	0	0	1	0	0	0	4

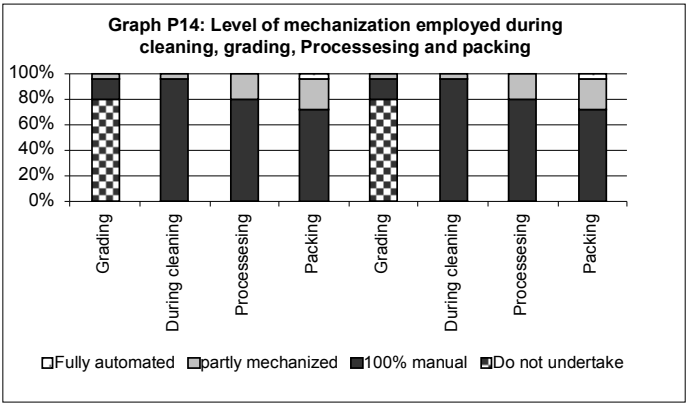


Table P15: Treatment of the leftover of grading process by the respondents

Sr. No.	*Treatment of the leftover of grading*	*Number*	*Percent*
1	Do not undertake grading	20	80
2	Dump it as wastage	5	20
	Total	**25**	**100**

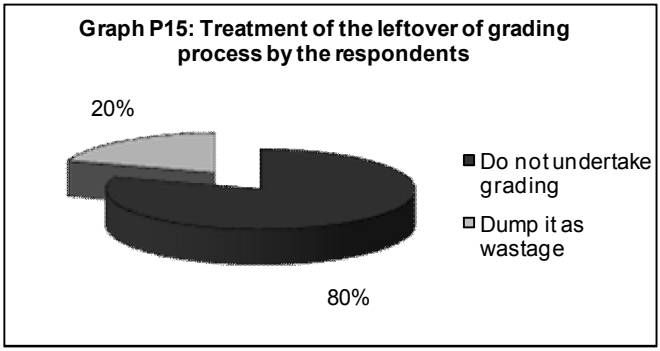


Table P16: Water purification or treatment facility is in place or not at the respondent's premises

Sr. No.	*Whether water purification/treatment plant in place or not*	*Number*	*Percent*
01	No	24	96
02	Yes	1	4
	Total	**25**	**100**

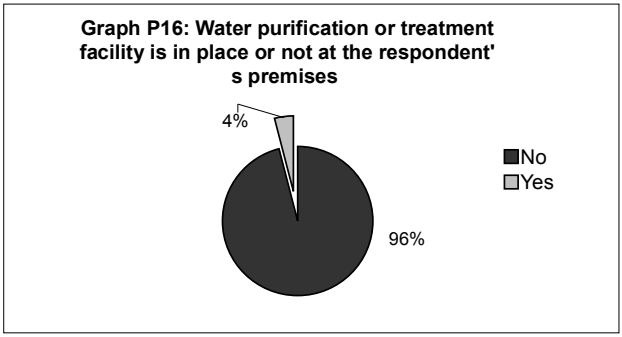


Table P17: Clearance from pollution control board obtained or not

Sr. No.	*Whether clearance from pollution control board obtained or not*	*Number*	*Percent*
01	No	22	88
02	Yes	3	12
	Total	**25**	**100**

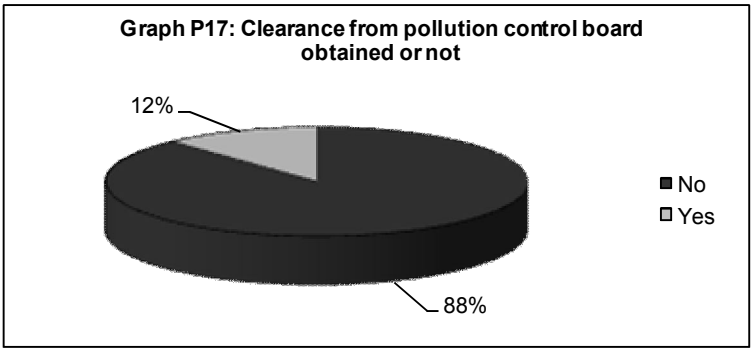


Table P18: Type of processing undertaken by the respondents

Sr. No.	*Type of Processing undertaken*	*Number*		*Percent*	
		Yes	*No*	*Yes*	*No*
1	Destalking	25	0	100	0
2	Chopping	25	0	100	0
3	De-seeding	25	0	100	0
4	Peeling	5	20	20	80
5	Pulping	5	20	20	80
6	Boiling	5	20	20	80
7	Stirring	4	21	16	84

8	Packing	25	0	100	0
9	Others like pickling (specify)	22	3	88	12

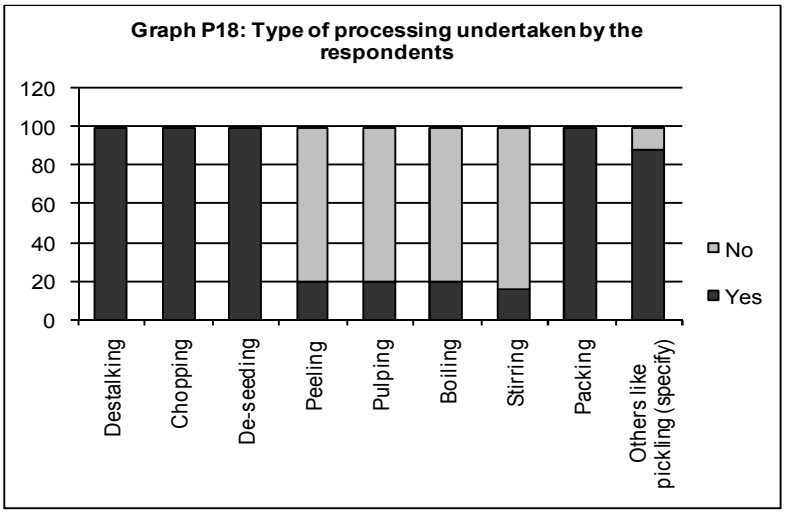


Table P19: process control mechanism like SPC/KAIZEN in place or not with respondents

Sr. No.	*Is there any process control mechanism like SPC/KAIZEN in place or not*	*Number*	*Percent*
1	No	25	100
2	Yes	0	0

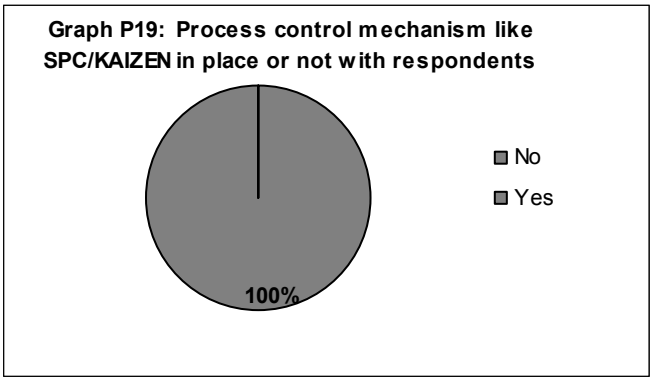


Table P20: Mechanism of controlling the various processes involved employed by respondents

Sr. No.	*How would you control the various processes involved*	*Number*	*Percent*
1	No controlling mechanism in place	8	32
2	Random inspection through effective supervision	15	60
3	Separate quality control department	2	8
	Total	**25**	**100**

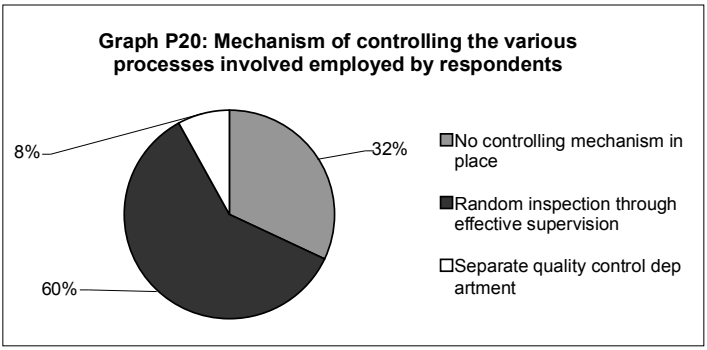


Table P21: Has this organization undergone radical change like Business Process Reengineering in last five years

Sr. No.	*Has this org. undergone radical changes like Business Process Reengineering in last 5years*	*Number*	*Percent*
01	No	25	100
02	Yes	0	0

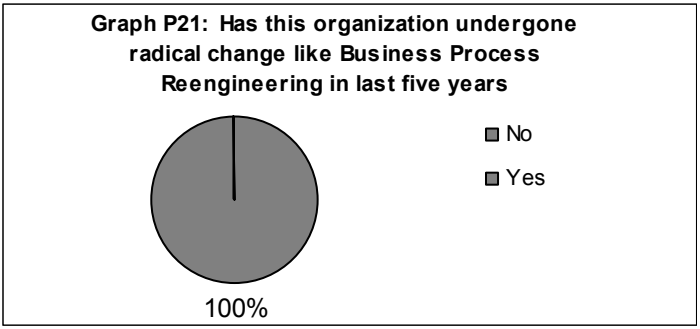


Table P22: Importance given on maintaining hygienic environment

Sr. No.	*How much importance you give on maintaining hygienic environment*	*Number*	*Percent*
01	Don't bother	2	8
02	Basic maintenance (important)	15	60
03	Take lot of care	8	32
	Total	**25**	**100**

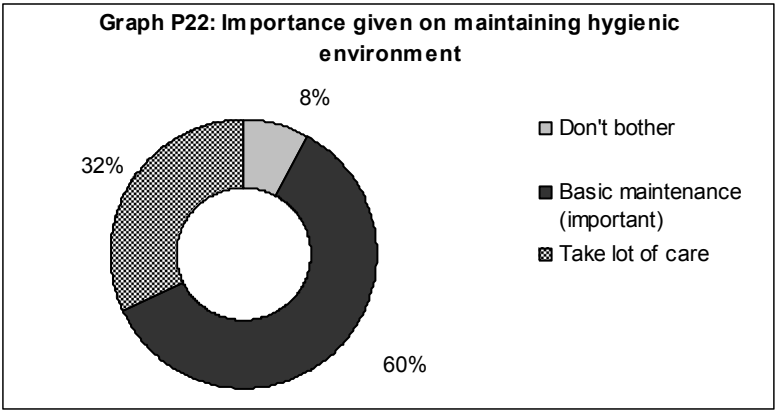


Table P23: Method of controlling quality I/P, work in process and O/P

Sr. No.	*How would you control quality I/P, work in process and O/P*	*Number*	*Percent*
1	Not responded	1	4
2	No controlling mechanism in place	6	24
3	Random inspection through effective supervision	10	40
4	Full fledged QC system	1	4
5	With skilled workers	2	8
6	Through maintaining hygienic environment	1	4
7	By controlling quality of RAW MATERIAL	4	16
	Total	**25**	**100**

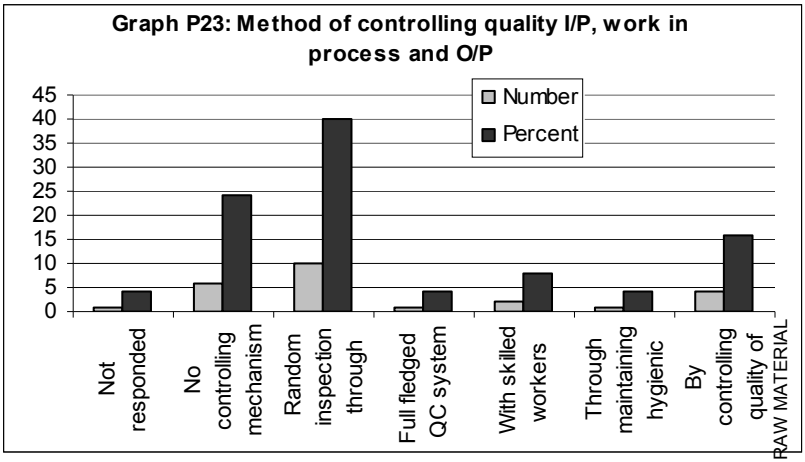


Table P24: Upgradation of technology undertaken or not in the last five years

Sr. No.	*Upgradation of technology undertaken or not in the last five years*	*Number*	*Percent*
1	No	21	84
2	Yes	4	16
	Total	**25**	**100**

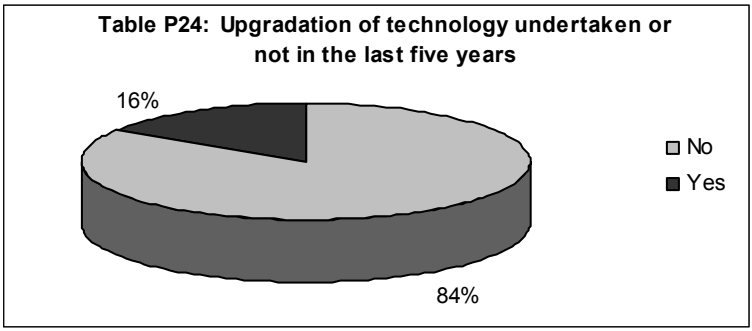


Table P25: Status of respondents w.r.t. implementation of TQM and ISO

Sr. No.	*Status w.r.t. implementation of TQM and ISO*	*Number*		*Percent*	
		TQM	*ISO*	*TQM*	*ISO*
1	Not aware	9	0	36	0
2	Aware but not thought of implementing	15	24	60	96
3	In the process of implementation	1	0	4	0
4	Already in place	0	1	0	4
	Total	**25**	**25**	**100**	**100**

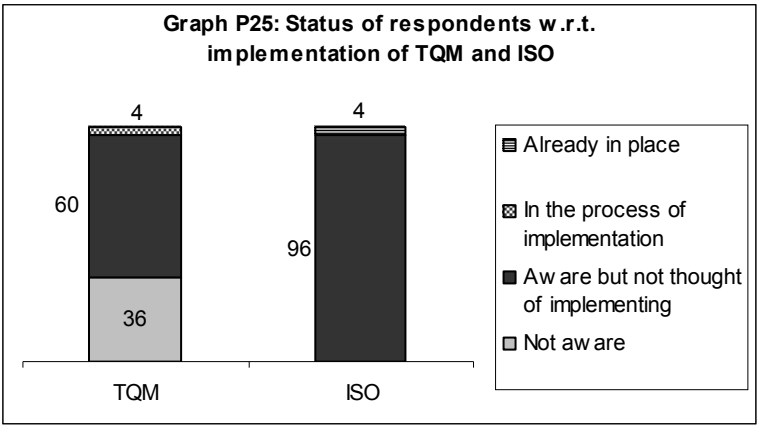


Table P26: Whether training been given to employees in last five years

Sr. No.	*Whether any Training been given to employees in last five years*	*Number*	*Percent*
01	No	19	76
02	Yes	6	24
	Total	**25**	**100**

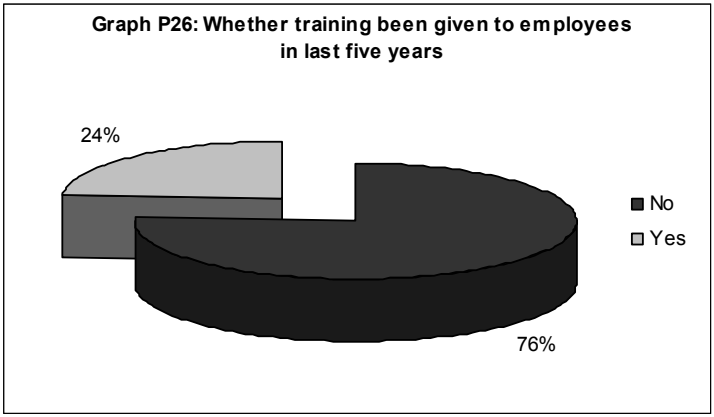
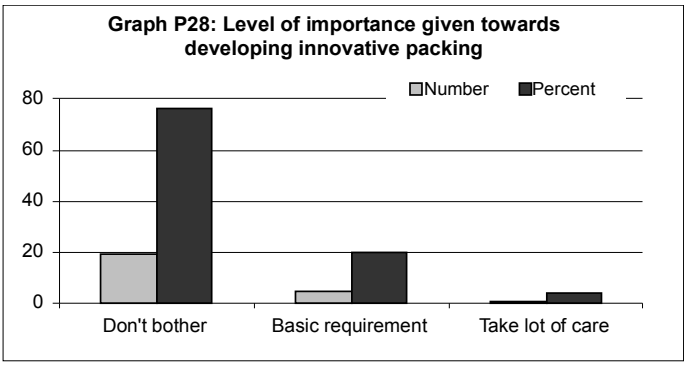


Table P27: Method of packing finished/semi finished goods

Sr. No.	*How do you pack your finished/semi finished goods*	*Number*	*Percent*
01	Bulk pack	19	76
02	Bulk pack and small pack	6	24
	Total	**25**	**100**

Table P28: Level of importance given towards developing innovative packing

Sr. No.	*How much importance you give towards developing innovative packing*	*Number*	*Percent*
1	Don't bother	19	76
2	Basic requirement	5	20
3	Take lot of care	1	4
	Total	**25**	**100**



Research Findings and Discussion

From the Tables P13 to P28 and corresponding Graphs P13 to P28 shown above, following inferences can be drawn:

1. From the Tables P13 and P15 and Graphs P13 and P15, it is clear that only 20 percent of the processors undertake grading, whereas remaining 80 percent of the processors don't. Moreover those who undertake grading don't know how to

process the wastage or leftover. They simply dump the leftover as wastage.

Processing fruits without grading is unthinkable and should be avoided. Damaged, diseased, immature, defective, and spoiled fruits need to be separated out from the good ones. If not, entire lot may have to be rejected at a later stage. Processors should think of utilizing the leftovers. If utilized properly the processors may turn this activity into a promising and money making opportunity. Utilizing mango kernels is one good e.g. Mango kernel oil extracted out of mango kernel has a great demand in the international markets. This is processed further and sold as mango butter/mango margarine in the developed markets that too at a premium price. It is also used as one of the key ingredients in manufacturing of organic cosmetic products like facial creams, hair tonics, etc.

2. From the Table P14 and Graph P14, it becomes evident that nearly 72-96 percent of the respondents undertake all the primary activities, i.e., cleaning, processing and packing using 100 percent manual techniques/operations. This is one of the grave challenges facing Indian fruit processing industry. This also is one of the key reasons why Indian fruit products are not being seen favorably in the international markets. Lack of mechaniczation, computerization, and integration hinders the productivity and performance of the processors and quality of the products as well. This will weaken the competitiveness of Indian processors both in the local and international markets.
3. From the Table P16 and Graph P16, it is clear that only one processor out of 25 fruit processors has some kind of water purification/treatment plant in place. This is quite alarming as fruit processing industry is a water based industry. Processors require lot of water. If they don't recycle water then the entire industry may face problem of acute shortage of water. This is one important part of building necessary infrastructure.

Calculated Chi-square value: 21.2, being much higher than the table value: 3.841, we reject the null hypothesis stating that 50 percent of the processors have such necessary infrastructure.

4. From the Table and corresponding Graph P17, it becomes evident that Indian fruit processing industry lacks professionalism and functions more like an unorganized sector. Only three out of 25 processors have obtained clearance from the State Pollution Control Board (SPCB).

Calculated Chi-square value: 14.4, being much higher than the table value: 3.84, we reject the hypothesis which state that 50 percent of processors have obtained clearance from SPCB.

Fruit processors need to follow the ethics and the corporate governance philosophy, and abide by all the rules and regulations. Polluting the environment is against corporate governance and ethics also. So necessary measures have to be taken by the processing community to prevent this.

5. From the Table and Graph P18, it is clear that different processors have different sequence of processes in place. The process flow chart is not common to entire industry. Based on the type of the processed product, combination of the processes varies.

Pickle manufacturing involves destalking, chopping (in to two pieces), deseeding, Slicing into required sizes (ranging from 0.5 sq inches to 01 sq inches), pickling, and packing. Whereas pulping involves destalking, chopping, de-seeding, peeling, pulping, boiling, stirring and packing.

6. From the Table and Graph P19, it becomes crystal clear that none of the respondents have thought of adopting quality control mechanisms like SPC/Kaizen/SQC/Six sigma/Quality Control/House of quality/etc. Improvement of quality and that too, to international standards, is only possible through adopting such quality control mechanisms. If the Indian fruit processors want to create niche in the international markets and compete globally, they should be aggressive in adopting such quality improvement techniques. If quality improves, loss at various stages will decrease resulting in increasing of productivity and the yield. This will ensure that the cost will be lowest when compared with competitors. This will allow Indian processors to price their products at par with global leaders and increase their market share and also help them in fetching a premium price (for maintaining high level of quality) for their products in the international markets.

Calculated Chi-square value: 25.00, being much higher than the table value: 3.84, we reject the null hypothesis which state that 50 percent of the fruit processors have adopted quality control mechanisms like SQC/ SPC/Kaizen/Six sigma/House of quality/Quality Circles and Councils/ etc.

7. From the Table and Graphs P20 and P23, it is clear that only 8 percent of the respondents have a separate Quality Control department to control quality. 60 percent of the respondents control quality through random inspection and effective supervision, whereas remaining 32 percent of the respondents have no controlling mechanism of whatsoever to control quality.

Fruit processors cannot control quality through random inspection and effective supervision only. There is a strong need to have some sort of controlling mechanism to control quality on continuous basis. Having sound Quality Control mechanism/doctrine is one of the Critical Success Factor (CSF) of this industry.

Calculated Chi-square value: 10.2, being much higher than table value: 5.99, we reject the null hypothesis which state that 33.33 percent of the processors possess the required Quality Control mechanism.

8. From the Table and Graph P21, it is clear that none of the respondents' organizations have undergone radical changes like BPRE (Business Process Re-engineering) in last five years.

Calculated Chi-square value: 25, being much higher than the table value: 3.84, we reject the null hypothesis which state that 50 percent of the fruit processors' organizations have undergone radical changes like BPRE.

For an industry to flourish, it is must that organizations, not only accept the change but be flexible enough to anticipate the change well in advance and be ready to accommodate the change with little or no resistance. Sometimes organizations should also undergo radical changes like BPRE to cope up with dramatic changes happening at the industry level.

9. From the Table and Graph P22, it can be noticed that 32 percent of the respondents take lot of care on maintaining hygienic environment in and around processing unit. 60 percent of the respondents undertake basic maintenance whereas remaining 8 percent of the respondents don't bother about hygiene.

Maintaining hygienic environment is one of the prerequisites of this industry as the end product is meant for human consumption. Processors can't afford taking risk of compromising on hygienic environment. Taking utmost care on maintaining 100 percent hygiene, in and around the unit, is one of the KSFs (Key Success Factors) to succeed in this industry.

10. From the Table and Graph P24, it is evident that only 16 percent of the respondents have undertaken Upgradation of technology in the last five years, whereas remaining 84 percent of the respondents have not thought about it.

Calculated Chi-square value: 11.6, being much higher than the table value: 3.84, we reject the null hypothesis which state that 50 percent of the respondents have undertaken technology Upgradation projects.

If Indian fruit processing industry wants to compete globally with international giants, it has to keep upgrading the technology and become leader when it comes to usage of upcoming contemporary technologies. Processors should, not only think of using the latest technology available but also develop new technologies in-house. Through technology Upgradation, productivity and quality improves, and thus provides a competitive advantage over international giants.

11. From the Table and Graph P25, it is clear that only one processor out of 25 processors has got ISO certification, whereas remaining 96 percent are aware of the benefits of ISO but never thought of applying for certification. Similarly only one respondent out of 25 respondents is in the process of implementing TQM and 15 respondents are aware of the benefits of TQM but never thought of implementing, whereas remaining 9 respondents are not even aware of TQM.

This clearly reveals the competency level of Indian Fruit Processing Industry. Having ISO certification and implementing TQM has to be made mandatory for all processors. Government departments /nodal bodies/institutions should help processors in this. Simply giving reimbursement of ₹ 75,000 per organization for getting ISO certification (Central Government had launched a scheme to reimburse ₹ 75,000 for spending around ₹ 1,00,000 for getting ISO certification) is not enough rather they should focus on the following;

(i) Creating awareness about TQM and ISO

(ii) Educating processors about how to implement TQM and bag ISO certification

(iii) Providing necessary training to processors about TQM and ISO related practices

(iv) Helping processors in the implementation phase

Having ISO certification has become must to qualify as a supplier for many importing countries. Hence not only processors but also

cultivators should get ISO certification and implement TQM. Even the cultivators should be given industry status.

12. From the Table and Graph P26, it is evident that 76 percent of the respondents have not given any kind of training to employees, whereas remaining 24 percent of the respondents have given some kind of training to employees related to processing, packing, etc.

Calculated Chi-square value: 6.76, being higher than the table value: 3.84, we reject the hypothesis which state that 50 percent of the processors impart necessary training to their employees.

Imparting necessary training to employees is must for the employees to update and acquire new KSAs (Knowledge, Skills and Abilities). Otherwise KSAs become obsolete like technology. Moreover expenditure on training should be viewed as an asset by the organizations and organizations should spend generously on training their work force. Quality of the Human Resource is one of the CSFs which provides a long term competitive edge to an organization over its rivals (domestic as well as international).

13. From the Table and Graph P27, it can be inferred that only 24 percent of the respondents undertake packing in bulk as well as small packs, whereas remaining 76 percent of the respondents undertake packing only in bulk packs.

From the Table and Graph P28, it is observed that 76 percent of the respondents don't even bother about developing innovative packing, 20 percent of the respondents try to meet the basic requirements and not beyond that, whereas only 4 percent of the respondents take initiative in developing innovative packing.

Ongoing continuous improvement in all areas, including packing is the need of the hour. Innovation and creativity at every level including packing is must for an organization if it wants to become the market leader and win competition at the international level. Lot of emphasis need to be given by the Indian processors to innovate and improve their packaging. Poor packing is one of the key reasons why Indian processed food products are not so well received in the international markets. Not only the quality of the product but also the quality of packaging (innovation in packaging) is important. Offering smaller and disposable packing, using recyclable packing material, is also important. Ongoing continuous improvement in all the processes, i.e., KAIZEN, is the need of the hour.

From the above discussion, we can clearly reject Ho-02 and accept Ha-02 which state "Indian fruit processing industry, especially mango

processing industry is plagued with lack of necessary infrastructure that is required for grading, processing, packing, etc. This is a serious bottleneck of this industry".

Part B(c): Analysis of specific information pertaining to marketing, competition, profitability and scope for expansion

Table P29: Type of marketing/selling channel adopted by respondents

Sr. No.	*How do you market your product*	*Number*	*Percent*
1	Through whole-sellers	11	44
2	Through retailers	3	12
3	Through full fledged distribution channel	5	20
4	Through wholesellers, own company outlets and mobile vans	1	4
5	Through Middlemen	3	12
6	Through Distributors	2	8
	Total	**25**	**100**

Graph P29: Type of marketing/selling adopted by respondents

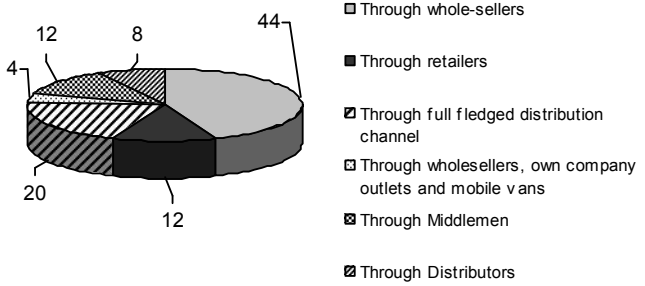


Table P30: Extent of market coverage by the respondents

Sr. No.	*What is your market coverage*	*Number*	*Percent*
1	Local city	2	8
2	Entire district	2	8
3	Local mkt. with More than one district	7	28

4	Entire state	7	28
5	More than one state	5	20
6	Entire country	1	4
7	Global	1	4
	Total	**25**	**100**

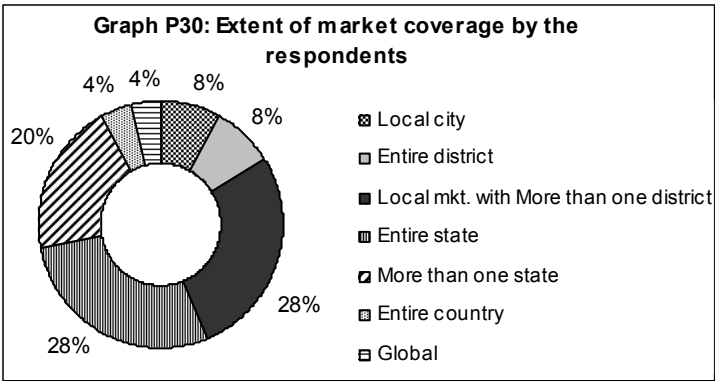


Table P31: Total no. of sales people employed by the respondents

Sr. No.	*Total no. of sales people employed*	*Number*	*Percent*
1	No sales people	17	68
2	1 to 5	5	20
3	5 to 10	2	8
4	10 to 50	1	4
	Total	**25**	**100**

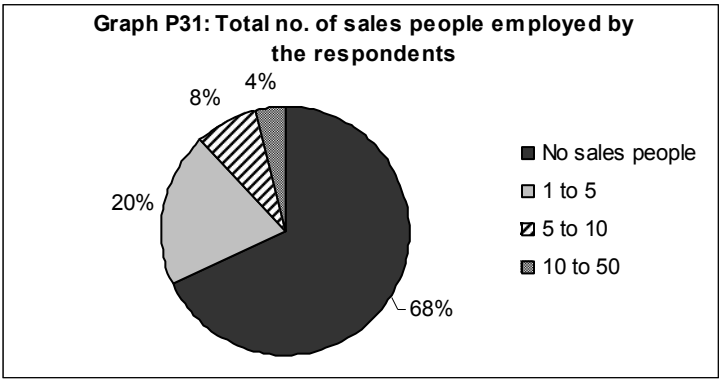


Table P32: Whether respondents advertise their products in mass media

Sr. No.	*Do you advertise your product in mass media*	*Number*	*Percent*
1	Yes	5	20
2	No	20	80
	Total	**25**	**100**

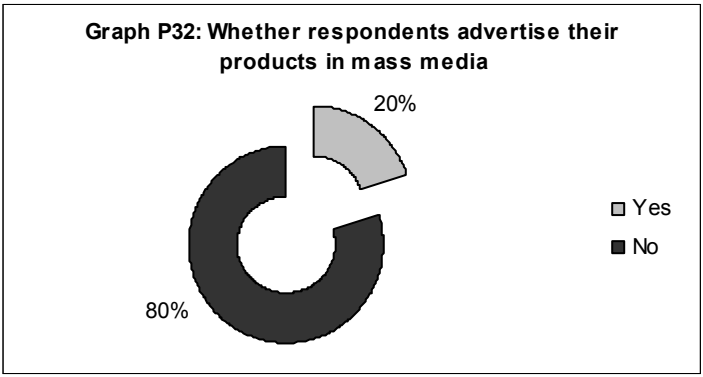


Table P33: The level of competition in the industry as revealed by respondents

Sr. No.	*How do you rate the level of competition in your industry*	*Number*	*Percent*
1	Cutthroat	9	36
2	Severe	9	36
3	Price dominant	5	20
4	Negligible	2	8
	Total	**25**	**100**

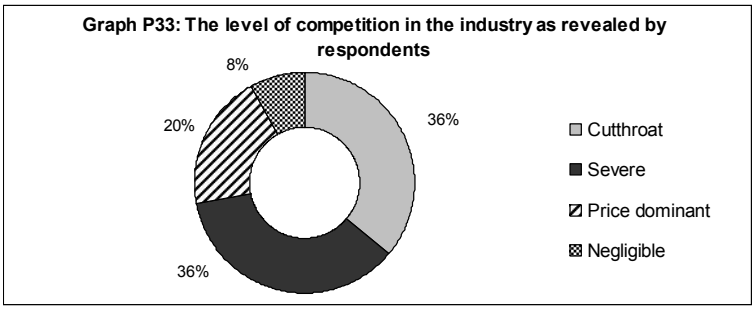


Table P34: Profitability of the venture as revealed by respondents

Sr. No.	*How much profitable is this venture*	*Number*	*Percent*
1	Not responded	1	4
2	Marginal profits (1-5%)	4	16
3	Normal profits (5-10%)	14	56
4	Lucrative profits (above 10%)	6	24
	Total	**25**	**100**

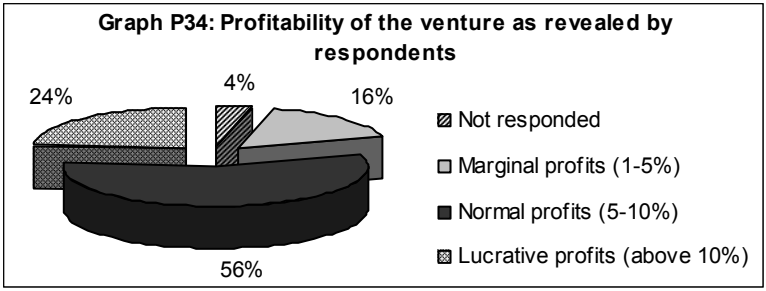


Table P35: Returns considering the risks involved as revealed by respondents

Sr. No.	*Returns considering the risks involved*	*Number*	*Percent*
1	No returns	4	16
2	Marginal returns with more risk	1	4
3	Normal returns with less risk	14	56
4	Lucrative returns with very less risk	6	24
	Total	**25**	**100**

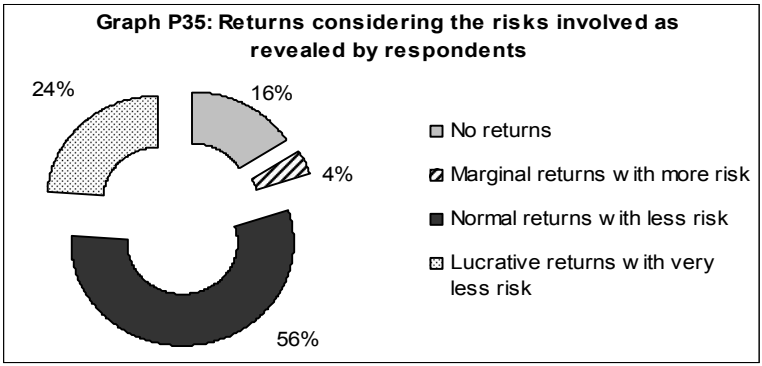
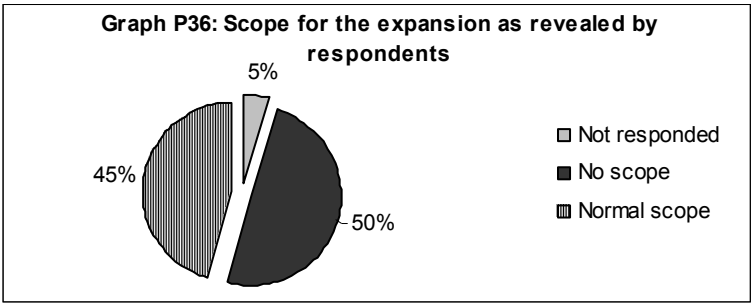


Table P36: Scope for the expansion as revealed by respondents

Sr. No.	*Scope for the expansion*	*Number*	*Percent*
1	Not responded	1	4
2	No scope	11	44
3	Normal scope	10	40
4	Tremendous scope	3	12
	Total	**25**	**100**



Research Findings and Discussion

From the Table and Graphs P29 to P36 shown above, following inferences can be drawn:

1. From the Table and Graph P29, it is clear that only 20 percent of the processors have a full fledged distribution channel, whereas the remaining 80 percent of the processors were marketing their produce through whole sellers (44%), retailers (12%), middle men (12%), or through distributors (8%) only.

Having a full fledged distribution channel, i.e., network of appointed distributors, dealers and retailers is one of the CSFs of this business. The processors can enjoy better market power and better control over market, if they have their own distribution channel. Otherwise middle men (freelance distributors, wholesellers, big retailers, etc.) will try and control the market and capture the profits by squeezing the margins of processors. This could be one of the key reasons behind ill growth of Indian processing industry, when compared with Brazil.

2. From the Table and Graph P30, it can be noticed that only one processor out of twenty five processors has an access to international markets. Only one processor has national coverage. Five processors have their presence in more than one state. Seven processors cover just one state. Whereas remaining

11 processors market their produce in the local markets covering one or more than one districts.

Having an access to at least national market if not international market, by the processors is must for their growth. Covering only the local markets or the regional markets will certainly restrict the growth prospectus of the processors. This is a serious drawback of small processors and need to be addressed. One of the solutions to overcome this drawback is to form associations or co-operative societies or cartels or consortium, and market their produce in a big way throughout the nation and in international markets as well.

The above discussion clearly reject null hypothesis Ho-03 and accept Ha-03 which state "Lack of cooperative effort amongst processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition".

3. From the Table and Graph P31, it can be noticed that nearly 68 percent of the respondents don't even employ a single sales person; 20 percent of the respondents employ one to five sales people; whereas remaining 12 percent of the respondents employ more than five sales people.

This again is due to smallness of the processors and can be overcome through co-operative effort, as discussed above.

4. From the Table and Graph P32, it is clear that only five out of twenty five processors advertise their products in mass media.

The calculated Chi-square value: 9.0, being higher than table value: 3.84, we reject the null hypothesis which state that 50 percent of the processors advertise their products in the mass media.

Advertising in the mass media creates awareness about the processed fruit products in the minds of customers and stimulates interest to try (buy) those products. The people of India, in general, are used to eating fresh fruits and avoid eating processed fruit products. This is primarily due to their poor understanding about the content and nutritional values of the processed fruit products (The people of India, in general, carry the notion that processed fruit products are not good for health and contain artificial/synthetic/chemical preservatives). Advertising in the mass media like TV, though very expensive, is one of the most effective ways to address this misunderstanding.

Due to entry of MNCs in to this sector in a big way, the attitude and behavior of Indian people towards processed fruit products is changing, but very slowly.

This definitely is a serious issue that needs to be addressed, for strengthening the domestic demand for processed fruit products. It is possible only through co-operative effort as discussed above.

5. From the Table and Graph P33, it becomes clear that nearly 92 percent of the respondents rate the competition as intense, severe, cut throat, and price dominant, whereas remaining 8 percent of the respondents rate the competition as negligible.

The intense rivalry in the market is primarily from the so called unorganized small sector. As they (unorganized small sector) carry less (very less) overheads compared to organized sector, their prices will be much cheaper than the prices set by the organized sector.

Unhealthy competition from the unorganized small sector where-in the firms (unorganized small firms) practice all sorts of unhealthy and unethical practices like; adulteration, tax evasion, producing without the necessary license, etc., is another reason for intense rivalry in this sector.

So the necessary steps/actions need to be taken by all the stake holders involved to weed out unhealthy competition from this sector and make this sector an investor savvy one. The fruit processing sector in India will flourish when the investors start pumping in their funds in to this sector and the investors will think of investing in to this sector if it is free from unhealthy competition and lucrative.

6. From the Table and Graph P34, it is clear that 24 percent of the respondents rated the profitability as lucrative (net margin above 10 percent); 56 percent of the respondents rated the same as normal (net margin between 5 to 10 percent); and the remaining 16 percent of the respondents rated the same as marginal (net margin between 1 to 5 percent).

From the Table and Graph P35, it is clear that 24 percent of the respondents rated overall returns considering the risks involved as 'Lucrative'; 56 percent of them rated the same as 'Normal'; 4 percent of them rated the same as 'Marginal'; whereas 16 percent of the respondents rated the same as 'No returns'.

Overall profitability of the processors in general is found to be adequate. Profitability can be further improved if the necessary actions

are taken by all the stake holders involved, to strengthen this industry at all the three levels naming;

(i) **Firm level:** Through formulating and adopting innovative strategies, tactics, and policies, using advanced technology, minimizing post harvest loss, etc.

(ii) **Industry level:** Entire industry has to come together through mechanisms like; cartel, consortium, co-operatives, associations, and other mechanisms of co-operative effort; to stimulate the domestic demand, to fight with the evil forces that create unhealthy competition, to create necessary infrastructure, etc., which will make this industry a very attractive and lucrative one.

(iii) **Environment level:** The nodal bodies involved, the State Government, the Central Government, the Departments involved, NGOs involved, institutions involved, etc., should direct their efforts in a strategic and integrated manner to strengthen this industry.

7. From the Table and Graph P36, it can be noticed that 44 percent of the respondents rated the scope for the expansions as 'No scope'; 44 percent of them rated the same as 'Normal scope'; whereas 12 percent of them rated the same as 'Tremendous scope'.

The growth trend and the growth pattern of exports of processed fruit products (CGR of 13 percent aggregate) as revealed in the Chapter 4 (Secondary Research) is on the rise and so also is the domestic consumption. People of India, especially the middle-class and the upper class, have become more health conscious and are reverting back to natural fruit drinks like; Orange squash, Mango juice, Strawberry squash, Lime juice, etc. They have started consuming processed fruit products that are available in cans, during off season like; mango pulp, sliced pineapple, etc. They even started eating condiments and chocolates made out of fruits like; Mango chocolate, Amla candy, etc. Thus the overall demand (domestic as well as international) for processed fruit products is increasing at a phenomenal rate (as discussed in detail, in the secondary research – Chapter 4). So, there lies ample scope for Indian fruit processors to undertake the following;

(a) Expand their capacities; Integrate horizontally

(b) Integrate vertically (both forward and backward)

(c) Related diversification

(d) Product development (stretching product line) and market development activities (entering new markets)

From the above discussion we can clearly reject Ho-03 and accept Ha-03 which state "Lack of co-operative effort is a serious hindrance that prohibits this industry from reaping the benefits of larger economics of scale and higher value addition:"

Part C: Analysis of Information Pertaining to Collaboration and Co-operation:

Table P37: Whether respondent is member of any association or NGO, etc.

Sr. No.	*Are you member of any association or org.*	*Number*	*Percent*
1	No	14	56
2	Yes	11	44
	Total	**25**	**100**

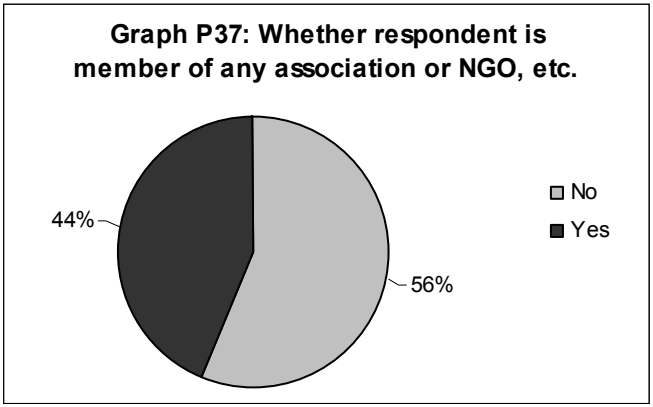


Table P38: Details about the membership

Sr. No.	*If yes, when was it formed and since when you are a member*	*When was association. Formed*		*Since when you are a member*	
		Number	*Percent*	*Number*	*Percent*
1	Not applicable	14	56	14	56
2	In last 2-5 years	9	36	9	36
3	In last 5-10 years	1	4	1	4
4	More than 10 years before	1	4	1	4
	Total	**25**	**100**	**25**	**100**

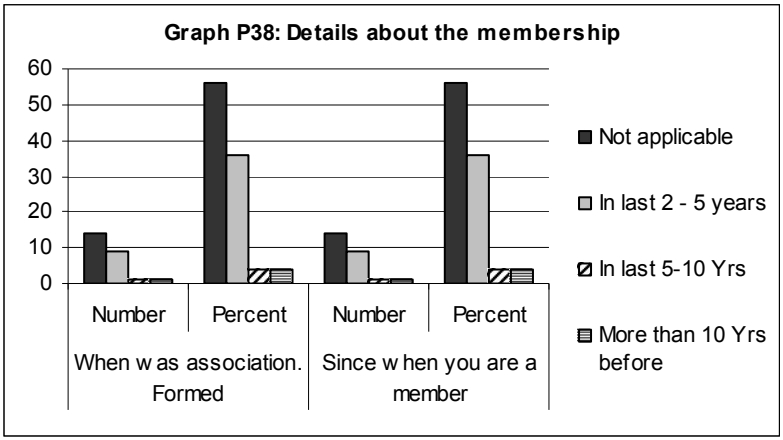


Table P39: Details about the association, Co-op society, NGO, etc.

Sr. No.	*Name of the organization and the number of members*	*Not applicable*	*AKPMA*	*CII*	*Total*
1	Number	14	9	2	25
2	Percent	56	36	8	100

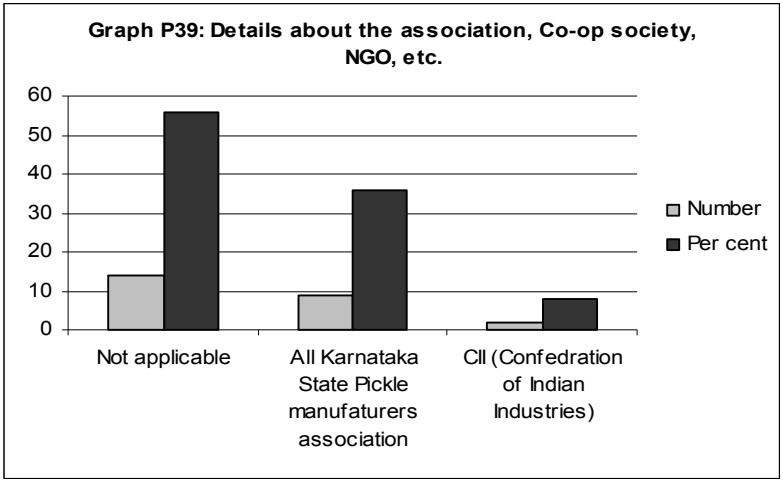


Table P40: Activities undertaken by the association.

Sr. No.	*Activities undertaken by the association*	*Number*	*Percent*
1	Not applicable	14	56
2	Liaising with government departments, nodal bodies, etc., for concessions	7	28
3	Training Programs	4	16
	Total	**25**	**100**

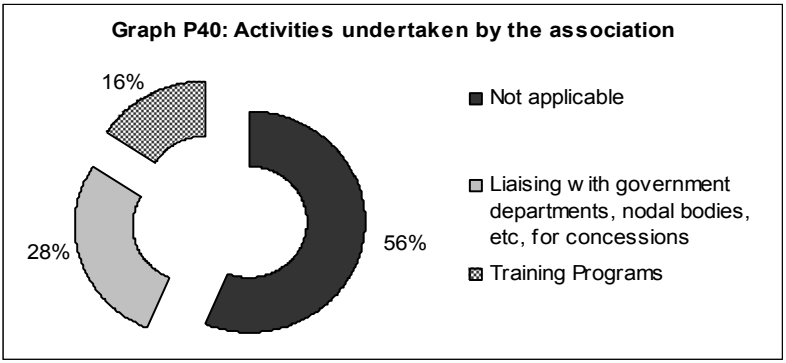


Table P41: Ranking support received from Association

Sr. No.	*How supportive is the association*	*Number*	*Percent*
1	Not applicable	14	56
2	Supportive	9	36
3	Very supportive	2	8
	Total	**25**	**100**

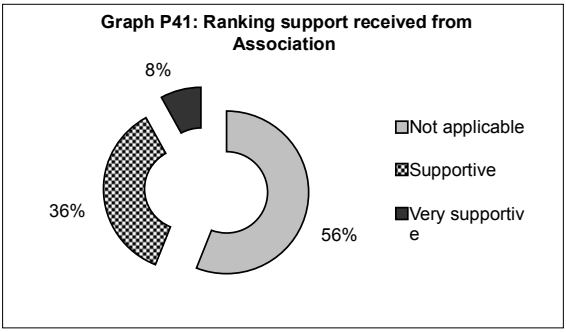


Table P42: Ranking the Financial incentives given by the Govt. to this industry

Sr. No.	*Rating Govt. support*	*Number*	*Percent*
1	No incentives	10	40
2	Marginal incentive	4	16
3	Normal incentive	11	44
	Total	**25**	**100**

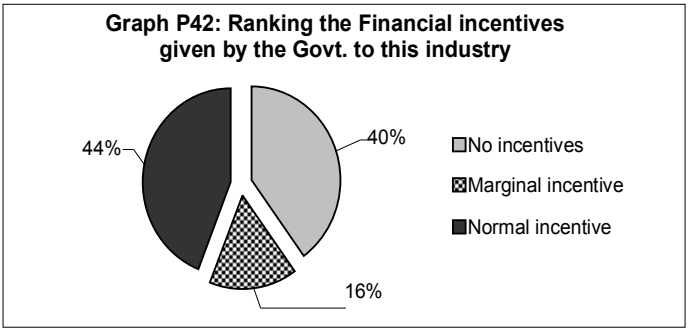


Table P43: Ranking support received from various Govt. nodal agencies

Sr. No.	*How would you rank the support*	*Number*	*Percent*
1	No support	24	96
2	Marginal support	1	4
	Total	**25**	**100**

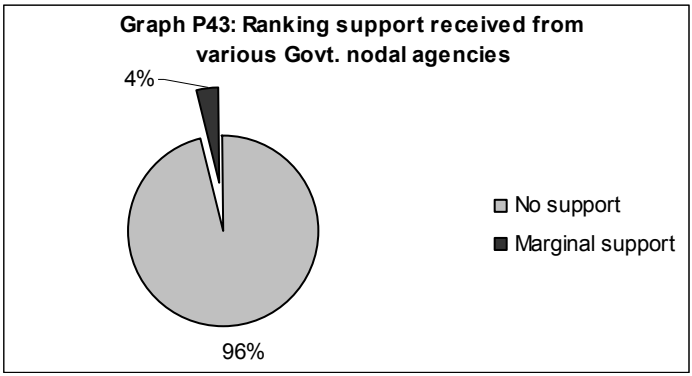
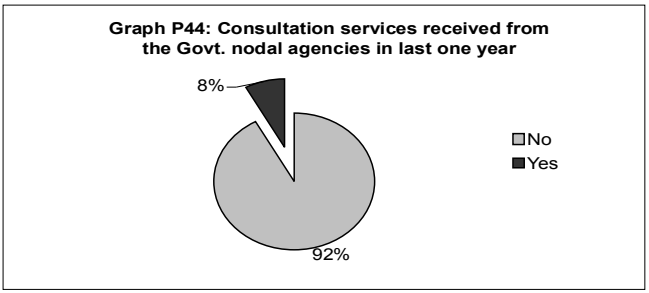


Table P44: Consultation services received from the Govt. nodal agencies in last one year

Sr. No.	*Consultation from Govt. nodal agency in last one year*	*Number*	*Percent*
1	No	23	92
2	Yes	2	8
	Total	**25**	**100**



Research Findings and Discussion

From the Table and Graphs P37 to P44 depicted above, following inferences can be drawn:

1. From the Table and Graph P37, it can be noticed that 44 percent of the respondents belonged to an association or NGO, whereas remainning 56 percent of them didn't belong to any association or NGO.
2. From the Table and Graph P38, it can be noticed that out of the 44 percent respondents who belong to some association or NGO; 36 percent be-came members in last 2 to 5 years; 4 percent in last 5 to 10 years; whereas remaining 4 percent became members more than 10 years back.
3. From the Table and Graph P39, it can be noticed that out of 44 percent respondents who belong to either APKMA or CII, 36 percent were members of All Karnataka Pickle Manufacturers Association (AKPMA), and the remaining 8 percent were members of Confederation of Indian Industries (CII). It can be further noticed that AKPMA was established very recently, i.e. in the year 2006.
4. From the Table and Graph P40, it can be inferred that liaising with the Government departments/nodal bodies/institutions like; NHM, NHB, APEDA, Agricultural Universities, etc. and the

Government (both state and central) itself for concessions and incentives to promote and strengthen this particular industry, and providing necessary training to members are the two key activities undertaken by these Associations.

5. From the Table and Graph P41, it can be noticed that out of 44 percent respondents who belonged to some Associations, 36 percent ranked the support received from Association as 'supportive' and 8 percent ranked the same as 'very supportive'.

From the above findings it can be inferred that fruit processors are slowly thinking of co-operative effort to strengthen the industry and hence want to belong to some Association. Many new Associations like; All Karnataka Pickle Manufacturers Association (AKPMA), etc. have been formed to take care of the interests of its members. The AKPMA liaised with concerned state government departments and government (state) itself and brought-in many concessions and incentives as discussed in the earlier part of this chapter. Below listed are some of the achievements of AKPMA;

(i) It was successful in bringing down the VAT rate applicable to 'Pickles and chutneys' from 16 percent to 12.5 percent, later from 12.5 percent to 4 percent and very recently from 4 percent to 0 percent.

(ii) It is assisting the new entrants in getting the FPO license from MOFPI (Ministry of Fruit Processing Industries), New Delhi.

(iii) It liaised with the state government and made this industry a 'green industry' which means processors need not have to take clearance from the KSPCB (Karnataka State Pollution Control Board).

(iv) The APMC (Agriculture Produce Marketing Committee) Cess (market cess) was brought down from 2 percent (on the tender mango purchases) to 0 percent.

(v) The Association conducted seminars and lectures by the experts from various fields like; Trademark and Brand Registry, Weights and Measurements, Food Safety Act, Packaging industry, etc., to educate its members and create awareness in them about the latest developments.

(vi) The Association had arranged visits to manufacturing facilities of the leading companies like; MTR Foods, Bangalore; Manjushree Extrusions Ltd., Bangalore; etc., to

assist members in understanding importance of various processes and practices followed by these companies.

From the above findings and discussion, we can reject null hypothesis Ho-03 and accept Ha-03 which states "Lack of cooperative effort amongst processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition".

Co-operative effort is one of the surest ways to address the concerns of fruit processors and will definitely help the industry to bloom like Dairy industry of India during 1980s.

6. From the Table and Graph P42, it can be inferred that 40 percent of the respondents opined that 'no financial incentives' were being given to this industry by the Government; 16 percent of the respondents opined that 'marginal financial incentives' were being given; whereas remaining 44 percent of the respondents opined that 'normal financial incentives' were being given to this industry by the Government.
7. From the Table and Graph P43, it can be noticed that 96 percent of the respondents opined that 'no support' was received from the government departments/nodal bodies/institutions like; NHM, NHB, APEDA, HOPCOMS, State department of horticulture, Agricultural Universities, MOFPI, etc., whereas remaining 4 percent opined that they received 'marginal support'.

The calculated Chi-square value: 21.2, being much higher than the table value: 3.841, we reject the null hypothesis which state that at least 50 percent of the processors received support from the concerned government nodal bodies.

8. From the Table and Graph P44, it can be inferred that 92 percent of the respondents neither consulted the government nodal bodies nor staff from the concerned government nodal bodies consulted processors in the last one year; whereas 8 percent of the respondents commented that they consulted the government nodal bodies.

The calculated Chi-square value: 17.6, being much higher than the table value: 3.841, we reject the null hypothesis which state that 50 percent of the processors availed consultation services from the concerned nodal government bodies.

From the above findings and discussion, it can be inferred that the government nodal bodies are not functioning properly. They are functioning like conventional government department (bureaucratic and political). Following are some of the key reasons for ill functioning of these government nodal bodies:

1. The bureaucratic 'top down' approach
2. Having strong influence of 'Inspector Raj'
3. Lack of incentives to work in the field. This will result in lack of interest to work in the field with either cultivators or processors.
4. Relying heavily on grants and aids from the government (either central or state) than making the nodal agency a self sustainable one.
5. Believing in subsidies and other financial incentives than providing necessary consultation, support services, technological knowhow, etc., to the processors.
6. Lack of strong, technically sound, dedicated, and vast extension network at ground level throughout the nation.
7. Lack of a strong well articulated clear cut vision and mission.
8. Lack of strong leadership (transformational) at the top.
9. Lack of co-ordination and integration within the organization, and also with other nodal bodies.

The above findings and discussion clearly reject the null hypothesis Ho-04 and accept the alternate hypothesis Ha-04 which states "Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the government departments/nodal bodies/ institutions with no clear direction and goals prohibit the processing industry of India from attaining the desired growth."

Thus there lies a most promising scope to import the 'Brazilian Model' where in a single nodal agency 'EMBRAPA' takes complete care of both farming community and processing industry by having a fool proof mechanism/system in place to address all their concerns/ problems and working in an integrated fashion with more clearer objectives, strategies and policies to sort out the contemporary upcoming issues. This is the secret of the success of Brazilian fruit processing industry.

Part D: Analysis of Concluding Information

Table P45: Whether respondent undertake regular exports or not

Sr. No.	*Do you undertake regular exports*	*Number*	*Percent*
1	No	22	88
2	Yes	3	12
	Total	**25**	**100**

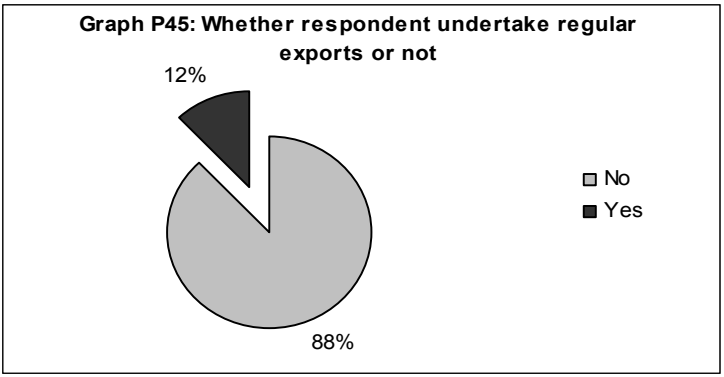


Table P46: % of SR spent on advertisement by the respondents

Sr. No.	*What % of SR you spend on advertisement*	*Number*	*Percent*
1	Zero Percent	17	68
2	1 to 5%	8	32
	Total	**25**	**100**

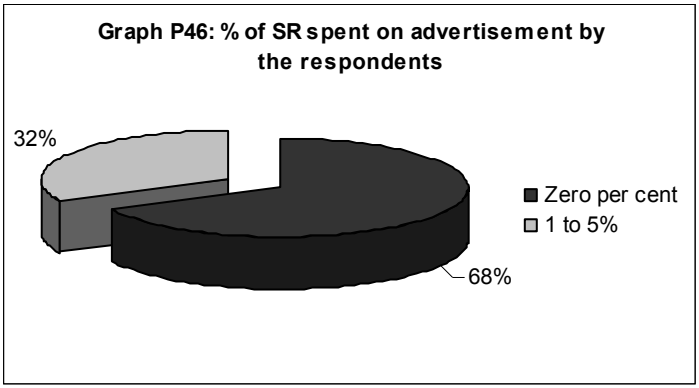


Table P47: Whether respondents undertakes any MR activity

Sr. No.	*Do you undertake any MR activity*	*Number*	*Percent*
1	No	25	100
2	Yes	0	0
	Total	**25**	**100**

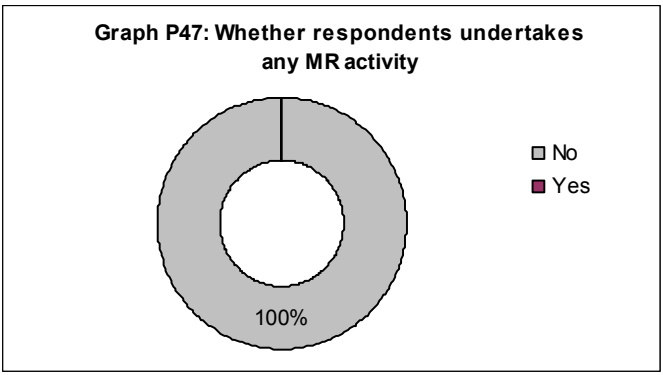
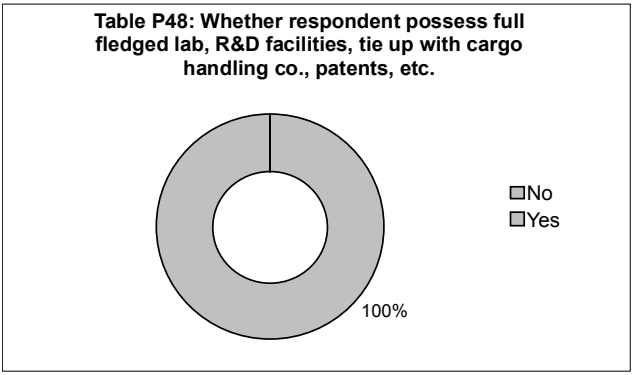


Table P48: Whether respondent possess full fledged lab, R&D facilities, tie-up with cargo handling co., patents, etc.

Si. No.	*Do you possess full fledged lab, R&D facilities, tie up with cargo handling co., patents, etc.*	*Number*	*Percent*
1	No	25	100
2	Yes	0	0
	Total	**25**	**100**



Research Findings and Discussion

From the Table and Graphs P45 to P48 shown above, following inferences can be drawn:

1. From the Table and Graph P45, it can be inferred that 88 percent of the total respondents did not undertook regular exports, whereas remaining 12 percent of the respondents undertook regular exports.

The calculated Chi-square value: 14.4, being much higher than table value: 3.841, we reject the null hypothesis which state that 50 percent of the respondents undertook regular exports.

As discussed in the secondary research (Chapter 4) there is a great demand for Indian processed mango products in the international markets (The exports of processed mango products in total was growing at the CGR of 13.70 percent between 1996 to 2005). But only 12 percent of the respondents, that too, only bigger companies undertook regular exports. The smallness of small processors prohibits the small processors from undertaking regular exports, as exports involve sizable investments in creating the necessary infrastructure. Hence small firms should come together and form Association/cartel/consortium, so that together they become big so that they can undertake regular exports.

2. From the Table and Graph P46, it can be inferred that 68 percent of the respondents didn't spend any amount on advertising their products in the mass media, whereas remaining 32 percent of the respondents spent one to 5 percent of their sales revenue on advertising.

Smallness of individual small processors prohibits them from advertising their products in the mass media, as it involves huge

spending. The solution to this problem is the co-operative effort. All small processors should come together, at least region wise, under one umbrella and advertise their products collectively so that spending will be distributed amongst all.

3. From the Table and Graph P47, it can be inferred that none of the respondents undertook any Marketing Research activity. Majority of the respondents even don't know the meaning of Marketing Research.

The calculated Chi-square value: 25, being much higher than the table value: 3.841, we reject the null hypothesis which state that 50 percent of the respondents undertake regular Marketing Research activities.

Carrying out regular Marketing Research activities involve a great deal of talent, expertise, time, and amount. This makes undertaking regular MR activities difficult for small firms and even for medium scale enterprises. So small and medium enterprises (SMEs) should come together and form an Association so that regular MR activities can be undertaken. This will benefit every firm, as all the firms will be made aware about some of the important factors listed below;

(i) Ongoing developments happening in the market
(ii) Changing customer preferences
(iii) Changing customer profiles
(iv) Changing customer needs
(v) Emerging substitutes
(vi) Changes in the competition forces
(vii) Changing customer attitudes
(viii) Changing customer behavior
(ix) Predicted demand for the forthcoming year, etc.

4. From the Table and Graph P48, it can be inferred that none of the respondents possessed full fledged laboratory facilities, R&D facilities, Patents, tie-up with cargo handling companies, etc.

The calculated Chi-square value: 25, being much higher than the table value: 3.841, we reject the null hypothesis which state that 50 percent of the respondents undertake regular Marketing Research activities.

This indeed is a matter of grave concern for the entire Indian Fruit Processing Industry. For an industry to flourish, it is must for the firms to have all such facilities/infrastructure. Ongoing improvement of the product, new product development, process re-engineering, etc. will be made possible through such kind of facilities/infrastructure. Brazil is far ahead compared to India when it comes to possessing of such kind of facilities/infrastructure. Creation of such unique facilities/infrastructure has become must for all the firms, if they want to emerge as the market leader not only in domestic markets but also in international markets. Strategic re-orientation is the need of the hour.

From the above research findings and the discussion, we can reject the null hypotheses Ho-02, Ho-03 and Ho-04 and accept alternate hypotheses Ha-02, Ha-03 and Ha-04, which are re-stated here-in-under;

(Ha-02): "Indian fruit processing industry especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging, marketing of the output, etc. This is a serious bottleneck for this industry".

(Ha-03): "Lack of cooperative effort amongst processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition."

(Ha-04): "Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the government departments/nodal bodies/institutions with no clear direction and goals prohibit the processing industry of India from attaining the desired growth."

7 Chapter

Conclusion and Recommendations

Conclusion of the Study

Based on the thorough evaluation of the findings of the research and critically analyzing their interpretations and subsequent discussions, as discussed in the last three chapters, i.e., Chapter 4 – secondary research, chapter 5 – primary research pertaining to cultivators, and Chapter 6 – primary research pertaining to processors; following conclusions have been drawn:

1. **The alternate hypothesis Ha-01, which is restated here-in-under is accepted.**

(Ha-01): "Indian fruit processing industry especially mango processing industry is affected by non availability of high yield, high pulp containing varieties of mangoes that also have high resistance towards pest attack which are ideal for processing".

This in turn is due to non availability of quality seedling/sapling of the desired variety at the time of plantations and lack of adequate extension support to farmers from the concerned Government nodal agencies.

This means that farming community should be provided with the required extension support by the concerned departments, nodal agencies and institutions with regard to following;

1. Providing right variety quality seedling/sapling in right quantity at right time. Necessary arrangements have to be made to ensure this.
2. Careful monitoring of the growth.
3. Using effective and efficient farm management practices.
4. Using right mode for harvesting at the right time.

5. Employing effective and efficient post-harvest management practices and post harvest technologies.
6. Seeking the benefits of economies of scale.
7. Minimizing post harvest loss, etc.

Cultivators should be made aware (educated) about the benefits of growing right variety, including fetching of better price for their produce in the market. Necessary steps need to be taken in this direction. Government departments/nodal bodies/institutions/NGOs/Co-operatives /Associations need to reorient their strategies and reallocate their resources in the right direction to ensure that farming community will not be deprived of necessary KSAs (knowledge, skills and abilities) and the basic infrastructure. This certainly will change the attitude and mindset of cultivators.

2. The alternate hypothesis Ha-02, which is restated here-in-under is accepted.

(Ha-02): "Indian fruit processing industry especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging, marketing of the output, etc. This is a serious bottleneck for this industry."

This means that there lies a tremendous scope to revamp this industry by; adopting well proven strategies, channelizing the funds properly to create the necessary infrastructure that is required, extending necessary support to the farming community as well as fruit processing industries by the concerned government departments, nodal bodies, and institutions, etc. Traditional practices needs to be replaced with ultra modern practices that embrace technological advancements together with sound management skills. This will definitely bring down the post harvest loss to more reasonable levels.

Creating necessary infrastructure should be the top most priority. All the stake holders should come together, join their hands and work on this common agenda of building necessary infrastructure, which is the need of the hour to turn around this industry. Government departments/nodal bodies/institutions/NGOs/Co-operatives/Associations need to reorient their strategies and re-direct/re-allocate their resources in the right direction to ensure that both farming community as well as processing industry will get all the necessary facilities/infrastructure that is required. This certainly will strengthen the fruit processing industry of India.

3. **The alternate hypothesis Ha-03, which is restated here-in-under is accepted.**

(Ha-03): "Lack of cooperative effort amongst farming as well as processing community is a serious hindrance that prohibits this industry from reaping the benefits of larger e conomies of scale and higher value addition."

This in turn mean smallness of individual cultivators and processors is the prime cause for their exploitation and is preventing Indian fruit processing industry from exploiting the huge potential that India has in this sector.

A cooperative movement amongst farming as well as processing community will strengthen their position with regard to the following;

(i) Creating necessary infrastructure like; well developed nurseries, laboratories, storage facilities including cold storage, pre cooling, and freeze drying facilities, packaging facilities, processing facilities, marketing and sales networks, extension networks, GIS facility, regional cargo airports, etc., will become possible.

(ii) Reaping the benefits of larger economies of scale and higher value addition will become possible.

(iii) Adopting an integrated approach right from the farm gate till final consumer encompassing all the activities like; planting the right variety quality seedling/sapling, harvesting at right time, proper grading, proper storing, error free processing, innovative packaging, efficient and effective marketing and selling, etc., will become possible.

(iv) Enjoying higher power to bargain in the market will lead to fetching better prices for their output, which in turn will improve the financial position of the cultivators and the processors.

(v) Creating a niche in the international market for Indian produce can be made possible through proper positioning, advertising, and marketing of the Indian products successfully in the international markets.

(vi) Changing the attitude and mindset (negative) of Indian consumers towards packed and processed fruit products can be accomplished through massive advertisements and awareness campaigns.

(vii) Developing and employing advanced technology for improving the quality standards of end products can be made possible.

Enchanting success of 'green revolution' and 'white revolution' in India has already set the trend. A similar approach needs to be followed to turn around this industry and making 'horticulture revolution' a successful one.

4. The alternate hypothesis Ha-04, which is re-stated here-in-under is accepted.

(Ha-04): " Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the government departments/nodal bodies/institutions with no clear direction and goals prohibit the farming community and processing industry of India from attaining the desired growth."

Following the footsteps of Brazil, wherein majority of cultivators are so big that they have their own processing facility. Those processors who don't own farms will enter into buy-back agreement through under contract farming with big cultivators. This, ultimately mean that all cultivators are processors and *vice versa*. 'EMBRAPA' provides necessary extension support to both groups and ensure that there lies harmony between the two groups and creates a "WIN-WIN" environment for both.

'EMBRAPA' employs 120,000 farmer agro-technology extension agents who work shoulder to shoulder with cultivators in the field using a 'Bottom Up' approach, innovating all the time.

Whereas in India, there lies a huge gap between these two groups, i.e., cultivators and processors. This has paved the way for 'middlemen menace', the serious problem facing this industry. The concept of "farm gate to customers' plate" has remained a concept only. NHB (National Horticulture Board), the Apex nodal body of India, employs 134 people altogether out of which 32 people are directors. It employ a 'Top Down' approach and focus on; launching new schemes; seeking grants from the Government; and distributing the same to cultivators and processors.

This means there lies a most promising scope to import the 'Brazilian Model' where in a single nodal agency 'EMBRAPA' (Brazilian Agency for Agricultural Research and Animal Husbandry)' takes complete care of both farming community and processing industry by having a fool proof mechanism/system in place to address all their concerns/problems and working in an integrated fashion with clear cut

objectives, strategies and policies to sort out the contemporary upcoming issues. This is the secret of the success of Brazilian fruit processing industry.

Recommendations

India the second largest producer of fruits (contributing to 9.54 percent of world production and growing at the CGR of 3.04 percent) and the topmost producer of mango (contributing to 45.47 percent of world production but growing at CGR of – 0.86 percent), has a competitive advantage over other countries in terms of natural endowments namely;

1. India has the right soil to grow almost all varieties of fruits.
2. India has the right climatic condition, quiet ideal to grow fruits of almost all kinds.
3. India has abundant source of spring water (underground source) that is required to grow fruits.
4. India has a rich and vast biodiversity, making it an ideal destination to grow fruits.

Moreover Indian 'Alphonso' is the most sought after fruit in the world. There is a great demand for fresh mangoes (exports are growing at the CGR of 8.03 percent) and also the processed mango products (exports are growing at the CGR of 12.87 percent) in the international markets. Indian fruit cultivators and fruit processors should realize the tremendous potential of this particular industry and exploit the same.

Following recommendations which are based on the findings of the research work undertaken will help Indian cultivators and processors in reaping benefits, which this sector has in store for them.

A. Recommendations to Fruit cultivators in general and Mango cultivators in particular:

1. Only one variety, i.e., 'Tom Atkins' which is similar to 'Alphonso' of India accounts for 70 percent (approximate) of total production in Brazil. Whereas 'Alphonso' and 'Totapuri' which are supposed to be ideal for processing, together account for around 5 percent (approximate) in India. Brazilian cultivators grow finger count varieties, whereas we will find more than 3,000 varieties being grown in India.

This clearly reveals the severity of the problem. Hence Indian fruit cultivators, especially mango cultivators should grow the right variety of

fruits like 'Alphonso' which are ideal for processing and also have a great demand (for both fresh fruit and processed fruit products) in not only international markets but also domestic markets. Growing such varieties will fetch a better price for their produce and strengthen their financial position.

2. Indian fruit cultivators, especially mango cultivators should buy /procure the certified seedling/sapling of the right quality and right variety from the qualified suppliers only. Because once planted nothing much can be done and cultivator has to suffer losses due to lower yield, poor demand and lower price throughout the life of that plant.
3. Farms/orchards (cultivating fruits) should be managed professionally and ongoing investments should be made in creating the necessary infrastructure like storage facility, grading facility, packing facility, etc., in the farm itself. Farms should be managed like we manage any profit making business venture and shouldn't be treated as any other appreciating asset. Necessary competencies (skills, knowledge and attitudes) need to be acquired/developed by cultivators through appropriate training/education.
4. Indian fruit cultivators in general and mango cultivators in particular should rejuvenate the old plants (mango trees of 20 years and above) using propagation techniques without disturbing the established root system, as their yield will be reduced significantly.
5. Indian fruit cultivators (large scale) will be better off if they export fresh fruits to developed countries like; UK, USA, Netherlands, etc., which yield higher value contribution than developing countries like Bangladesh, Nepal, etc. They need to maintain required quality standards in terms of percentage of pesticide residue, percentage of deceased fruits, etc., to qualify as a supplier to these developed countries.

So it has become must for Indian fruit cultivators (large scale), to grow fruits in an organic environment and to have the basic infrastructure facilities like VHT (Vapor Heat Treatment) facility which will preserve the freshness of the fruits for a very long time. It has become mandatory for Indian fruit cultivators (large scale) to have necessary facilities to grade, clean and pack the fruits properly and to have an access to; cold chain facility for storing their produce for a longer duration and air cargo facility for enabling quick shipment of fruits.

6. Indian fruit cultivators in general and mango cultivators in particular should come forward, join their hands and form co-operatives/associations and run them successfully like small milk producers did during 1980s. Regional fruit cultivators' associations need to be formed like 'Suvarna Karnataka Maavu Belegarar Sangha' of Hanagal during 2006. Every fruit growing region should have a strong co-operative/association so that necessary infrastructure can be created, collectively, with the help of Nodal agencies/Government departments/other concerned Institutions. Forming such co-operatives/ associations will strengthen their position in the market, as they can sell their produce under one brand name like 'MAHAGRAPE' in Maharashtra. Collectively, they can set their own processing facility, which will ultimately make every cultivator a processor like in Brazil. Co-operative movement amongst cultivators is the need of the hour to turn around this industry.

Problems that arise due to the smallness of the cultivator can all be addressed through such a co-operative movement throughout the nation. Creation of advanced, capital intensive, and state of the art infrastructure facilities like; cold chain, gene bank, cargo airports, terminal markets, pre-cooling centers, nurseries, full fledged laboratories with all the technologically advanced equipments, etc., is possible only through such co-operative effort. All the stake holders namely; Government (both state and central), all concerned Government departments, NGOs, nodal bodies, agricultural universities, CFTRI, and all concerned institutions together with cultivators and processors, should come together and create a common platform to launch/intensify this movement throughout the country.

B. Recommendations to fruit processors in general and mango processors in particular:

1. Indian fruit processors in general and mango processors in particular should capitalize on the phenomenal growth which this sector has experienced in terms of exports of processed fruit products (CGR of 12.87 percent aggregate) and exports of processed mango products (CGR of 13.25 percent aggregate) in the past years. The big Indian business houses like; Reliance, TATA, ITC, etc., and also the processors should redirect/re-allocate the resources with a strategic re-orientation to meet this increasing global demand. India should reposition herself in the

global market as a prime supplier of processed (high value added) fruit products and not just fresh fruits.

2. Like Brazil, India should focus on exporting value added processed fruit products like fruit juices (Brazilian exports of fruit juices stand at US$ 114 million compared to Indian exports of the same which stands at US$ 0.77 million), etc. than simply the fresh fruits. Moreover the byproducts of fruits like mango kernel, etc. should not be wasted. Indian processors should think of producing value added products like mango kernel oil, mango butter, mango margarine, cosmetics (base material for facial creams), feed for pigs (for piggery industry abroad), etc., from such by products.

Indian mango processors (especially large scale enterprises and MNCs) should strengthen their R&D facilities so that they can look for various applications like; facial creams, mango butter, etc., from such intermediary products or byproducts like; mango kernel, mango kernel oil, mango flour, etc.

This strategic move will have a strong and positive impact on Indian economy in terms of employment generation, increased exports, stronger BoP (Balance of Payments) position, and reduction in postharvest losses to international standards (from existing level of 35-40 percent to 20 percent). India needs to follow the footsteps of Brazil in this regard.

3. Indian fruit processors should undertake and speed up technology Upgradation. They should bring in advanced technology from the developed countries or the leading countries like Brazil. Mechanization, automation, computerization, and integration of the processes involved have become mandatory if the fruit processors want to compete in the international markets. (Thirty percent of Brazilian imports pertaining to FPI constitute food processing machines and other agricultural machines, whereas the same is 10 percent for India).

Simultaneously the processors should adopt all sorts of best management practices like SPC (Statistical Process Control), SQC (Statistical Quality Control), KAIZEN, Six Sigma, TQM (Total Quality Management), etc., to make the processes error free and fool-proof, which will subsequently result in final products with zero defects. Once the fruit processors adopt the practices mentioned above, they become eligible for ISO certification.

4. Having basic facilities like; full fledged laboratory, basic R&D facility, tie-up with cargo handling companies, water purification plant, etc., are all must for fruit processors to flourish in this industry. Ongoing improvements in the processes and products can be made possible through developing such kind of facilities.

So fruit processors of India (especially large scale processors) should make tangible investments in creating/developing such kind of facilities, which will definitely provide them the competitive edge over processors of other countries.

5. Indian processors will be better off if they export processed fruit products to developed countries like; UK, USA, Netherlands, etc., which yield higher value contribution than developing countries like Bangladesh and Nepal and Middle East countries. Even though the quality standards of the developed countries are much stringent than the developing and Middle East countries, they are very rewarding.
6. Indian processors should realize that there lies vast potential in the domestic market also for both fresh fruits as well as processed fruit products. Disposable income of the so called 'middle-class and upper middle-class' population has increased significantly. Also the sheer population of this class has increased significantly (around 350 million, as per recent estimate). Their standard of living also has undergone dramatic change. They have become more health conscious. Their spending on fresh fruits and processed fruit products has become more generous. But due to strong traditional and cultural values held by Indian population in general, it is felt that they are bit reluctant to consume processed and packed fruit products and are used to eating fresh fruits.

This is a challenge as well as an opportunity for Indian fruit processors in general to change the mindset and attitudes of this class through active promotional campaigns aimed at creating awareness in the minds of these people about the nutritional values of these products and their benefits. It also calls for creative advertisements by the fruit processors, collectively.

7. Indian processors (especially small processors) should come forward, join their hands and form co-operatives and run them successfully like it happened with dairy industry during 1980s. Regional fruit processors' associations need to be formed like

AKPMA (All Karnataka Pickle Manufacturers Association) during 2007. Every fruit processing region should have a strong association, so that necessary infrastructure can be created, collectively, with the help of Nodal agencies/Government departments/other concerned Institutions. Forming such associations will also strengthen their position in the market. Collectively, they can set the terms for 'under contract farming' and 'buy-back agreement' with the cultivators, which will ultimately make every processor a cultivator like in Brazil. Co-operative movement amongst processors (especially small processors) is the need of the hour to turn around this industry.

Problems that arise due to the smallness of the processor can all be addressed through such a co-operative movement throughout the nation. Creation of advanced, capital intensive, and state-of-the-art infrastructure facilities like; cold chain, cargo airports, logistic support systems, full fledged laboratories and testing centers with all the technologically advanced equipments, etc., is possible only through such co-operative movement. All the stake holders namely; Government, all concerned Government departments, NGOs, nodal bodies, agricultural universities, CFTRI, and all concerned institutions together with cultivators and processors, should come together and create a common platform to launch/intensify this movement throughout the country.

C. Recommendations to Government Departments/Nodal bodies/Other concerned Institutions:

1. Concept of RBHs (Rural Business Hubs) as discussed in chapter 5, which is aimed at identifying rural pockets (potential centers) and developing them in to 'Business Hubs' through infusion of critical inputs and services and also providing an assured market for their produce need to be implemented on top priority. This will curb the 'middle men menace', a serious problem facing this industry.
2. Certified good quality seedling/sapling of the right variety should be made available to cultivators at the time of plantations. Cultivators should also be made aware about the drawbacks associated with growing available varieties other than recommended varieties, which are ideal for processing. Conducting awareness campaigns, field shows, Krishi melas, etc., at village levels is required. All concerned institutions, nodal bodies and Govt. departments should come together and address this issue.

3. All concerned Government departments and nodal bodies including; NHB, NHM, HOPCOMS, State Horticulture Department, APEDA, MOFPI, etc., should work in an integrated manner under one banner like 'EMBRAPA' of Brazil. Objectives of a particular agency should not conflict with the other. There has to be synergy amongst all concerned departments.
4. 'Office enjoyment' culture, largely driven by scientists working in laboratories and directors framing strategies and policies based on the recommendations of scientists; need to be supplemented with 'field support' culture. Strong extension network throughout the country is the need of the hour, where-in the field extension agent will spend most of his/her time working in the field, supporting the cultivators as well as processors in addressing their concerns and educating them on continuous basis.

We should follow the footsteps of Brazil and China in this regard, where-in strong and vast extension network of highly motivated, technically sound, and dedicated team of extension agents, work in the field with the cultivators and processors addressing their concerns and educating them on continuous basis.

5. These bodies should realize that giving grants and subsidies is not the only solution. Strong extension network throughout the country, supporting both the farming community and the processors, is the need of the hour. At least one well equipped Agriculture Extension Office, lead by Agricultural Extension Agent (A self motivated person who is an expert possessing required knowledge, skills and abilities), for every RBH (Rural Business Hub) is what is required. His/her job is to provide total extension support to cultivators as well as processors.
6. An extensive awareness campaign/program to disseminate information about consumers' preferences of the importing countries, suitable export quality varieties, advanced post harvest technologies, phytosanitary measures like VHT (Vapor Heat Treatment), etc., need to be conducted for both cultivators and processors.

Modern methods of processing like aseptic packaging, vacuum concentration, aroma recovery, etc., are preferred by the importing countries. So processors should be made aware about all such technological advancements through conducting regular workshops for processors.

7. All the nodal bodies/Government Departments/concerned Institutions should work on a common agenda of building required infrastructure. They should liaise with Government authorities to get the necessary approvals and also the funds for creating the same.

D. Recommendation to Agriculture Ministry, Government of India:

1. Government of India should seriously think of importing the Brazilian model 'EMBRAPA' to India. A team of experts (comprising all the stake holders) have to be sent to Brazil on a study tour for one full year (at least) to study and analyze how the entire system works during different times (plantations, nurturing, flowering, fruit bearing, ripening, harvesting, post harvesting, etc.,) in Brazil. The similar model with required alterations/modifications based on the advice of team, to suit to Indian context, can be developed and implemented in India. 'EMBRAPA' can also act as a consultant for Indian Government in this regard.

8 Chapter

Limitations of this Study and Scope for Further Studies

Limitations of the Study

In spite of all the efforts by the author to accomplish the study without any serious limitations, limitations are bound to arise, and this research project is not an exception. The subject opted for research, i.e., "Current Status of Indian Fruit Processing Industry vis-a-vis Brazil – A Case Study of Mango" is by nature a very vast subject, covering all the fruits in general and mango in particular. Vastness of the subject area is the primary source of limitations. Vastness of the geographical, agronomical, and demographical coverage is another important source for limitations. Some of the major limitations of this study can be grouped in to two categories as discussed below:

Limitation Pertaining to Secondary Research

1. The secondary data collected from the reliable and authenticated sources were sometimes not very specific and this has lead to making fair assumptions by the author, which may not be 100 percent valid all the times.
2. Secondary data beyond some period in some cases was not available and hence study has to be limited till that period.
3. Specific secondary data for Brazil in some cases was not available and hence study has to be restricted to available data.
4. Many countries including India and Brazil maintain statistics about production, yield, area of cultivation, post harvest loss, etc., of the 'fruit and vegetable' category as a whole. This sometimes, limits the study to available specific data on fruits only.
5. Hundred percent similar, compatible and comparable information about the subject matter for two different countries is very difficult to get. Under such circumstances, researcher is forced to choose the closest information. This will limit the study like this to available closest match.

Limitation Pertaining to Primary Research

1. Advantages of census survey will be lost if researcher opts for alternate survey methods like Probabilistic/non probabilistic sample survey methods. In spite of the practical advantages of sample survey (in terms of cost, time, and effort) such surveys will have their own limitations including;
   (i) A given sample (chosen using a given sampling scheme) may not represent the entire population completely (i.e., 100%).
   (ii) There might be biases, judgment errors, sampling errors, etc., while conducting sample surveys.
   (iii) Results may not be 100 percent valid.
   (iv) Results may not be 100 percent accurate.

These are the obvious limitations of this particular study also, as it is based on sample survey. Smaller sample size (25 processors and 50 cultivators) is another important limitation of this particular study.

2. The author has to arrive at findings based on the information given by the respondents, which sometimes may be biased/distorted for various reasons. This, to some extent, might have lead to marginal errors in the outcome of the study.
3. A human error is another important source of limitation for any study like this. In spite of repetitive editions, scrutinizing, critical evaluation of the subject matter, error might have happened and hence may limit the study to that extent.

Overall Limitation

As the topic clearly says "Current status of Indian fruit processing industry *vis-a-vis* Brazil – A Case Study of Mango", this study is limited to fruit processing industry in general and mango processing industry in particular.

Scope for Further Studies

On Similar lines, studies can be undertaken to cover major vegetables that are being produced in India like; Potato, Tomato, chilli, etc., and the processing industry of the same with the leading processors of that particular vegetable in the world.

In a similar fashion, study like this can also be undertaken in the other core food processing sectors of India like; Poultry industry, Sheep raring industry, Ostrich cultivation industry, Fisheries industry, etc.

Secondly, within mango processing industry, particular major processed mango product produced in India like; Mango pulp, Mango juice, Mango squash, Mango pickle and chutney, etc., can be chosen and an in-depth comparative study about that particular processed mango product can be pursued on similar lines. In other words, an in-depth and well-focused research project can be undertaken on any one of the major processed mango products of India.

Lastly, such type of benchmarking study can be pursued not only in the food processing sector, but also in majority of the other important sectors of India, including; Textiles industry, Sugar manufacturing industry, Steel industry, Electronic appliances industry, etc.

Such benchmarking studies at macro level will throw light on the important CSFs (Critical Success Factors) that have to be set right, in order to thrive in a given industry, globally. Such studies will help the nation in locating major hurdles which prevent the nation from thriving, in that particular sector. Outcome of such research projects will be used to frame/guide the strategies and policies by all the stakeholders involved, in order to overcome the hurdles. Thus such studies will help the nation in strengthening the respective industry though implementing strategies framed and evaluating the same on a continuous basis, so that the industry will remain competitive, globally.

There lies a tremendous scope for Action Research once the descriptive and diagnostic research like this is completed. Such Action Research requires choosing one particular small mango growing area (one village/taluk/district/ state) and to try-out/implement recommended strategies in that particular geographic area. Once strategies are implemented, results can be sought and evaluated. Based on the attractiveness of the results, the strategy may be replicated throughout the nation.

The following quotes clearly demonstrate the importance of benchmarking studies:

1. ‘common country learns from her own mistakes, whereas a smart country learns from others mistakes’
2. ‘why spin the wheel again’

❋ ❋ ❋

Appendices

Appendix I

Table 1(I): Major fruit producing countries of the world and their production quantity in 000'Tonnes

	Year									
	1996	***1997***	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***		
Countries	***Quantity***	***Quantity***	***Quantity***	***Quantity***	***Quantity***	***Quantity***	***Quantity***	***Quantity***	***% contribution***	***CGR***
China	45462	52748	55037	64826	64614	68921	72002	72003	13.60	6.70
India	39197	38531	38561	45758	48571	45041	45951	45911	9.54	3.04
Brazil	35928	38309	35009	37094	331 18	33306	35734	34064	7.75	-1.16
USA	28841	32331	3 1 466	28064	32600	30064	30298	29125	6.66	-0.29
Italy	17182	15633	17760	18427	17881	18287	16076	15728	3.76	-0.50
Spain	12095	5426	13667	15421	16167	15142	15747	17071	3.31	3.48
France	11211	11020	10344	11701	11155	11041	10682	9730	2.38	-1.18
Turkey	9534	9750	10389	10625	10540	10738	10584	11200	2.28	2.07
Mexico	12179	12595	11730	12513	13290	14296	13940	14716	2.89	3.00
Philippines	7388	10543	10024	10303	10597	11119	11516	1804	2.29	14.95
Thailand	6577	7265	6924	7629	7544	7770	7547	7521	1.61	1.16
Iran	9774	10895	11172	11447	10868	12672	12864	12712	2.54	3.63
Others	178564	187944	180213	183989	189469	193845	194955	198665	41.39	1.41
Total	**413932**	**442990**	**432296**	**457797**	**466414**	**472242**	**477896**	**480250**	**100.00**	**2.05**

Source: FAO Production year book for the years 1996 to 2003

Appendix II

Table 1(II): Major Mango producing countries of the world and their production quantity in 000'Tonnes

	Year									
	1996	1997	1998	1999	2000	2001	2002	2003		
Countries	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	% contribu-tion	COR
India	10000	12000	12000	11400	11500	10240	10640	10500	45.47	-0.86
	1208	2150	2127	3127	3211	3273	3513	3413	11.34	11.3
Thailand	665	1350	1250	1350	1350	1700	1750	1750	5.75	2.32
Mexico	1420	1500	1474	1508	1559	1577	1523	1503	6.21	0.85
Pakistan	908	914	917	927	938	1037	1036	1036	3.97	4.85
Philippines	480	987	932	866	848	882	956	890	3.52	9.08
Indonesia	600	1088	600	827	876	923	1403	731	3.663	4.88
Brazil	435	600	600	456	538	782	842	845	2.63	6.18
Nigeria	500	689	731	729	729	730	730	730	2.87	3.55
Egypt	240	231	223	287	299	325	326	326	1.16	5.54
Others	2759	2786	2896	3181	3188	3673	3760	3839	13.45	14.05
Total	**19215**	**24295**	**23750**	**24658**	**25036**	**25142**	**26479**	**25563**	**100**	**3.16**

Source: FAO Production year books for the years 1996 to 2003

Appendix III

Table 2: Agrarian structure of India and Brazil Area in 000'Hectares

Year	1985		1990		1995	
Parameter	India	Brazil	India	Brazil	India	Brazil
Total area	328726	851488	328726	851488	328726	851488
Total land area	297319	845942	297319	845942	297319	845942
Total arable area	169015	53241	169438	57408	169750	65500
Total arable land under temporary crops	163215	47300	163138	50681	162250	58059
Total arable land under permanent crops	5800	5941	6300	6727	7500	7441
Total non arable land	128304	792701	127881	788534	127569	780442
Total Forest Cover	66910	476500	67200	476800	67359	477048

Year	*2002*		*2005*	*Average % incr/decr*			
Parameter	*India*	*Brazil*	*India*	*India*		*Brazil*	
Total area	328726	851488	328726	***		***	
Total land area	297319	845942	297319	***		***	
Total arable area	170115	66580	170300		0.04		1.33
Total arable land under temporary crops	161715	58980	160300		-0.09		1.31
Total arable land under permanent crops	8400	7600	10000		3.62		1.48
Total non-arable land	127204	779362	127019		-0.05		-0.09
Total Forest Cover	67500	477398	67701		0.06		0.01

Source: FAO commodity year book series and the little green and red data book series of WB (World Bank)

Appendix IV

Table 3: Population distribution structure of India and Brazil based on their primary activity Population in 000's

Year	*1990*		*1995*		*2002*		*2008*		*Average % incr/decr*	
Parameter	*India*	*Brazil*	*India*	*Brazil*	*India*	*Brazil*	*India*	*Brazil*	*India*	*Brazil*
Total population	846418	148809	931351	160545	1049549	176257	1110000	189000	1.73	1.5
Total agricultural population dependent on agriculture for their livelihood	630279	37562	683633	35196	754819	31221	***	***	1.65	-1.41
Total economically active population	358344	65445	399333	72293	460252	81406	***	***	2.37	2.03
Economically active population engaged in agriculture	229417	15232	247073	14297	270252	12673	***	***	1.48	-1.4
Economically active population engaged in agriculture as a percentage of Total EA population (%)	64%	23.30%	61. 90%	19.80%	58.70%	15.60%	***	***	-0.69	-2.76

Source: FAO commodity year book series and the little green and red data book series of WB (World Bank)

Appendix V

Table 4(I): FAO indices for total food production, total agricultural production, total crop production, total live stock production and total cereal production of India and Brazil

Base year: 1999-2001: 100

Year	*1994*		*1995*		*1996*		*1997*	
Parameters	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Total Food production	83.40	80.90	85.70	86.70	89.40	85.40	91.40	89.10
Total agriculture production	84.10	80.70	86.40	85.50	90.30	84.50	91.80	88.10
Total crop production	86.60	86.00	88.10	88.50	92.30	83.30	93.00	88.70
Live stock production	78.20	76.50	82.40	83.60	85.40	87.20	88.90	87.50
Total cereal production	88.70	91.70	86.90	99.00	91.10	88.50	93.10	87.50

Year	*1998*		*1999*		*2000*	
Parameters	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Total Food production	94.20	89.90	98.70	97.00	99.50	98.90
Total agriculture production	94.70	89.40	99.00	96.60	99.20	99.10
Total crop production	95.30	90.00	100.00	96.60	98.60	98.50
Live stock production	93.30	88.20	96.90	95.50	100.70	99.60
Total cereal production	95.20	79.30	99.10	96.30	97.90	92.60

Source: FAO commodity year book series and the little green and red data book series of WB (World Bank)

Appendix V

Table 4(II): FAO indices for total food production, total agricultural production, total crop production, total live stock production, total cereal production of India and Brazil

Base year: 1999 -2001: 100

Year	*2001*		*2002*		*2003*		*2004*	
Parameters	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Total Food production	10 1.80	104.10	97.10	1 I 1.30	103.10	118.60	105.40	125.10
Total agriculture production	101.70	104.40	96.60	112.20	103.20	118.10	106.20	126.80
Total crop production	101.50	105.00	93.00	111.00	10 1.1 0	120.60	****	****
Live stock production	102.40	104.90	105.20	111.60	109.20	117.50	****	****
Total cereal production	103.00	111.1 0	84.70	100.70	97.10	128.20	****	****

Year	*2005*		*Average % incr/decr*		*CGR*	
Parameters	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Total Food production	105.60	125.40	2.22	4.58	2.12	4.28
Total agriculture production	106.30	126.60	2.20	4.74	2.06	4.48
Total crop production	****	**.*	1.67	4.02	1.51	3.81
Live stock production	****	****	3.96	5.36	3.73	4.51
Total cereal production	****	****	0.95	3.98	0.88	2.85

Source: FAO commodity year book series and the little green and red data book series of WB (World Bank)

Appendix VI

Table 5: Imports of major groups related to FPI (fruit processing industry) for the past years of Brazil and India

Value in 000' US

Year	2000		2001		2002		2003	
Major groups	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Fruits/nuts fresh or dried	392509	204973	252040	187531	387274	142091	467463	126412
Fruits nrenared/preserved	1003	29649	896	23527	1318	23283	2813	18914
Fruit juices	6600	5832	9266	8401	9342	5515	7416	2298
Seeds and oleaginous fruit, whole or broken for fixed oil	3967	146768	2145	144826	9677	183283	14299	244300
Food nrocessine: machines	15659	73767	21258	71183	16783	53761	30023	38121
Agricultural machinery excluding tractors	19813	68423	13834	75076	20856	65017	21694	82939
Tractors	1744	16375	1815	12026	854	7269	1255	9196
Total	**441295**	**545787**	**301254**	**522570**	**446104**	**480219**	**544963**	**522180**

Year	***2004***		***Average % contribution***		***Average % incr/decr***	
Major groups	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Fruits/nuts fresh or dried	625132	163199	85.87	32.45	11.85	-4.08
Fruits nrenared/preserved	2811	21407	0.36	4.60	36.05	-5.56
Fruit juices	8723	3761	1.67	1.02	6.43	-7.10
Seeds and oleaginous fruit, whole or broken for fixed oil	15300	84681	1.83	31.65	57.14	-8.46
Food nrocessine: machines	45770	46358	5.23	11.15	38.46	-7.43
Agricultural machinery excluding tractors	41385	127158	4.75	16.48	21. 78	17.17
Tractors	1280	22352	0.28	2.65	-5.32	7.30
Total	**740401**	**468916**	**100.00**	**100.00**	**13.56**	**-2.86**

Source: International trade statistics from www.trademap.com, the official website of ITC (International Trade Center)

Appendix VII

Table 6: Exports of Major groups related to FPI (fruit processing industry) for the past years of Brazil and India

Value in 000'US$

Year	*2000*		*2001*		*2002*		*2003*	
Major groups	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Fruits/nuts fresh or dried	545943	364789	470794	339854	518580	362718	537075	498588
Fruits prepared/preserved	89450	30774	78508	31525	80802	26212	97663	32438
Fruit juices	4554	1090155	3555	880058	5714	1095997	5379	1249505
Seeds and oleaginous fruit, whole or broken for fixed oil	243517	2189919	200722	2731290	147074	303761	363527	4302454
Food processing machines	24540	22615	21666	22981	22104	26536	32498	24782
Agricultural machinery excluding tractors	20595	114715	18607	133825	21741	130985	25478	296047
Tractors	23281	70879	29059	95900	64649	197358	78584	303080
Total	**951880**	**3883846**	**822911**	**4235433**	**860664**	**4877417**	**1140204**	**6706894**

Year	*2004*		*Average % contribution*		*Average % incr/decr*	
Major groups	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Fruits/nuts fresh or dried	699583	584858	54.86	7.70	5.63	12.07
Fruits prepared/preserved	98884	38699	8.81	0.57	2.11	5.15
Fruit juices	7743	1141358	0.5.3	19.54	14.01	0.94
Seeds and oleaginous fruit, whole or broken for fixed oil	286188	5434816	24.56	63.36	3.50	29.63
Food processing machines	44520	45256	2.88	0.51	16.28	20.02
Agricultural machinery excluding tractors	29480	492755	2.29	4.18	8.63	65.91
Tractors	111083	485935	6.07	4.13	75.43	117.12
Total	**1277481**	**8223677**	**100.00**	**100.00**	**6.84**	**22.35**
Net exports					1.04	26.46

Source: International trade statistics from WWW.trademap.com, the official website of ITC (International Trade Center)

Appendix VIII

Table 7(I): Major fruit production for the past ten years of Brazil and India

Quantity in 000' Tons

Year	*1996*		*1997*		*1998*	
Major fruits	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Oranges	2000.00	21811.00	2000.00	22961.00	2000.00	20732.00
Bananas	9935.00	5160.00	10982.00	5412.00	11000.00	5322.00
Papayas	490.00	2350.00	450.00	1700.00	450.00	1700.00
Mangoes	10000.00	435.00	12000.00	600.00	12000.00	600.00
Pineapple	820.00	1048.00	1100.00	1807.00	1100.00	1641.00
Grape fruit	70.00	62.00	92.00	62.00	92.00	65.00
Lemons	1700.00	495.00	1000.00	470.00	1000.00	470.00
Peaches and Nectarins	85.00	135.00	87.00	136.00	87.00	146.00
Pears	130.00	19.00	135.00	16.00	135.00	16.00
Others	13967.00	4413.00	10685.00	5145.00	10697.00	4317.00
Total	**39197.00**	**35928.00**	**38531.00**	**38309.00**	**38561.00**	**35009.00**

Year	*1999*		*2000*		*2001*	
Major fruits	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Oranges	3000.00	22768.00	3200.00	17943.00	2860.00	16983.00
Bananas	15100.00	5528.00	16000.00	6079.00	16450.00	6177.00
Papayas	644.00	1402.00	644.00	1440.00	687.00	1489.00
Mangoes	11400.00	456.00	11500.00	538.00	10240.00	782.00
Pineapple	1006.00	1477.00	1100.00	1293.00	1220.00	1430.00
Grape fruit	124.00	65.00	130.00	66.00	130.00	66.00
Lemons	1342.00	551.00	1400.00	578.00	1320.00	965.00
Peaches and Nectarins	114.00	131.00	120.00	182.00	150.00	223.00
Pears	178.00	16.00	188.00	17.00	200.00	22.00
Others	12850.00	4700.00	14289.00	4982.00	11784.00	5169.00
Total	**45758.00**	**37094.00**	**48571.00**	**33118.00**	**45041.00**	**33306.00**

Source: FAO production year books for the years 1996 to 2003

Appendix VIII

Table 7(II): Major fruit production for the past ten years of Brazil and India

Quantity in 000' MT

Year	***2002***		***2003***	
Major fruits	***India***	***Brazil***	***India***	***Brazil***
Oranges	2980.00	18531.00	2980.00	16936.00
Bananas	16450.00	6423.00	16450.00	6518.00
Papayas	700.00	1598.00	700.00	1600.00
Mangoes	10640.00	842.00	10500.00	845.00
Pineapple	1260.00	1433.00	1100.00	1400.00
Grape Ftuit	137.00	67.00	115.00	67.00
Lemons	1370.00	985.00	1370.00	950.00
Peaches and Nectarins	150.00	218.00	150.00	215.00
Pears	200.00	20.00	200.00	20.00
Others	12064.00	5617.00	12346.00	5513.00
Total	**45951.00**	**35734.00**	**45911.00**	**34064.00**

Year	***Average % contribution***		***Average % incr/decr***		***CGR***	
Major fruits	***India***	***Brazil***	***India***	***Brazil***	***India***	***Brazil***
Oranges	6.05	56.15	6.13	-2.79	7.31	-4.29
Bananas	32.33	16.5	8.2	3.29	8.45	3.68
Papayas	1.37	4.7	5.36	-3.99	7.37	-3.93
Mangoes	25.4	1.8	0.63	11.78	-0.86	9.08
Pineapple	2.51	4.08	4.27	4.2	3.86	0.38
Grape Fruit	0.26	0.18	8.04	1.01	8.11	1.19
Lemons	3.02	1.93	-2.43	11.49	1.12	13.27
Peaches and Nectarins	0.27	0.49	9.56	7.41	10.5	8.97
Pears	0.39	0.05	6.73	0.66	7.68	3.01
Others	28.4	14.11	-1.45	3.12	0.17	3.14
Total	**100**	**100**	**2.14**	**-0.65**	**3.04**	**-1.16**

Source: FAO production year books for the years 1996 to 2003

Appendix IX

Table a(I): Total exports of major fresh fruits for the past ten years from India

Qty=000'Kgs/Value in ₹Lakhs

Year	*1996*		*1997*		*1998*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fresh grapes	20957.66	5248.26	23679.79	6452.28	11382.18	3709.07
Fresh mangoes	24773.48	4487.64	42894.93	7359.61	45407.59	7913.67
Apples fresh	13215.80	1356.42	11093.89	1145.73	7442.12	1002.36
Pomegranates	4768.39	669.31	5599.73	860.85	4239.15	896.07
Oranges fresh or dried	23563.66	1733.79	18179.40	1346.77	10407.10	1022.87
Lemons fresh or dried	917.82	139.88	1094.65	181.89	2325.68	484.12
Pappayas fresh	606.63	82.39	826.65	104.02	2504.71	342.64
Watermelons	2455.04	105.80	3158.44	135.52	4574.03	523.70
Guava fresh or dried	394.42	54.67	960.14	100.32	496.84	69.22
Pineapple fresh or dried	45.45	3.51	151.45	19.91	244.68	16.79
Other fresh fruits	18158.51	2131.50	28394.61	3556.98	17479.06	3221.14
Total	**109856.86**	**16013.17**	**136033.68**	**21263.88**	**106503.14**	**19201.65**

Year	*1999*		*2000*		*2001*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fresh grapes	1400561	5513.82	20646.08	8293.55	14571.03	5995.60
Fresh mangoes	34631.18	7154.89	37109.67	6860.71	44429.33	8099.13
Apples fresh	5476.57	884.34	2847.03	417.29	19296.01	1339.29
Pomegranates	5726.37	1153.69	4455.54	991.56	4773.70	1041.85
Oranges fresh or dried	24019.23	2375.47	26822.53	2737.34	28588.76	3187.54
Lemons fresh or dried	2359.95	326.21	3526.97	574.87	4295.81	672.18
Pappayas fresh	12659.99	2076.10	11928.26	1619.91	1975.87	286.89
Watermelons	2444.32	151.90	1480.53	10 1.16	3343.81	244.50
Guava fresh or dried	2101.53	272.10	670.16	127.84	889.72	172.30
Pineapple fresh or dried	137.55	38.04	756.71	128.59	836.80	159.97
Other fresh fruits	24882.36	4444.68	29965.25	4893.55	52110.47	7822.23
Total	**128444.66**	**24391.24**	**140208.73**	**26746.37**	**175111.31**	**29021.48**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix IX

Table a(II): Total exports of major fresh fruits for the past ten years from India

***Qty=000'Kg/Val*ue in ₹ Lakhs**

Year	*2002*		*2003*		*2004*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fresh grapes	25567.98	10867.18	26469.64	10368.38	38898.34	12643.80
Fresh mangoes	38003.43	8419.44	60551.32	11051.90	53480.02	8961.06
Apples fresh	15632.41	1571.89	9032.49	1317.64	23225.21	2634.98
Pomegranates	6303.80	1434.57	10315.97	2109.00	14039.99	2988.71
Oranges fresh or dried	27484.71	2846.72	57427.00	5227.59	31528.41	3300.66
Lemons fresh or dried	3156.08	447.11	7442.47	839.31	10523.50	835.79
Pappayas fresh	3452.29	475.92	3550.24	460.56	3700.96	531.20
Water melons	16567.56	257.18	3370.97	201.18	5485.66	350.21
Guava fresh or dried	1111.41	207.44	2810.78	568.01	3339.76	692.62
Pineapple fresh or dried	717.21	142.23	1623.77	201.71	1765.65	245.15
Other fresh fruits	32600.84	4947.41	56150.41	7363.85	47052.27	6657.90
Total	**170597.72**	**31617.09**	**238745.06**	**39709.13**	**233039.77**	**39842.08**

Year	*2005*		*Average % contribution*		*CGR*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fresh grapes	53908.30	21382.87	14.55	29.70	84.30	15.80
Fresh mangoes	69606.60	12811.12	26.24	27.29	8.03	8.29
Apples fresh	30043.88	3812.91	7.99	5.08	11.93	12.47
Pomegranates	19652.15	5670.16	4.65	5.85	15.65	22.09
Oranges fresh or dried	36487.56	3487.25	16.56	8.95	10.72	13.87
Lemons fresh or dried	11099.31	1128.25	2.72	1.85	31.49	22.44
Pappayas fresh	6434.02	665.13	2.78	2.18	52.34	16.77
Water melons	7162.38	453.95	2.16	0.83	8.80	11.20
Guava fresh or dried	5359.89	982.98	1.05	1.06	26.86	35.13
Pineapple fresh or dried	4407.08	515.49	0.62	0.48	55.66	63.41
Other fresh fruits	48799.14	5920.68	20.68	16.73	12.63	11.87
Total	**292960.31**	**56830.79**	**100.00**	**100.00**	**12.50**	**13.09**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade

Appendix X

Table b(I): Total exports of major processed fruit products for the past ten years from India

Qty: 000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*
Processed fruit Products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***
Fruit pulp	43121.56	11432.62	48720.29	13381.62	39615.28
Fruit sliced & dried	309.84	90.48	304.10	66.29	455.48
Fruit slices in brine	2064.26	595.10	3947.90	1265.62	2020.67
Tamarind dried	5024.93	948.60	5656.74	1176.53	6871.06
Jams. Jellies and mrmlds	4099.59	1514.83	3098.37	1293.14	5004.96
Pickles & chutnies	11858.12	4002.60	12285.29	4562.59	14239.30
Prepared & preserved fruits	43.19	35.15	39.26	14.51	47.67
Squash	584.52	292.34	576.47	305.99	718.85
Juice (frozen and unfrozen)	935.59	319.22	2507.40	757.12	5334.13
Processed fruit products cont. not cont. sugar	43.58	20.19	147.27	49.22	54.14
Raisins & sultanas and dried grapes	42.83	17.05	308.52	219.97	143.33
Dried fruits & peels of fruits	2483.90	226.22	1717.65	235.56	486.45
Tamarind seeds & others	2415.76	222.16	1174.36	138.95	1179.03
fruit flours & others	3628.68	531.40	4287.68	661.62	5808.40
Total	**76656.35**	**20247.96**	**84771.30**	**24128.73**	**81978.75**

Year	*1999*		*2000*		*2001*	
Processed fruit products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fruit pulp	74702.05	20451.70	59632.32	27092.49	80886.78	25383.06
Fruit sliced & dried	483.64	184.61	505.60	211.46	372.62	124.98
Fruit slices in brine	2908.32	981.04	2782.85	1012.48	2840.71	894.49
Tamarind dried	6394.44	1437.60	7225.20	1548.86	4674.13	1120.15
Jams, Jellies and mrmlds	6254.81	1879.08	6739.94	2772.41	8462.68	3540.18
Pickles & chutnies	15463.78	6271. 70	15886.48	6864.01	16914.87	6865.61
Prepared & preserved fruits	32.78	17.85	58.30	34.51	193.40	100.03
Squash	596.72	268.14	662.99	412.64	2149.61	1049.76
Juice (frozen and unfrozen)	3426.43	1127.34	5627.39	2048.56	4185.63	1673.36
Processed fruit products cont., or not cont, sugar	101.51	46.39	159.43	76.82	825.30	155.98
Raisins & sultanas and dried grapes	76.97	40.83	134.26	98.30	78.97	47.61
Dried fruits & peels of fruits	592.23	244.54	406.81	100.96	1438.84	184.20
Tamarind seeds and others	2763.09	423.99	3004.45	458.65	1227.61	218.35
fruit flours & others	5999.06	1185.41	8439.58	1242.55	14066.23	1134.12
Total	**119795.83**	**34560.22**	**111264.60**	**43974.70**	**138317.38**	**42491.88**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT)

Appendix X

Table b(II): Total exports of major processed fruit products for the past ten years from India

Qty: 000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Processed fruit products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fruit pulp	102319.47	31610.35	89514.84	24198.57	95857.00	31571.94
Fruit sliced & dried	234.80	113.11	11978.40	1481.50	4007.59	1027.31
Fruit slices in brine	2199.67	871.08	13005.09	4476.82	10838.85	3729.61
Tamarind dried	8318.96	1354.51	7729.51	1184.75	5532.65	1208.93
Jams Jellies and mrmlds	8113.66	3580.08	12383.09	4571.47	10955.84	4109.33
Pickles & chutnies	20066.32	7768.52	18021.14	6310.07	18891.89	6796.69
Prepared and preserved fruits	414.81	243.40 .	1511.62	508.54	1394.72	518.13
Squash	2590.96	1098.44	3870.93	1741.98	4322.44	1671.59
Juice (frozen and unfrozen)	9042.16	2774.05	647101	2478.07	9738.52	3676.51
Processed fruit products cont., or not cont, sugar	464.06	231.83	778.58	338.21	1368.54	758.78
Raisins & sultanas and dried grapes	167.46	192.23	314.19	220.44	440.61	200.77
Dried fruits & peels of fruits	1324.50	159.30	2070.38	174.34	4190.29	366.98
Tamarind seeds & others	1740.84	295.40	0.00	0.00	0.00	0.00
fruit flours & others	4812.54	1126.18	725379	1774.14	6962.18	1748.98
Total	**161810.21**	**51418.48**	**174902.57**	**49458.90**	**174501.12**	**57385.55**

Year	*2005*		*Average % contribution*		*CGR*	
Processed fruit products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Fruit pulp	134613.20	36424.17	56.72	56.07	13.10	13.10
Fruit sliced & dried	3035.63	1088.75	1.60	1.09	37.45	35.50
Fruit slices in brine	7601.12	2381.84	3.67	404	18.60	18.68
Tamarind dried	9619.20	2285.07	4.95	3.29	4.10	3.82
Jams, Jellies and mrmlds	29293.51	10529.71	6.96	8.45	21.46	21.75
Pickles & chutnies	21606.06	7803.08	12.19	14.92	6.53	6.33
Prepared & preserved fruits	1368.51	512.78	0.38	0.48	64.78	54.99
Squash	2414.57	978.95	1.36	1.91	28.12	25.77
Juice (frozen and unfrozen)	10269.11	4050.97	4.24	4.94	23.37	25.79
Processed fruit products cont., or not cont, sugar	1559.00	738.38	0.41	0.57	50.54	53.21
Raisins & sultanas and dried grapes	141.57	77.98	0.14	0.28	12.31	14.30
Dried fruits & peels of fruits	3320.28	404.53	1.33	0.54	12.74	4.34
Tamarind seeds & others	0.00	0.00	1.00	0.46	-78.54	-71.52
Fruit flours & others	7376.48	2053.61	5.05	2.96	6.73	13.83
Total	**232218.24**	**69329.82**	**100.00**	**100.00**	**12.87**	**13.70**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XI

Table c(I): Total imports of major fresh fruits for the past ten years by India

Qty: 000'tons/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dates Fresh	34895.43		18274.42		78130.98	
Pears & Quinches	0.01		-		15.20	
Cherries fresh	0.02		-		-	
Plums & sloes	0.01		-		-	
Kiwi fruits	1.52		0.58		34.32	
Pomegranates	-		.4.52		-	
Berries fresh	1.44		-		-	
Apricots	2.28		-		-	
Grapes	-		0.20		-	
Avacados	0.47		7.78		-	
Oranges	-		26.24		6.30	
Mangoes	-		9.00		-	
Lemons	-		-		-	
Water melons & melons	-		-		-	
Apples	-		-		2.70	
Peaches & Nectarins	-		-		-	
Others	49.57		6.34		31.87	
Total	**34950.75**	**0.00**	**18329.08**	**0.00**	**78221.37**	**0.00**
Year	*1999*		*2000*		*2001*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dates Fresh	88212.91		27587.27		57108.76	
Pears & Quinches	361.28		216.27		1220.11	
Cherries fresh	10.07		3.05		5.08	
Plums & sloes	0.35		26.98		1.84	
Kiwi fruits	45.49		73.26		77.27	
Pomegranates	575.29		7711)5		406.49	
Berries fresh	19.59		15.29		0.60	
Apricots	16.56		41.07		58.50	
Grapes	28.24		58.18		251.21	

Avacados	-		-		-	
Oranges	255.80		101.30		155.49	
Mangoes	6.08		12.96		0.26	
Lemons	25.14		1.42		-	
Water melons & melons	175.38		342.66		685.01	
Apples	1973.77		6586.35		17028.50	
Peaches & Nectarins	18.16		3.35		1.17	
Others	281.92		142.23		614.19	
Total	**92006.03**	**0.00**	**35983.59**	**0.00**	**77614.48**	**0.00**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XI

Table c(II): Total imports of major fresh fruits for the past ten years by India

Qty: 000'tons/Value in ₹ Lakhs

Year	**2002**		**2003**		**2004**	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dates Fresh	62001.87		24411.50		8757.43	
Pears & Quinches	2538.28		2327.80		2951.00	
Cherries fresh	8.85		1.92		4.27	
Plums & sloes	88.79		87.90		251.23	
Kiwi fruits	145.54		157.33		296.38	
Pomegranates	266.66		63.83		21.42	
Berries fresh	62.13		65.59		11.53	
Apricots	19.50		26.62		56.62	
Grapes	406.68		497.42		1146.27	
Avacados	-		-		0.02	
Oranges	641. 87		583.35		734.34	
Mangoes	53.00		-		38.30	
Lemons	-		1.45		0.14	
Water melons & melons	712.86		1272.92		572.05	
Apples	18197.17		18578.17		21622.08	
Peaches & Nectarins	32.72		7.58		10.06	
Others	67.64		94.33		398.79	
Total	**85243.56**	**0.00**	**48177.71**	**0.00**	**36871.93**	**0.00**

Year	*2005*		*Average % contribution*		*CGR*	
Fresh fruits	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dates Fresh	4397.47		72.85		-16.59	
Pears & Quinches	4418.52		2.53		322.81	
Cherries fresh	10.51		0.01		122.09	
Plums & sloes	226.44		0.12		306.10	
Kiwi fruits	771.13		0.29		88.57	
Pomegranates	273.60		0.43		209.88	
Berries fresh	29.46		0.04		112.69	
Apricots	136.89		0.06		131.87	
Grapes	1495.58		0.70		361.54	
Avacados	0.43		0.01		-24.69	
Oranges	1555.92		0.73		159.04	
Mangoes	0.80		0.02		5.89	
Lemons	-		0.01		-3.02	
Water melons and melons	722.24		0.81		330.97	
Apples	32367.80		20.99		473.85	
Peaches & Nectarins	59.96		0.02		164.94	
Others	409.02		0.38		36.12	
Total	**46875.77**	**0.00**	**100.00**		**3.49**	

Source: Export Import Data Bank from thr official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XII

Table d(I): Total imports of major processed fruit products for the past ten years by India

Qty: 000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Processed fruit products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dried Dates & figs dried	170363.72		167980.94		167580.80	
Raisins & sultanas	1585.30		2300.78		9179.15	
Prep. & Pres. Fruits	9.50		0.80		8.04	
Squash	1.00		0.85		14.54	
Juice	453.14		972.82		2606.34	
Dried Grape must incl. wine	259.01		351.54		286.22	
Vermouth & other wine of fresh grapes	18.25		1.24		18.17	
Pomegranates seeds	4.02		171.21		19.38	
Flours & pdrs. of fruits					4.08	
Jams, jellies & mrmlds	1.30		10 1.39		174.55	
Dried fruits & peels of fruits	134.22		394.68		1505.45	
Apricots & other kernels					274.15	
Fruit pulp and juice based drinks					-	
Total	**172829.46**	**0.00**	**172276.25**	**0.00**	**181670.87**	**0.00**

Year	*1999*		*2000*		*2001*	
Processed fruit products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dried Dates & figs dried	152174.25		166821.09		118918.37	
Raisins & sultanas	5427.98		6223.00		8459.51	
Prep. & Pres. Fruits	15.47		82.71		56.67	
Squash	12.62		209.61		146.63	
Juice	5906.61		7029.77		8978.75	
Dried Grape must incl. wine	245.14		210.53		307.13	
Vermouth & other wine of fresh grapes	1.64		20.89		-	
Pomegranates seeds	-		20.89		-	
Flours & pdrs. of fruits	10.65		-		44.13	

Jams, jellies & mrmlds	349.55		26.09		2219.87	
Dried fruits & peels of fruits	2117.13		2254.73		2258.03	
Apricots & other kernels	108.49		125.16		231.40	
Fruit pulp and juice based drinks	-		-		0.00	
Total	**166369.53**	**0.00**	**183024.47**	**0.00**	**141620.49**	**0.00**

Source: Export Import data bank from the official website of Directorate General of Foreign Trade (DGFT) under the ministry of commerce and industry of India.

Appendix XII

Table d(II): Total imports of major processed fruit products for the past ten years by India

Qty: 000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Processed fruit Products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dried Dates & figs dried	111224.41		171653.92		246717.23	
Raisins & sultanas	4897.57		9876.07		7371.95	
Prep. & Pres. Fruits	175.77		283.12		866.42	
Squash	277.49		12.82		166.35	
Juice	8481.77		10127.80		12830.71	
Dried Grapes must incl. wine	145.25		45062		895.62	
Vermouth & other wine of fresh grapes	0.30		1.30		3.05	
Pomegranates seeds	-		-		-	
Flours & pdrs. of fruits	26.24		103.26		63.42	
Jams, jellies & mrmlds	506.68		241.03		333.50	
Dried fruits & peels of fruits	1946.51		1946.51		6693.14	
Apricots & other kernels	-		-		317.94	
Fruit pulp and juice based drinks	37.65		48.20		23475.28	
Total	**127719.64**	**0.00**	**194744.65**	**0.00**	**299734.61**	**0.00**

Year	*2005*		*Average % contribution*		*CGR*	
Processed fruit Products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Dried Dates & figs dried	238652.54		88.37		2.81	
Raisins & sultanas	7765.25		3.26		14.83	
Prep. & Pres. Fruits	405.26		0.10		89.53	

Squash	132.63		0.05		70.36	
Juice	8437.33		3.40		37.46	
Dried Grapes must incl. wine	1496.63		0.24		15.24	
Vermouth & other wine of fresh grapes	11.95		0.01		-18.60	
Pomegranates seeds	-		0.01			
Flours & pdrs. of fruits	17.22		0.01		156.46	
Jams, jellies & mrmlds.	378.81		0.22		51.89	
Dried fruits & peels of fruits	2317.00		1.11		32.55	
Apricots & other kernels	1922.96		0.15		87.51	
Fruit pulp and juice based drinks	35946.35		3.07		537.51	
Total	**297483.93**	**0.00**	**100.00**		**5.01**	

Source: Export Import data bank from the official website of Directorate General of Foreign Trade (DGFT) under the ministry of commerce and industry of India.

Appendix XIII

Table i(I): Major processed mango products exported for the past ten years from India

Qty=000'Kgs\in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Major products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Mango pulp	40302.22	10500.63	45874.53	12531.22	38133.72	13856.43
Mango slices in Brine	2064.26	595.10	3947.90	1265.62	2020.67	787.31
Mango Sliced and Dried	309.84	90.48	304.10	66.29	455.48	182.28
Mango Chutney	3743.24	1136.41	4525.72	1485.25	6207.69	2294.70
Mango Pickles	2227.07	733.76	2125.49	806.69	1778.85	719.15
Jams, Jellies, mrmlds of Mango	2191.08	800.96	1393.13	676.84	1281.14	563.74
Mango Squash	24.62	13.70	56.32	31.27	57.23	34.88
Mango Juice	408.29	92.81	1331.25	411.03	3677.24	1310.46
Mango Kernel oil	116.40	97.95	132.00	109.24	-	-
Mango kernel with nut broken	21.32	21.29	17.85	7.66	-	-
Flour of Mango	66.13	23.38	51.01	20.96	59.31	20.41
Total	**51474.47**	**14106.47**	**59759.30**	**17412.07**	**53671.33**	**19769.36**

Year	*1999*		*2000*		*2001*	
Major products	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Mango pulp	72384.23	19652.66	57303.53	26384.88	76735.19	24134.13
Mango slices in Brine	2908.32	981.04	2782.85	1012.48	2840.71	894.49
Mango Sliced and Dried	483.64	184.61	505.60	211.46	372.62	124.98
Mango Chutney	5615.46	2063.87	6955.08	;Z803.76	6095.67	2303.08
Mango Pickles	2366.69	1067.43	1887.23	795.83	2764.88	1131.58
Jams, Jellies, mrmlds of Mango	2469.36	856.83	3485.16	1747.58	6367.14	2939.54
Mango Squash	88.61	32.06	46.44	26.12	236.37	130.46
Mango Juice	2067.76	660.46	1285.65	611.93	1680.09	713.73
Mango Kernel oil	153.00	150.64	-	-	-	-
Mango kernel with nut broken	-	-	31.00	16.10	60.71	22.29
Flour of Mango	70.03	50.08	166.77	53.69	174.46	31.15
Total	**88607.10**	**25699.68**	**74449.31**	**33663.83**	**97327.84**	**32425.43**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XIII

Table i(II): Major processed mango products exported for the past ten years from India

Qty = 000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Major products	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Mango pulp	96107.31	29701.07	89514.84	24198.57	95857	31571.94
Mango slices in						
Brine	2199.67	871.08	6613.6	2370.79	7031.15	2410.73
Mango Sliced and Dried	234.8	113.11	11978.4	1481.5	4007.59	1027.31
Mango Chutney	6513.58	2398.68	-	-	-	-
Mango Pickles	2723.54	1071.91	-	-	-	-
Jams, Jellies, mrmlds of Mango	5712.16	2882.12	7372.01	2769.51	5736.36	2470.74
Mango Squash	218.24	105.2	1503.42	485.27	1529.35	449.32
Mango Juice	3954.76	1635.19	3193.87	1242.83	5008.2	1568.68
Mango Kernel oil	18.00	12.76	-	-	-	-
Mango kernel with nut broken	240	28.22	12.37	9.57	292.67	
Flour of Mango	103.94	32.61	301.76	83.47	121.61	
Total	**118026**	**38851.95**	**120490.3**	**32641.51**	**119583.9**	**39592.57**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Major products	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Mango pulp	134613.2	36424.12	78.72	75.84	13.86	13.99
Mango slices in Brine	3287.07	1113.56	3.76	4.08	8.42	9.64
Mango Sliced and Dried	3035.63	1088.75	2.29	1.50	37.43	35.50
Mango Chutney	-	-	4.18	4.80	8.84	12.59
Mango Pickles	-	-	1.67	2.10	4.34	7.08
Jams, Jellies, mrmlds of Mango	19294.47	7500.99	5.83	7.69	28.48	28.46
Mango Squash	830.33	278.03	0.48	0.53	57.89	47.32
Mango Juice	4200.32	1271.11	2.83	3.15	21.23	24.02
Mango Kernel oil	-	-	0.04	0.12	-61. 40	-60.94
Mango kernel with nut broken	61.52	32.84	0.08	0.07	78.56	59.31
Flour of Mango	65.15	23.77	0.12	0.12	9.76	5.60
Total	**165387.7**	**47733.17**	**100.00**	**100.00**	**13.25**	**13.18**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XIV

Table ii(I): Region/country wise total exports of fresh mangoes for the past ten years from India

Qty: 000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Bangladesh	4879.89	316.87	7691.84	577.47	15069.28	928.40
UAE	9348.97	1988.10	12200.98	2814.31	8902.72	2151.74
UK	1136.89	308.81	2060.14	548.29	1652.56	587.94
Saudi Arabia	4626.62	697.92	7956.77	1034.59	10267.76	1904.69
Netherlands	232.63	62.00	690.62	187.76	284.54	128.84
Nepal	3.70	0.68	27.42	8.36	266.52	77.79
Bahrain	653.62	101.97	1615.27	215.74	1842.10	337.28
USA	162.75	65.75	843.39	197.12	300.88	87.32
Kuwait	1466.57	345.53	2469.98	509.56	2362.21	525.69

Russia	0.57	0.28	-	-	1.89	0.30
Oman	41. 70	12.91	122.58	18.82	140.53	46.21
Malaysia	236.09	83.08	390.21	118.84	189.19	54.19
Singapore	312.63	107.51	248.99	87.01	260.29	110.30
Others	1670.85	396.23	6576.74	1041.74	3867.12	972.98
Total	**24773.48**	**4487.64**	**42894.93**	**7359.61**	**45407.59**	**7913.67**

Year	***1999***		***2000***		***2001***	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Bangladesh	9623.93	952.93	21426.82	2323.57	21033.74	2410.40
UAE	10021.00	2553.53	6859.38	1872.95	12809.55	2818.77
UK	2297.23	754.55	842.71	340.26	1372.87	454.19
Saudi Arabia	5374.76	882.86	2111.69	470.22	2942.88	661.98
Netherlands	982.36	349.09	326.28	149.09	301.12	107.80
Nepal	21.10	2.74	12.80.	3.30	101.40	14.70
Bahrain	1063.56	228.27	443.20	141.20	596.90	200.67
USA	394.08	147.23	716.43	198.32	730.69	162.73
Kuwait	1420.87	375.86	940.49	303.60	984.70	309.82
Russia	2.40	0.84	0.00	0.00	0.00	0.00
Oman	95.85	34.00	335.44	121.51	875.23	188.20
Malaysia	375.56	100.32	216.60	79.13	356.25	80.46
Singapore	432.32	162.43	302.63	152.18	321.93	116.02
Others	2525.86	610.24	2575.20	705.38	2002.07	573.39
Total	**34630.88**	**7154.89**	**37109.67**	**6860.71**	**44429.33**	**8099.13**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XIV

Table ii (II): Region/country wise total exports of fresh mangoes for the past ten years from India

Qty: 000'Kg/ Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Bangladesh	13392.85	1388.54	23797.13	2262.09	32503.22	2971.66
UAE	14033.56	3703.31	21056.16	4885.45	10338.61	2903.54
UK	1227.57	532.07	1511.63	722.37	1308.56	745.77
Saudi Arabia	2085.02	681.51	3845.72	921.55	2300.53	747.78
Netherlands	1089.13	326.39	855.94	322.87	532.00	212.68
Nepal	426.19	96.29	2930.11	243.86	3400.94	269.64
Bahrain	866.89	234.93	635.65	232.95	848.69	214.06
USA	467.91	104.54	632.61	133.27	34.86	18.24
Kuwait	807.41	373.64	438.30	177.66	267.96	150.45
Russia	0.00	0.00	1930.80	188.93	68.03	20.34
Oman	512.13	99.41	556.73	151.45	143.40	42.74
Malaysia	372.63	86.83	294.23	102.98	185.00	49.80
Singapore	292.56	122.24	238.84	104.18	159.63	84.46
Others	2429.58	669.74	1827.47	602.29	1388.59	529.90
Total	**38003.43**	**8419.44**	**60551.32**	**11051.90**	**53480.02**	**8961.06**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Bangladesh	32770.90	2766.36	40.40	20.33	20.29	24.83
UAE	26533.76	7304.40	29.30	39.70	8.97	11.23
UK	839.97	537.93	3.16	6.66	-4.58	4.60
Saudi Arabia	1564.15	442.20	9.55	10.16	-14.51	-6.13
Netherlands	260.86	131.52	1.23	2.38	3.03	7.37
Nepal	4116.01	322.98	2.51	1.25	106.11	77.14
Bahrain	620.81	243.56	'2.04	2.59	-6.22	3.95
USA	83.21	42.29	0.97	1.39	-13.59	-11.36
Kuwait	104.59	107.32	2.50	3.83	-25.85	-13.82
Russia	0.00	0.00	0.44	0.25	26.51	71.11
Oman	226.69	75.79	0.68	0.95	19.28	20.81

Malaysia	243.66	60.21	0.63	0.98	-1.35	-3.67
Singapore	242.24	91.83	0.62	1.37	-4.12	-1.86
Others	1999.75	684.73	5.97	8.16	-7.72	-1.28
Total	**69606.60**	**12811.12**	**100.00**	**100.00**	**8.03**	**8.29**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XV

Table iii (I): Region/country wise total exports of mango pulp for the past ten years from India

Qty = 000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Saudi Arabia	14483.70	3139.17	9100.81	2281.24	8855.86	2761.81
UAE	5800.67	1267.24	8945.17	2163.70	7952.35	2787.97
Netherlands	2200.91	931.62	4191.58	1237.45	2638.78	1249.85
USA	2173.51	740.54	1745.95	622.78	2048.02	869.94
UK	2138.51	708.82	2467.33	748.43	2305.10	1014.69
Germany	1581.59	592.67	2610.99	847.49	1739.20	761.68
Kuwait	2296.99	584.79	3871.60	1164.62	3833.46	1347.16
Israel	909.46	300.31	772.15	241.09	550.41	207.93
Oman	1168.45	272.50	1391.65	360.17	625.99	185.45
Lebanon	1576.70	359.61	1023.64	220.20	1067.24	375.89
Yemen Republic	1219.08	224.64	1907.45	462.34	1211.15	276.85
Canada	564.91	194.17	1088.17	341.23	669.55	301.37
Malaysia	652.38	154.81	1037.28	254.08	409.54	135.60
South Africa	640.38	153.39	843.52	217.28	570.80	196.28
Others	2894.99	876.35	4877.24	1369.12	3656.27	1383.96
Total	**40302.23**	**10500.63**	**45874.53**	**12531.22**	**38133.72**	**13856.43**

Year	*1999*		*2000*		*2001*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Saudi Arabia	19889.02	4017.79	18540.15	8692.88	21445.27	5654.75
UAE	10463.37	2381.49	10098.63	3991.23	6442.93	1994.61
Netherlands	6342.32	2377.92	4442.64	2332.59	6472.84	2534.34
USA	4041.26	1304.34	2591.01	1180.35	2829.82	1342.37
UK	2915.48	2308.12	2170.60	1047.46	3436.33	1540.89

Germany	2061.34	712.14	1238.32	695.48	1534.73	708.22
Kuwait	3995.63	995.47	4040.25	1982.52	5658.75	1518.32
Israel	980.08	328.68	104.2.3	35.43	1109.81	348.86
Oman	1368.45	316.25	889.24	455.95	1536.25	395.37
Lebanon	2109.70	405.04	1031.50	471.94	2008.82	510.45
Yemen Republic	5151.68	1049.21	3797.38	1638.72	8106.04	1757.62
Canada	1224.56	476.99	1062.44	604.54	959.67	479.53
Malaysia	1182.36	222.33	576.75	278.44	903.16	204.09
South Africa	866.65	172.38	38.70	11.19	478.11	126.31
Others	9792.33	2584.51	6681.69	2966.16	13812.66	5018.40
Total	**72384.23**	**19652.66**	**57303.53**	**26384.88**	**76735.19**	**24134.13**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XV

Table iii (II): Region/country wise total exports of mango pulp for the past ten years from India

Qty = 000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Saudi Arabia	32266.25	9248.43	31521.25	7391.32	31205.31	9402.33
UAE	8594.05	2772.78	6912.79	1733.04	8808.47	2676.55
Netherlands	5807.17	2640.43	7228.17	2803.06	7239.92	3510.01
USA	3028.38	1348.58	2866.69	1151.02.	2540.77	1115.72
UK	2818.25	1160.32	2717.87	935.63	2901.31	1265.57
Germany	1153.37	461.93	551.60	194.27	1311.50	597.77
Kuwait	5228.28	1604.11	6157.82	1655.26	3997.71	1448.01
Israel	290.96	105.07	716.08	251.46	0.00	0.00
Oman	2301.22	443.92	1856.80	355.77	2146.60	595.87
Lebanon	2881.30	762.18	2308.02	467.23	2403.36	610.91
Yemen Republic	13809.80	2585.63	9615.50	1797.40	14654.06	3173.77
Canada	1148.10	565.59	1113.54	412.12	1431.34	513.53
Malaysia	1290.37	326.56	986.16	226.95	1072.83	267.22
South Africa	70.69	26.37	5.27	3.63	0.00	0.00
Others	15419.12	5649.17	14957.28	5971.43	16143.82	6394.68
Total	**96107.31**	**29701.07**	**89514.84**	**24198.57**	**95857.00**	**31571.94**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Saudi Arabia	45033.19	10237.60	31.11	27.30	17.62	18.17
UAE	13296.54	3177.80	11.69	10.84	3.46	4.43
Netherlands	9291.71	3938.07	7.48	10.23	14.22	16.15
USA	2934.18	1182.34	3.59	4.75	3.85	6.47
UK	4602.75	1577.31	3.81	5.35	5.74	5.48
Germany	1663.27	650.63	2.07	2.70	-6.81	-5.72
Kuwait	6839.75	1653.42	6.15	6.06	8.56	8.24
Israel	408.00	156.33	0.78	0.86	-40.60	-37.18
Oman	3356.75	822.92	2.23	1.83	12.94	11.28
Lebanon	3300.88	755.12	2.64	2.14	11.58	10.76
Yemen Republic	16616.28	3160.54	10.19	7.01	36.92	34.90
Canada	2305.22	872.65	1.55	2.07	10.73	11.70
Malaysia	1227.19	254.39	1.25	1.01	6.91	5.10
South Africa	18.80	3.08	0.47	0.39	-57.13	-53.96
Others	23718.69	7981.90	14.99	17.46	24.71	28.10
Total	**134613.20**	**36424.10**	**100.00**	**100.00**	**13.86**	**14.16**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVI

Table iv(I): Region/country wise total exports of mango slices in brine for the past ten years from India

Qty = 000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	958.59	244.99	1870.78	516.92	1014.48	383.60
USA	326.36	112.11	302.69	98.38	152.94	62.82
Saudi Arabia	272.51	83.83	825.19	207.03	263.00	103.85
Israel	183.66	52.46	0.00	0.00	0.00	0.00
Germany	157.92	45.44	.83.40	43.18	18.60	9.62
UAE	18.18	6.93	84.99	21.62	64.00	18.93
Netherlands	0.00	0.00	367.74	232.18	272.43	113.61
Japan	26.13	13.27	14.69	8.69	6.00	6.28
Jordan	30.00	5.11	46.68	9.76	143.00	58.69
Kuwait	5.75	1.74	0.65	0.86	0.70	0.74
Canada	2.86	1.92	63.56	24.31	2.00	1.13
France	0.00	0.00	18.00	4.51	0.00	0.00
Yemen Rep.	0.00	0.00	74.00	14.94	0.00	0.00
Others	82.30	27.30	195.53	83.24	83.52	28.04
Total	**2064.26**	**595.10**	**3947.90**	**1265.62**	**2020.67**	**787.31**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	1549.05	473.34	1269.48	464.65	1508.08	417.96
USA	125.49	61.27	495.10	127.00	227.10	107.33
Saudi Arabia	716.27	228.10	562.60	226.44	642.21	203.23
Israel	17.00	3.45	18.50	6.30	27.13	7.80
Germany	115.00	49.23	.76.36	46.56	0.00	0.00
UAE	21.40	11.84	107.70	30.23	0.03	0.01
Netherlands	0.00	0.00	20.00	6.86	0.00	0.00
Japan	24.72	16.39	10.82	7.29	70.30	46.16
Jordan	0.00	0.00	0.00	0.00	12.63	3.41
Kuwait	0.00	0.00	93.00	44.15	40.00	6.48
Canada	51.37	24.03	39.91	24.44	17.67	9.76
France	0.00	0.00	0.00	0.00	142.60	69.04
Yemen Rep.	37.00	6.92	0.00	0.00	100.00	14.18
Others	251.02	106.47	89.38	28.56	52.96	9.13
Total	**2908.32**	**981.04**	**2782.85**	**1012.48**	**2840.71**	**894.49**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVI

Table iv(II): Region/country wise total exports of mango slices in brine for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakh

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	880.88	356.08	1511.13	488.78	1529.38	511.41
USA	173.47	74.51	218.33	100.41	203.33	121.99
Saudi Arabia	366.06	141.97	1081.17	376.98	2977.43	1094.82
Israel	27.43	6.92	114.00	41.60	8.00	1.91
Germany	0.00	0.00	44.28	15.34	60.00	22.03
UAE	26.44	7.34	39&.85	105.64	339.75	93.46
Netherlands	103.44	44.79	1009.15	407.81	421.02	163.55
Japan	130.16	92.05	323.31	163.32	88.48	66.87
Jordan	139.32	26.41	51.46	13.05	0.00	0.00
Kuwait	0.01	0.06	487.66	176.06	205.00	55.40
Canada	22.55	9.68	151.18	76.82	17.82	14.83
France	0.00	0.00	217.68	85.74	92.61	39.66
Yemen Rep.	150.00	36.07	186.00	32.49	998.00	204.44
Others	179.26	75.20	819.40	286.75	90.33	20.36
Total	**2199.02**	**871.08**	**6613.60**	**2370.79**	**7031.15**	**2410.73**

Year	2005		Average % contribution		CGR (%)	
Country	Quantity	Value	Quantity	Value	Quantity	Value
UK	435.56	130.65	35.84	32.42	-4.75	-3.26
USA	162.35	78.74	6.82	7.68	-4.23	0.70
Saudi Arabia	1927.05	647.40	27.56	26.94	21.22	23.59
Israel	7.00	1.71	1.15	0.99	49.02	37.30
Germany	22.60	7.90	1.65	1.94	-27.21	-27.10
UAE	275.61	94.18	3.83	3.17	23.46	21.73
Netherlands	48.00	12.80	6.41	7.99	87.71	69.60
Japan	100.05	58.55	2.27	3.89	36.41	36.47
Jordan	42.00	15.44	1.33	1.07	-14.33	-9.65
Kuwait	17.30	5.83	2.44	2.37	59.22	45.43
Canada	63.10	9.86	1.24	1.60	25.10	19.51
France	9.01	5.61	1.38	1.68	122.87	114.95
Yemen Rep.	80.00	22.03	2.36	2.68	148.72	133.68
Others	97.44	22.86	5.55	5.59	3.65	-1.19
Total	**3287.07**	**1113.56**	**100.00**	**100.00**	**7.88**	**9.65**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVII

Table v(I): Region/country wise total exports of mango sliced and dried for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	1996		1997		1998	
Region or Country	Quantity	Value	Quantity	Value	Quantity	Value
UK	68.68	17.36	270.15	52.03	131.40	69.79
USA	33.92	14.73	0.10	0.07	20.00	7.46
Saudi Arabia	83.64	28.54	0.00	0.00	176.52	58.28
UAE	68.31	7.73	1.41	0.48	24.73	5.07
Germany	45.14	19.20	20..00	9.35	40.00	17.98
Japan	0.00	0.00	0.00	0.00	14.30	10.15
Netherlands	0.23	0.08	0.00	0.00	0.00	0.00
Bangladesh	0.00	0.00	0.00	0.00	0.00	0.00
Others	9.92	2.84	12.44	4.36	48.53	13.55
Total	**309.84**	**90.48**	**304.10**	**66.29**	**455.48**	**182.28**

Year	1999		2000		2001	
Region or Country	Quantity	Value	Quantity	Value	Quantity	Value
UK	100.14	26.90	0.00	0.00	92.00	26.63
USA	40.00	8.18	59.24	34.02	16.98	7.58
Saudi Arabia	280.35	87.90	325.54	140.27	95.10	27.57
UAE	15.05	5.09	115.54	33.03	24.14	6.42
Germany	0.00	0.00	G.OO	0.00	21.92	9.99

Japan	0.00	0.00	0.00	0.00	23.00	14.21
Netherlands	32.80	50.16	0.00	0.00	0.00	0.00
Bangladesh	0.00	0.00	0.00	0.00	0.00	0.00
Others	15.30	6.38	5.28	4.14	99.48	32.58
Total	**483.64**	**184.61**	**505.60**	**211.46**	**372.62**	**124.98**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVII

Table v(II): Region/country wise total exports of mango sliced and dried for the past ten years from India

Qty=000'Kgs Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Region or Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
UK	99.54	67.64	301.84	100.15	364.02	129.78
USA	7.28	2.23	52.20	21.70	42.74	24.31
Saudi Arabia	24.00	8.35	363.57	109.96	581.91	297.20
UAE	31.03	10.07	11.57	2.28	33.33	8.81
Germany	0.00	0.00	212.00	89.13	147.03	74.59
Japan	3.05	2.16	16.50	5.77	17.20	11.15
Netherlands	0.00	0.00	241.50	87.60	338.00	179.76
Bangladesh	0.00	0.00	10549.75	980.66	2387.20	272.86
Others	69.90	22.66	229.47	84.25	96.16	28.85
Total	**234.80**	**113.11**	**11978.40**	**1481.50**	**4007.59**	**1027.31**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Region or country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
UK	289.13	135.75	7.06	13.72	14.75	25.58
USA	48.97	18.76	1.49	3.04	43.99	41.03
Saudi Arabia	538.00	167.34	11.50	20.24	71.00	64.62
UAE	122.51	34.45	2.09	2.45	17.59	40.78
Germany	325.80	113.58	3.78	7.31	33.62	32.05
Japan	158.14	38.35	1.08	1.77	171.67	139.04
Netherlands	897.22	400.96	7.02	15.73	239.94	204.71
Bangladesh	321.43	32.27	61.70	28.14	353.40	239.35
Others	334.43	147.29	4.28	7.59	45.12	47.38
Total	**3035.63**	**1088.75**	**100.00**	**100.00**	**37.15**	**35.52**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVIII

Table vi(I): Region/country wise total exports of mango chutney for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	2440.44	642.96	2441.15	707.36	3749.53	1185.36
USA	267.9	91.88	299.57	107.80	443.64	201.42
Japan	190.97	89.06	378.61	156.48	302.42	157.03
Germany	230.67	67.78	450.16	131.27	433.37	167.72
Denmark	120.75	39.33	106.25	43.60	164.12	72.75
Australia	27.7.	10.44	60.54	26.19	83.82	36.91
Canada	24.37	12.69	36.14	20.09	93.13	45.61
Netherlands	195.26	66.20	214.38	67.18	272.58	113.16
Saudi Arabia	63.18	27.16	23.00	7.10	12.00	9.19
Sweden	33.00	13.86	0.25	0.12	22.25	10.85
Hong Kong	42.05	27.86	58.50	30.49	111.88	65.47
UAE	0.00	0.00	0.00	0.00	0.00	0.00
Others	106.94	47.19	457.17	187.57	518.95	229.23
Total	**3743.24**	**1136.41**	**4525.72**	**1485.25**	**6207.69**	**2294.7**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XVIII

Table vi(II): Region/country wise total exports of mango chutney for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1999*		*2000*		*2001*	
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	3155.46	1005.21	3841.91	1215.71	3452.69	1086.27
USA	587.91	252.81	990.59	341.14	541.61	253.65
Japan	301.99	160.39	334.48	182.88	165.23	85.24
Germany	418.97	151.69	487.27	193.21	578.39	201.33
Denmark	161.42	70.17	168.03	78.79	311.20	112.64
Australia	44.49	29.82	75.33	39.46	70.20	43.51
Canada	108.75	40.70	58.27	27.91	59.71	37.20
Netherlands	429.44	165.14	284.14	176.94	367.41	166.61
Saudi Arabia	11.50	8.09	99.48	180.12	0.00	0.00
Sweden	11. 73	6.86	32.52	24.74	40.37	24.92
Hong Kong	65.00	30.41	122.53	83.56	114.18	95.55
UAE	0.00	0.00	0.00	0.00	100.99	103.49
Others	318.80	142.58	460.53	259.30	293.69	92.68
Total	**5615.46**	**2063.87**	**6955.08**	**2803.763**	**6095.67**	**2303.09**

Year	*2002*		*2003*		*2004*	
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	3736.22	1159.54	-	-	-	-
USA	478.29	192.81	-	-	-	-
Japan	202.81	114.38	-	-	-	-
Germany	594:83	222.94	-	-	-	-
Denmark	171.09	87.72	-	-	-	-
Australia	79.40	39.75	-	-	-	-
Canada	98.78	40.63	-	-	-	-
Netherlands	229.26	111.35	-	-	-	-
Saudi Arabia	40.34	10.68	-	-	-	-
Sweden	366.68	163.80	-	-	-	-
Hong Kong	163.76	110.93	-	-	-	-
UAE	29.54	7.91	-	-	-	-
Others	322.58	136.24	-	-	-	-
Total	**6513.58**	**2398.68**	**-**	**-**	**-**	**-**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	-	-	57.54	48.34	7.39	9.94
USA	-	-	9.1	9.96	14.26	17.27
Japan	-	-	4.73	6.52	-4.86	-1.13
Germany	-	-	8.05	7.84	13.14	17.62
Denmark	-	-	3.03	3.49	12.17	17.04
Australia	-	-	1.11	1.56	12.4	20.68
Canada	-	-	1.21	1.55	18.7	16.19
Netherlands	-	-	5.02	5.98	5.88	14.68
Saudi Arabia	-	-	0.63	1.67	-40.68	-36.69
Sweden	-	-	1.28	1.7	137.5	134.4
Hong Kong	-	-	1.71	3.07	21.69	27.1
UAE	-	-	0.34	0.76	355.98	295.98
Others	-	-	6.25	7.56	8.61	7.03
Total	**-**	**-**	**100**	**100**	**8.84**	**12.6**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XIX

Table vii(I): Region/country wise total exports of mango pickles for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*			*1998*
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	526.73	157.56	414.57	125.66	374.66	133.43
USA	227.93	90.72	227.55	101.43	162.33	83.94
Saudi Arabia	464.33	138.21	457.86	161.43	303.86	115.02
UAE	418.19	128.29	343.18	158.71	341.13	114.90
Kuwait	87.65	33.65	31.58	13.81	142.46	65.51
Oman	81.92	23.69	73.94	23.00	26.66	10.73
Singapore	51.38	20.51	36.80	12.77	66.49	28.69
Australia	41.22	17.69	23.74	12.45	39.52	21.71
Canada	34.83	12.05	150.31	61.13	31.17	14.67
Bahrain	45.75	16.32	0.00	0.00	13.50	3.92
Qatar	19.32	7.43	12.00	2.68	38.52	16.02
Netherlands	16.42	5.97	33.11	12.62	0.00	0.00
Others	211.40	81.67	320.85	121.00	238.55	110.61
Total	**2227.07**	**733.76**	**2125.49**	**806.69**	**1778.85**	**719.15**

Year	*1999*		*2000*		*2001*	
Region or Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
UK	357.24	133.35	486.85	145.52	481.48	170.78
USA	409.97	230.51	301.41	169.77	291.77	155.35
Saudi Arab	379.14	143.76	107.00	43.40	522.87	206.87
UAE	288.70	117.53	236.66	83.27	587.27	203.22
Kuwait	6653	32.92	67.46	30.25	170.98	76.80
Oman	64.05	27.53	40.96	13.34	79.80	23.33
Singapore	53.17	23.28	10.82	10.22	25.41	11.42
Australia	25.91	22.05	111.35	41.55	101.51	45.77
Canada	153.45	102.88	20.33	10.64	95.53	58.35
Bahrain	110.32	34.93	6.30	2.62	56.23	23.05
Qatar	20.93	13.42	26.51	8.50	39.04	16.28
Netherlands	48.40	19.64	128.05	73.93	105.79	39.18
Others	388.88	165.63	343.53	162.82	207.20	10 1.18
Total	**2366.69**	**1067.43**	**1887.23**	**795.83**	**2764.88**	**1131.58**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XIX

Table vii(II): Region/country wise total exports of mango pickles for the past ten years from India

Qty=000'Kg/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Region or Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
UK	466.64	184.31	-	-	-	-
USA	242.37	110.40	-	-	-	-
Saudi Arabia	717.16	228.51	-	-	-	-
UAE	433.10	182.79	-	-	-	-
Kuwait	73.04	22.06	-	-	-	-
Oman	66.68	20.50	-	-	-	-
Singapore	56.13	26.20	-	-	-	-
Australia	181.66	102.23	-	-	-	-
Canada	98.35	31.05	-	-	-	-
Bahrain	39.24	13.96	-	-	-	-
Qatar	28.50	17.97	-	-	-	-
Netherlands	9.16	3.79	-	-	-	-
Others	311.51	128.14	-	-	-	-
Total	**2723.54**	**1071.91**	**-**	**-**	**-**	**-**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Region or Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
U.K	-	-	19.58	16.60	0.69	4.23
U.S.A	-	-	11.74	14.88	4.73	7.91
Saudi Arabia	-	-	18.60	16.38	1.90	3.78
U.A.E	-	-	16.68	15.62	2.96	4.51
Kuwait	-	-	4.03	4.36	7.56	4.81
Oman	-	-	2.74	2.26	-0.12	-0.83
Singapore	-	-	1.88	2.09	-7.87	-2.16
Australia	-	-	3.31	4.17	34.92	35.65
Canada	-	-	3.67	4.60	6.48	9.09
Bahrain	-	-	1.72	1.50	76.56	69.61
Qatar	-	-	1.17	1.30	12.34	22.17
Netherlands	-	-	2.14	2.46	43.26	42.36
Others	-	-	12.74	13.78	2.39	4.97
Total	**-**	**-**	**100.00**	**100.00**	**4.34**	**7.06**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XX

Table viii(I): Region/country wise total exports of mango jams, jellies and mrmdls for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Region or Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Netherlands	1019.98	431.33	868.79	465.97	693.84	312.80
Netherlands Artil						
USA	436.94	131.30	104.81	65.39	188.04	96.69
UK	161.57	53.72	20.74	14.70	0.00	0.00
UAE	136.38	44.71	67.30	23.20	13.62	9.88
Saudi Arabia	140.57	50.37	3.00	1.22	42.36	7.12
Japan						
Germany	10.01	6.97	104.75	32.16	125.36	33.65
Canada	0.00	0.00	47.23	23.92	51.30	33.22
Malaysia	40.61	9.32	62.20	12.75	0.00	0.00
Kuwait	21.00	5.86	0.00	0.00	2.27	1.07
Sweden	19.00	10.15	0.00	0.00	0.00	0.00
Singapore	0.00	0.00	0.00	0.00	85.70	18.81
Finland	0.00	0.00	0.00	0.00	0.00	0.00
Others	205.02	57.23	114.31	37.53	78.65	50.50
Total	**2191.08**	**800.96**	**1393.13**	**676.84**	**1281.14**	**563.74**

Year	*1999*		*2000*		*2001*	
Region or Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Netherlands	1907.17	622.33	1657.04	726.33	4154.85	1970.13
Netherlands Artil					0.00	0.00
USA	170.44	75.47	121.08	49.43	465.69	218.64
UK	21.00	9.19	191.06	10 1.36	155.15	74.75
UAE	10.00	4.99	95.88	39.19	273.09	118.38
Saudi Arab	10.00	2.57	222.00	183.36	85.00	40.78
Japan					0.00	0.00
Germany	142.50	46.04	219.78	117.68	39.69	25.49
Canada	46.54	21.49	144.73	81.11	107.20	53.35
Malaysia	0.78	0.50	121.33	98.85	103.86	26.54
Kuwait	1.10	1.55	149.53	85.05	248.78	92.77
Sweden	0.00	0.00	0.00	0.00	0.64	0.20
Singapore	21.10	3.56	0.90	0.33	77.10	25.09
Finland	0.00	0.00	161.86	86.39	73.51	31.21
Others	138.73	69.14	399.97	178.50	582.58	262.21
Total	**2469.36**	**856.83**	**3485.16**	**1747.58**	**6367.14**	**2939.54**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign

Appendix XX

Table viii(II): Region/country wise total exports of mango jams, jellies and mrmdls for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	2297.99	1111.47	1794.41	757.42	1742.55	866.85
Netherlands Artil	1051.40	600.55	0.00	0.00	0.00	0.00
USA	408.33	193.89	427.82	171. 56	234.40	94.82
UK	370.49	208.57	1667.91	573.91	925.11	318.70
UAE	54.66	38.91	620.05	223.61	529.51	176.26
Saudi Arabia	61.00	21.90	438.66	113.10	234.59	87.55
Japan	0.00	0.00	0.00	0.00	234.96	133.04
Germany	192.94	128.80	197.71	71.48	77.10	39.96
Canada	271.07	146.92	181.35	73.77	136.20	70.51
Malaysia	54.65	16.78	80.17	31. 75	13.50	8.21
Kuwait	0.00	0.00	334.95	78.89	123.23	40.48
Sweden	0.00	0.00	140.09	62.30	118.05	50.60
Singapore	23.00	6.70	87.15	26.65	142.63	40.35
Finland	88.80	44.83	18.00	9.37	19.00	10.70
Others	837.83	362.80	1383.74	575.70	1205.53	532.51
Total	**5712.16**	**2882.12**	**7372.01**	**2769.51**	**5736.36**	**2470.54**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	5181.04	2222.78	38.55	40.86	16.87	17.25
Netherlands Artil	0.00	0.00	1.90	2.59	23.40	22.15
USA	885.98	377.59	6.23	6.35	12.93	12.48
UK	2924.49	1041.46	11.64	10.33	108.27	97.10
UAE	1327.20	399.63	5.66	4.65	43.94	41.03
Saudi Arabia	1647.78	395.65	5.22	3.89	51.78	51.33
Japan	1741.07	1065.20	3.57	5.16	196.01	181.30
Germany	288.57	117.28	2.53	2.67	19.65	21.50
Canada	502.50	205.51	2.69	3.06	102.18	90.62
Malaysia	214.17	46.88	1.25	1.09	44.96	43.01
Kuwait	532.30	194.62	2.55	2.16	91.62	78.31
Sweden	191.19	85.07	0.85	0.90	131.83	110.33
Singapore	22.47	7.91	0.83	0.56	134.91	119.81
Finland	283.28	146.88	1.17	1.42	255.07	223.29
Others	3552.43	1194.53	15.36	14.31	45.84	46.81
Total	**19294.47**	**7500.99**	**100.00**	**100.00**	**28.48**	**28.46**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXI

Table ix(I): Region/country wise total exports of mango squash for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	-	-	-	-	-	-
Bangladesh	-	-	-	-	36.32	19.68
Bahrain	-	-	-	-	-	-
Canada	-	-	-	-	-	-
Denmark	-	-	-	-	-	-
Germany	-	-	-	-	-	-
Japan	-	-	-	-	-	-
Nepal	0.75	0.34	-	-	9.50	9.60
Netherlands	-	-	-	-	-	-
UAE	2.58	0.96	13.00	6.45	-	-
UK	-	-	40.32	23.24	-	-
USA	21.00	12.21	-	-	**11.1**	5.33
Yemen Rep.	-	-	-	-	-	-
Maldives	-	-	-	.	-	-
Others	0.29	0.18	3.00	1.58	0.37	0.27
Total	**24.62**	**13.69**	**56.32**	**3 1.27**	**57.29**	**34.88**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	-	-	0.02	0.01	60.00	36.37
Bangladesh	-	-	32.56	14.36	36.94	28.44
Bahrain	-	-	-	-	11.95	7.00
Canada	-	-	-	-	-	-
Denmark	-	-	-	-	16.38	10.58
Germany	-	-	-	-	-	-
Japan	-	-	1.00	0.84	-	-
Nepal	-	-	-	-	-	0.12
Netherlands	17.00	7.12	-	-	-	
UAE	-	-	2.62	1.54	60.70	28.05
UK	-	-	-	-	2.00	2.44
USA	32.76	6.64	2.59	1.19	17.52	7.91
Yemen Rep.	37.75	16.61	-	-	-	
Maldives	-	-	6.91	7.76	-	
Others	1.10	1.69	0.74	0.41	30.78	9.55
Total	**88.61**	**32.06**	**46.44**	**26.11**	**236.27**	**130.46**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXI

Table ix(II): Region/country wise total exports of mango squash for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Australia	-	-	0.40	0.17	0.30	0.10
Bangladesh	-	-	68.90	35.78	17.82	7.85
Bahrain	12.25	6.97	1.00	0.27	0.23	0.10
Canada	-	-	15.22	10.59	15.47	6.28
Denmark	-	-	-	-	0.31	0.12
Germany	0.02	0.01	-	-	45.56	17.23
Japan	-	-	-	-	-	-
Nepal	41.00	7.99	316.59	103.66	501.88	170.65
Nether land	89.48	47.28	37.60	13.40	-	-
UAE	17.11	11.03	104.10	24.07	10.78	10.72
UK	-	-	302.50	84.21	515.56	136.43
USA	8.00	4.84	48.90	42.10	59.40	16.57
Yemen Rep.	-	-	-	-	294.00	65.05
Maldives	-	-	19.52	5.02	-	-
Others	50.38	27.08	588.69	166.00	68.04	18.22
Total	**218.24**	**105.20**	**1503.42**	**485.27**	**1529.35**	**449.32**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Australia	3.40	**1.11**	0.65	1.09	43.88	35.10
Bangladesh	5.02	2.64	4.31	6.97	96.87	85.28
Bahrain	-	-	0.55	0.90	36.54	17.21
Canada	0.40	0.16	0.65	1.09	76.21	62.19
Denmark	-	-	0.35	0.64	4.57	4.28
Germany	20.85	10.10	1.46	1.73	117.07	99.84
Japan	64.20	31.64	1.42	2.11	56.85	51.03
Nepal	35.52	11.69	19.74	19.49	148.59	169.86
Nether land	36.00	14.42	3.92	5.18	106.79	90.99
UAE	24.37	9.54	5.07	5.82	77.66	75.52
UK	588.88	178.28	31.63	27.16	176.72	141.83
USA	2.10	1.37	4.44	6.26	31.06	28.53
Yemen Rep.	-	-	7.23	5.25	. 33.19	26.77
Maldives	-	-	0.59	0.84	21.00	15.93
Others	49.59	17.08	17.27	14.19	177.81	141.72
Total	**830.33**	**278.03**	**100.00**	**100.00**	**57.77**	**51.53**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXII

Table x(I): Region/country wise total exports of mango juice for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	-	-	258.96	88.93	814.34	331.37
USA	87.47	22.99	483.59	120.46	1303.58	450.17
UK	11.00	2.49	-	-	145.65	71.43
UAE	33.01	6.10	18.54	7.15	557.58	164.75
Saudi Arabia	-	-	.	.		142.20
Canada	-	-	22.90	9.62	-	-
Japan	0.23	0.18	22.50	15.37	5.10	4.23
Germany	45.00	10.06	.	.	-	-
Yemen Rep.	-	-	.	.	-	-
Singapore	12.00	3.44	2.51	1.42	-	-
Malaysia	34.01	5.26	42.10	8.59		1.50
Russia	-	-		-	-	
Others	185.57	42.29	480.15	159.49	392.30	109.93
Total	**408.29**	**92.81**	**1331.25**	**411.03**	**3677.24**	**1310.46**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	473.01	196.20	154.10	85.76	317.17	128.66
USA	749.95	156.86	689.62	348.50	648.80	296.57
UK	131.66	50.26	70.49	29.65	31.78	12.82
UAE	15.51	17.35	8.82	3.97	2.88	1.96
Saudi Arabia	37.00	21.49	0.05	0.01	276.50	77.57
Canada	50.77	25.67	26.04	16.49	160.52	85.88
Japan	18.90	11.18	-	-	97.12	38.65
Germany	16.00	4.56	-	-	3.50	2.48
Yemen Rep.	0.71	0.73	-	-	-	-
Singapore	-	-	9.05	4.82	-	-
Malaysia	16.91	3.29	55.86	18.36	-	-
Russia	88.80	38.21	18.24	6.89	-	-
Others	468.54	134.66	253.38	97.48	141.82	69.14
Total	**2067.76**	**660.46**	**1285.65**	**611.93**	**1680.09**	**713.73**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXII

Table x(II): Region/country wise total exports of mango juice for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	496.72	266.47	395.52	153.73	596.00	233.60
USA	434.28	180.06	533.09	193.97	1380.18	361.08
UK	61.24	32.61	209.86	109.32	80.74	18.81
UAE	304.17	101.53	247.00	100.55	296.95	70.83
Saudi Arabia	905.20	361.81	181.55	78.49	501.64	189.33
Canada	81.15	53.59	73.31	31.65	238.92	68.09
Japan	238.20	144.88	120.60	69.91	104.00	55.61
Germany	35.77	22.84	53.68	17.67	158.00	50.61
Yemen Rep.	909.88	272.77	20.00	5.28	358.00	106.09
Singapore	7.32	10.44	15.10	3.69	30.70	8.02
Malaysia	1.67	5.03	0.62	0.40	20.82	4.52
Russia	50.00	16.93	681.00	248.39	190.00	57.38
Others	429.16	166.23	662.54	229.78	1052.25	344.71
Total	**3954.76**	**1635.19**	**3193.87**	**1242.83**	**5008.20**	**1568.68**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Netherlands	509.35	181.86	13.03	17.5	91.64	75.2
USA	1194.96	332.92	28.63	25.89	16.18	18.35
UK	145.80	60.98	3.39	4.08	67.38	66.04
UAE	122.96	35.54	6.14	5.37	23.44	23.31
Saudi Arabia	463.00	77.37	9.57	8.92	223.11	179.91
Canada	372.52	93.04	3.92	4.05	161.83	133.45
Japan	-	-	2.32	3.57	29.97	27.08
Germany	153.08	62.76	1.78	1.81	119.98	111.61
Yemen Rep.	139.87	31.02	5.45	4.37	274.27	207.11
Singapore	14.00	6.74	0.35	0.4	50.23	49.77
Malaysia	31.90	12.06	0.79	0.6	-13.49	-1.32
Russia	-	-	5.12	5.28	47.02	39.24
Others	1052.88	376.82	19.51	18.16	14.87	19.3
Total	**4200.32**	**1271.11**	**100**	**100**	**21.88**	**24.18**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXIII

Table xi(I): Region/country wise total exports of mango kernel with nut broken for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Belgium	-	-	-	-	-	-
Germany	4.52	8.53	-	-	-	-
Japan	-	-	-	-	-	-
Korea	2.00	1.25	-	-	-	-
Kuwait	-	-	-	-	-	-
Malaysia	1A.80	11.51	-	-	-	-
Singapore	-	-	1.85	0.60	-	-
USA	-	-	16.00	7.06	-	-
Bangladesh	-	-	-	-	-	-
Saudi Arabia	-	-	-	-	-	-
Sri lanka	-	-	-	-	-	-
Sweden	-	-	-	-	-	-
UK	-	-	-	-	-	-
Nepal	-	-	-	-	-	-
Others	-	-	-	-	-	-
Total	**21.32**	**21.29**	**17.85**	**7.66**	**Nil**	**Nil**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Belgium	-	-	-	-	-	-
Germany	-	-	-	-	-	-
Japan	-	-	-	-	-	-
Korea	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Singapore	-	-	-	-	-	-
USA	-	-	-	-	-	-
Bangladesh	-	-	6.00	0.46	-	-
Saudi Arabia	-	-	-	-	60.00	20.80
Sri lanka	-	-	-	-	0.71	1.49
Sweden	-	-	25.00	15.64	-	-
UK	-	-	-	-	-	-
Nepal	-	-	-	-	-	-
Others	-	-	-	-	-	-
Total	**Nil**	**Nil**	**31.00**	**16.10**	**60.71**	**22.29**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXIII

Table xi(II): Region/country wise total exports of mango kernel with nut broken for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Ouantitv*	*Value*	*Ouantitv*	*Value*
Belgium	-	-	10.50	4.29	-	-
Germany	-	-	-	-	-	-
Japan	-	-	-	-	-	-
Korea	-	-	1.75	5.13	20.00	5.99
Kuwait	-	-	0.12	0.15	-	
Malaysia	-	-	-	-	-	
Singapore	-	-	-	-	-	
USA	-	-	-	-	-	
Bangladesh	-	-	-	-	-	
Saudi Arabia	-	-	-	-	-	
Sri lanka	-	-	-	-		-
Sweden	-	-	-	-	-	
UK	240.00	28.22	-	-	-	
Nepal	-	-	-	-	272.58	53.53
Others	-	-	-	-	0.09	0.25
Total	**240.00**	**28.22**	**12.37**	**9.57**	**292.67**	**59.77**

Year	*2005*		*Average % contribution*		*CGR ('%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Ouantitv*	*Value*
Belgium	-	-	1.50	2.05	23.64	19.91
Germany	-	-	0.69	4.56	-28.75	-31.00
Japan	-	-	0.01	0.05	0.00	0.00
Korea	34.00	19.80	7.83	16.08	89.19	86.47
Kuwait	-	-	0.01	0.05	0.00	0.00
Malaysia	15.00	9.04	4.06	10.	0.00	0.00
Singapore	-	-	0.28	0.55	-20.13	-17.75
USA	-	-	2.17	3.56	-26.87	-24.26
Bangladesh	-	-	0.82	0.05	-3.80	0.00
Saudi Arabia	6.63	1.53	9.05	11.58	50.69	39.84
Sri lanka	-	-	0.15	0.55	2.83	2.83
Sweden	-	-	3.38	8.07	-4.63	-4.37
UK	-	-	32.39	14.09	20.13	15.52
Nepal	-	-	36.84	27.14	54.24	43.99
Others	5.89	2.47	0.82	1.04	41. 75	33.51
Total	**61.52**	**32.84**	**100.00**	**100.00**	**56.54**	**38.89**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXIV

Table xii(I): Region/country wise total exports of flour mango for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	1.53	0.33	0.12	0.08	8.76	6.10
Canada	2.37	0.37	1.36	0.85	3.50	1.73
Indonesia	-	-	-	-	20.00	2.61
Japan	1.00	0.15	-	-	0.10	0.03
Nigeria	0.90	0.09	-	-	18.95	5.95
South Africa	-	-	0.64	0.35	0.80	0.50
UAE	2.37	0.74	4.37	2.87	3.80	1.72
UK	23.17	11.27	21.27	11.04	-	-
USA	30.59	9.63	1.71	0.81	3.40	1.77
Netherlands	-	-	20.00	3.58	-	-
Others	4.20	0.80	1.54	1.38	-	-
Total	**66.13**	**23.38**	**51.01**	**20.96**	**59.31**	**20.41**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	-	-	-	-	3.39	3.44
Canada	5.40	20.22	30.00	11.02	0.45	0.13
Indonesia	-	-	0.18	0.06	-	-
Japan	-	-	-	-	20.00	2.97
Nigeria	-	-	-	-	-	-
South Africa	20.40	6.46	0.52	0.18	1.30	0.44
UAE	8.60	2.69	-	-	8.61	3.68
UK	8.81	8.07	-	-	2.40	0.71
USA	26.82	12.64	24.82	18.56	18.02	4.94
Netherlands	-	-	40.00	5.66	80.00	9.99
Others	-	-	71.25	18.21	40.29	4.85
Total	**70.03**	**50.08**	**166.77**	**53.69**	**174.46**	**31.15**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXIV

Table xii (II): Region/country wise total exports of flour mango for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	14.10	1.85	0.50	0.13	-	-
Canada	10.10	5.16	1.61	0.80	-	-
Indonesia	20.00	6.07	0.30	0.24	-	-
Japan	-	-	-	-	19.00	8.74
Nigeria	-	-	-	-	-	-
South Africa	0.70	0.32	0.11	0.06	-	-
UAE	6.32	2.08	0.85	1.14	9.30	5.03
UK	16.16	2.17	22.00	3.56	20.35	3.16
USA	34.22	13.93	86.75	33.72	38.48	8.84
Netherlands	-	-	120.00	16.94	-	-
Others	2.34	1.03	69.64	26.88	34.48	8.31
Total	**103.94**	**32.61**	**301.76**	**83.47**	**121.61**	**34.08**

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Australia	6.30	6.07	2.98	4.62	17.31	33.11
Canada	15.63	3.01	5.87	11.64	-13.27	2.75
Indonesia	-	-	3.41	2.46	-8.80	-5.50
Japan	-	-	3.41	2.46	12.21	31.86
Nigeria	-	-	1.71	1.65	-38.12	-17.62
South Africa	0.03	0.01	2.13	. 1.92	-32.25	-22.57
UAE	5.00	1.60	4.17	6.23	7.92	6.97
UK	9.00	4.16	10.29	11.91	25.19	7.68
USA	25.58	7.38	24.74	30.85	24.55	16.52
Netherlands	-	-	22.11	10.03	-3.31	-2.54
Others	3.61	1.54	19.21	17.05	61. 75	55.49
Total	**65.15**	**23.77**	**100.00**	**100.00**	**9.63**	**4.45**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXV

Table xiii(I): Region/country wise total exports of mango kernel oil for the past ten years from India

Qty=000'Kgs/Value in ₹ Lakhs

Year	*1996*		*1997*		*1998*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Denmark	-	-	30.00	17.90	-	-
Japan	102.40	85.55	102.00	91.34	-	.
USA	14.00	12.40	-	-	-	.
Italy	-	-	-	-	-	-
Korea Rep.	.	-	-	-	-	-
Total	**116.40**	**97.95**	**132.00**	**109.34**	**Nil**	**Nil**

Year	*1999*		*2000*		*2001*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Denmark	-	-	-	-	-	-
Japan	.	-	.	.	.	-
USA	.	.	.	.	.	-
Italy	152.00	147.40	-	-	-	-
Korea Rep.	1.00	3.24	-	-	-	-
Total	**153.00**	**150.64**	**Nil**	**Nil**	**Nil**	**Nil**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXV

Table xiii(II): Region/country wise total exports of mango kernel oil for the past ten years from India

Year	*2002*		*2003*		*2004*	
Country	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Denmark	-	-	-	-	-	-
Japan	-	-	-	-	-	-
USA	18.00	12.76	-	-	-	-
Italy	-	-	-	-	-	-
Korea Rep.	-	-	-	-	-	-
Total	**18.00**	**12.76**	**Nil**	**Nil**	**Nil**	**Nil**

Qty=000'Kgs/Value in ₹ Lakhs

Year	*2005*		*Average % contribution*		*CGR (%)*	
Country	***Quantity***	***Value***	***Quantity***	***Value***	***Quantity***	***Value***
Denmark	-	-	7.17	4.88	-43.55	-41.46
Japan	-	-	48.67	47.82	-80.76	-80.25
USA	-	-	7.64	6.77	2.73	0.86
Italy	-	-	36.27	39.72-	0	0
Korea Rep.	-	-	0.25	0.83	0	0
Total	**Nil**	**Nil**	**100**	**100**	**-53.34**	**-53.48**

Source: Export Import Data Bank from the official website of the Directorate General of Foreign Trade (DGFT) under Ministry of Commerce and Industry of India

Appendix XXVI

INTERVIEW SCHEDULE

I. General/Introductory Information

(a) Name of the farmer :
(b) Address :
(c) Total land holding :
(d) Proprietary status :
(e) Area under different permanent crops :
(f) Area under field crops :
(g) Irrigation status : Irrigated/non irrigated

II. Specific Information

(a) Area under Mango crop :
(b) Total number of Mango plants :
Mango age group wise :
1-2 years :
2-5 years :
5-10 years :
10 and above :
(c) Varieties cultivated : Number of Plants
(i) Alphonso :
(ii) Mallika :
(iii) Neelam :
(iv) Totapuri :
(v) Others :
(d) Details about the purchase of seedlings/saplings :
Purchased from :
Certified or not : Yes/No
If yes, by which authority :
(e) Variety-wise annual yield : Kgs/per plant
(i) Alphonso :
(ii) Mallika :
(iii) Neelam :
(iv) Totapuri :
(v) Others :
(f) Application of fertilizers (Qty per acre) :

(g) Frequency of application of fertilizers :

(No. of times per year)

(i) :

(ii) :

(iii) :

(iv) :

(h) Application of plant protection chemicals/growth regulators/pesticides (Qty per acre)

(i) Frequency of application of the above : Time of application

(i) :

(ii) :

(iii) :

(iv) :

(j) Major diseases encountered : Time severity frequency

Severity on a scale of 1 to 10

(1: Negligible, 10: Most severe) :

(a) :

(b) :

(c) :

(d) :

(k) Major pest attack : Time severity frequency

Severity on a scale of 1 to 10

(1: Negligible, 10: Most severe)

(i) :

(ii) :

(iii) :

(iv) :

(l) General time of harvest :

(m) Method of harvesting :

(i) :

(ii) :

(n) Grading process followed based on :

Variety : Yes/No

Size : Yes/No

Colour : Yes/No

Taste : Yes/No

Diseased Fruits : Yes/No

Other advanced mechanism specify :

(o) Packing process followed :

No packing : Yes/No

Bulk packing : Yes/No

Crates (cartons) : Yes/No

Any other specify :

(p) Availability of storage facilities at farm : Yes/No

(q) Details of storage facility :

(r) If using any other storage facility specify

(s) Marketing of the produce :

In local market : Yes/No

Through middlemen : Yes/No

In main/terminal markets : Yes/No

Through wholesalers : Yes/No

Through exporters : Yes/No

Any other (specify) :

III. Collaborative Information

(a) Are you a member of any co-operative society/NGO/any other group etc? Yes/No

If yes, answer b to l

(b) Since when

(c) Name of the organization

(d) Is the organization is registered : Yes/No

If yes, when was it registered

(e) Type of organization

(f) Total number of members in the above organization

(g) Key activities undertaken by the above organization

(h) Type of support extended to you by that organization

(i) How much is the membership fee

(j) Is the organization run in a professional manner : Yes/No

(k) Have you ever availed any facilities/support from the above organization Yes/No

(l) If yes, specify what type of facilities/support

(m) Have you ever availed any facility/support from a government nodal body like NHB, APEDA, CFTRI, Agriculture universities, Horticulture Depart-ment, HOPCOMS etc

(n) Type of facility/support availed :

(o) Frequency of availment :

(p) Has any official/consultant from the above nodal agency/institution ever visited your farm or consulted you in person : Yes/No

If yes :

Why :

When :

Outcome :

(q) Have you consulted the officials from the above government nodal bodies/institutions : Yes/No

If yes :

Why :

When :

With whom :

Outcome :

IV. Concluding Information

(i) Is this farming activity profitable or not? : Yes /No

If yes how much is the annual net profit:

If no how much is the loss incurred :

(ii) Do you treat your orchard as a profit making center/cost center/simply an asset

(iii) How much amount did you invest in the farm in last five years?

(iv) How would you prefer to deal with this venture in future?

(a) Continue as it is with no further tangible investments :

(b) Lease it or sit quite :

(c) Sell it :

(d) Develop the farm by investing more funds :

(v) Important problems/suggestions/remarks pertaining to following

1. Availability of certified quality saplings/seedlings :
2. During production/cultivation :

3. During harvesting :
4. During post harvesting :
   (a) grading :
   (b) storing :
   (c) packing :
   (d) marketing :
5. Support from the Govt. nodal agencies/institutions :

Appendix XXVII
INTERVIEW SCHEDULE

I. General/Introductory Information

(a) Name of the unit :
(b) Address :
(c) When the unit is registered (under FPO) :
(d) Year of commencement of mass production :
(e) Ownership status: Prop/Partnership /Pvt ltd/ltd/co-op/other :
(f) Major business activity undertaken :
(g) Installed capacity of the unit :
(h) Scale of the unit (Tick the appropriate) : Tiny/SSI/MSI/LSI
(i) Total number of employees :
(j) Average annual turnover (Last five year) :
(k) Average annual net profit (Last five year) :
(l) Average capacity utilization rate (Last five year) :
(m) Details about product manufactured/ processed :

(n) Do you indulge in any sort of under contract farming : Yes/No

(o) What is the type of arrangement :

II. Specific Information

(A) Procurement

(i) How do you procure the raw material or input :

(ii) How much quantity you procure :

(iii) When do you procure :

(iv) From where you procure :

(v) Procurement criteria for raw material :

(a) price : Yes/No

(b) transportation cost : Yes/No

(c) variety : Yes/No

(d) size : Yes/No

(e) pulp content : Yes/No

(f) fibre content : Yes/No

(g) citric acid content : Yes/No

(h) sucrose content : Yes/No

(i) skin thickness : Yes/No

(j) size of the seed : Yes/No

(k) colour : Yes/No

(m) smell : Yes/No

(n) taste : Yes/No

(l) other features (in brief) :

(vi) Extension of training to procurement officials/agents (in brief)

(vii) Availability of infrastructure like cold chain during procurement phase (in brief)

(viii) Do you use any computer software package like MRP, SAP, ERP etc

(B) Storing

(i) How do you store :

(ii) Storage capacity :

(iii) How long you store raw material :

(iv) Details about storage facilities in place :

(v) How much is the total wastage during the process of storing (as % of total input to this process)

(C) Grading

(a) Do you undertake any grading activities:

(b) Type of grading :

(c) How do you treat left over :

(d) Criterion for grading :

(i) size : Yes/No

(ii) colour : Yes/No

(iii) variety : Yes/No

(iv) smell : Yes/No

(v) other :

(e) Level of mechanization/automation adopted in grading (in brief)

100% manual :

Partly mechanized/automated :

Fully automated :

Integrated set up :

(f) How much is the total wastage during the grading process (as % of total input to grading process)

(D) Cleaning

(a) Do you undertake any cleaning activities : Yes/No

(b) How :

(c) Level of mechanization/automation adopted (tick the appropriate)

100 % manual :

Partly mechanized/automated :

Fully automated :

Integrated set up :

(d) Cleaning agents used :

(e) Any water/waste purification/treatment process in place : Yes/No

(f) How much is the total wastage during cleaning process (as % of total input to this process)

(g) Whether clearance from Pollution Control Authorities obtained : Yes/No

(E) Processing

(a) Capacity :

(b) Processes involved and respective capacity

- Destalking :
- Chopping :
- De-seeding :
- Peeling :
- Pulping :
- Boiling :
- Stirring :
- Packing :
- Others (specify) :

(c) Is there any process control mechanism like SPC/ KAIZEN in place

(d) Or how would you control the various processes involved

(e) Level of mechanization/automation/computerization employed in above processes

- No mechanization/automation :
- Partial mechanization :
- 100% automation :
- Integrated set-up :

(f) Has this organization undergone radical change like Business Process Reengineering in last five years

(g) How much importance you give on maintaining hygienic environment

(h) How would you control the quality of input, work in process and output

(i) Has this organization upgraded the existing processes involved to higher technology

(j) How much is the total wastage during processing stage (as % of total input to this stage)

(k) How would you position your organization w.r.t implementation of TQM: (tick the appropriate)

(a) Aware :
(b) Thinking of implementing :
(c) Initial stage of implementation :
(d) Already in place :

(l) Have you applied/having ISO certification : (Tick the appropriate)

(a) Not aware :

(b) Aware but no thought of applying :

(c) In the process of applying :

(d) Applied :

(e) Has certification :

(m) Have you undertaken any training program for employers in last 5 years (in brief)

(F) Packing

(a) How do you pack your semi-finished/finished products

(b) Level of mechanization/automation/computerization being adopted in packing:

(a) No mechanization/automation :

(b) Partial mechanization :

(c) 100% automation :

(d) Integrated set-up :

(e) How much importance you give towards developing innovative packing

(G) Other Processes

(i) Lab facilities and R&D facilities

(a) Whether you have in-house full fledged lab for checking quality of input, work in process and output and R&D facilities for developing new products, improving the quality of existing products upgrading the processes, etc

(b) Whether unit has any other facility like gene bank, etc.,

(c) Whether unit has any tie up-with Railways, cargo airlines, shipping companies, etc., for logical support to take care of goods transshipments Transshipment company : Type of tie-up/arrangement

(d) Do you own any patents : Yes/No

If yes, please specify

(e) Do you outsource any of the above process

Type of process Suppliers Type of arrangement

(ii) How would you rank your lab or research and development facility

(i) Full fledged with ultramodern equipment

(ii) Conventional setup :

(iii) Bare minimum setup :

(iv) Nothing :

(H) Marketing

(a) How do you market your product?

(b) Whether you have your own distribution channel for marketing:

(c) What is your market coverage?

(d) Total no. of distributors/dealers/in your network

(e) Total no. of sales people employed

(f) What are the sales promotion techniques used

(g) Do you advertise your products in mass media?

(h) In percentage of sales revenue, how much you spend on advertisement?

(i) Do you undertake any Market Research activities?

(j) How do you rate the level of competition in your industry (Tick the appropriate)

(a) Cut-throat :

(b) Severe :

(c) Price dominated :

(d) Negligible :

(k) Do you undertake regular exports : Yes/No

If yes,

Details of export quantity to which country

(l) Average share of exports as % of total sales

(m) Since when you have started exports :

(I) Financial

(a) How profitable is this venture :

(b) Returns considering the risks involved :

(c) Scope for expansion :

(d) Bottlenecks in your opinion :

(e) Financial incentives from the government if any :

III. Collaborative Information

(a) What sort of support/incentives you are getting from various government nodal agencies/ bodies like MOFPI, NHM, etc.,

(b) In last one year have you ever consulted the above entioned institutions for seeking any kind of support

(c) How was the response from those bodies/offices

(d) Are you a member of any association/organization like pulp manufacture organization

Yes/No

If yes, answer etol

(e) Since when :

(f) When was the association formed :

(g) Name of the association :

(h) Total number of members :

(j) How much is the membership fee :

(k) Activities undertaken by that association

(l) How helpful is that association to you (tick appropriate)

(a) Very supportive :

(b) Supportive :

(c) Name sake :

(d) Not supportive :

IV. Concluding Information

(a) How would we place our products compared to the products exported by other developing countries like Brazil for example

(b) What is the need of the hour to turnaround this industry

(c) Please comment on the type of support you expect from the nodal agencies.

Appendix XXIII

Independent t-Test Table Indicating the Results

Sr. No.	*Description of the Broad Economic Indicator*	*Individual parameters*	*Unit of Measurement*	*Mean value*	
				India	*Brazil*
1	Agrarian structure of the nation (1985-2005)	Total arable land area	000 Hectares	169723	62025
		Total arable land under temporary crops	000 Hectares	162123	56855
		Total arable land under permanent crops	**000 Hectares**	**7600**	**7081**
		Total non-arable land	000 Hectares	127595	783916
		Total forest cover	000 Hectares	67334	477088
2	Demographical structure of the nation (1990-2008)	Total population	000	1030300	175267

		Total Agri. Popln. Dependent on agri. for livelihood	000	719226	33206
		Total Economically Active popln. (TEAP)	000	429792	76849
		Total Econ. Active Popln. Engaged in Agri (TEAPEIA)	000	258662	13485
		TEAPEIA as per cent of TEAP	Per cent (%)	61.53	19.53
		Per Capita arable land	Hectares	0.17217	0.39286
3	FAO Indices related to Food Processing Industry (1994-2005)	Total food Production	Base year: 1999-2001: 100	96.25	101.33
		Total Agri. Production	Base year: 1999-2001: 100	96.62	101
		Total Crop production	Base year: 1999-2001: 100	94.95	96.82
		Total Live stock Production	Base year: 1999-2001: 100	94.26	95.21
		Total Cereal production	Base year: 1999-2001: 100	93.68	97.49
4	Imports of major groups related to Fruit processing Industry (2000-2004)	Fruits I nuts fresh or dried	000 US$	424883	164841
		Fruits prepared/preserved	000 US$	1768	23356
		Fruit juices	000 US$	8269	5161
		Seeds and oleaginous fruit, whole or broken for fixed oil	000 US$	9077	160771
		Food processing machines	000 US$	25898	56638
		Agricultural machinery excluding; tractors	000 US$	23516	83722
		Tractors	000 US$	1389	13443
		Total Imports	**000 US$**	**494803**	**507934**
5	Exports of major groups related to Fruit processing Industry (2000-2004)	Fruits/nuts fresh or dried	000 US$	554395	430161
		Fruits prepared/preserved	000 US$	89061	31929
		Fruit juices	000 US$	5389	1091414
		Seeds and oleaginous fruit, whole or	000 US$	248205	3539218
		Broken for fixed oil			
		Food processing machines	000 US$	29065	28434
		Agricultural machinery excluding tractors	000 US$	23180	233665
		Tractors	000 US$	61331	230630
		Total Exports	**000 US$**	**1010628**	**5585453**
		Total Net exports	**000 US$**	**551824**	**5077519**
6	Major fruit production (1996-2003)	Orange	000 Metric tones	2627	19833
		Banana	000 Metric tones	14045	5827
		pappaya	000 Metric tones	595	1659

		Mango	000 Metric tones	11035	637
		Pineapple	000 Metric tonnes	1086	1441
		Grape fruit	000 Metric tonnes	111	65
		Lemon	000 Metric tonnes	1312	683
		Peaches and Nectarines	000 Metric tonnes	117	173
		Pears	000 Metric tonnes	170	18
		Others	000 Metric tonnes	1255	4982
		Total	**000 Metric tonnes**	**43440**	**35320**

Sr. No.	***T Critical Two Tail***	***T Value at 5% Significance Level***	
		T stat	***Remarks/Resent***
1	2.306	37.927	Reject Ho: Significant Difference
	2.364	54.56	Reject Ho: Significant Difference
	2.306	**0.629**	**Accept Ho: No significant difference**
	2.306	-231.136	Reject Ho: Significant Difference
	2.306	-1633.094	Reject Ho: Significant Difference
2	2.776	16.101	Reject Ho: Significant Difference
	4.302	19.243	Reject Ho: Significant Difference
	4.302	11.459	Reject Ho: Significant Difference
	4.302	21.103	Reject Ho: Significant Difference
	2.776	15.506	Reject Ho: Significant Difference
	14.089	**-12.1408**	**Accept Ho: No Significant Difference**
3	2.07	-0.94	Accept Ho: No Significant Difference
	2.07	-0.84	Accept Ho: No Significant Difference
	2.1	-0.45	Accept Ho: No Significant Difference
	2.1	-0.18	Accept Ho: No Significant Difference
	2.1	-0.8	Accept Ho: No Significant Difference
4	2.306	4.154	Reject Ho: Significant Difference
	2.306	-11.803	Reject Ho: Significant Difference
	2.306	2.67	Reject Ho: Significant Difference
	2.306	-5.761	Reject Ho: Significant Difference
	2.306	-3.455	Reject Ho: Significant Difference
	2.306	-4.929	Reject Ho: Significant Difference
	2.306	-4.449	Reject Ho: Significant Difference
	2.306	**-0.177**	**Accept Ho: No significant difference**
5	2.306	2.024	Accept Ho: No sil1;nificant difference
	2.306	12.314	Reject Ho: Significant Difference
	2.306	-18.076	Reject Ho: Significant Difference
	2.306	-5.591	Reject Ho: Significant Difference
	2.306	**0.103**	**Accept Ho: No significant Difference**
	2.306	-2.894	Reject Ho: Significant Difference

	2.306	-2.181	Reject Ho: Significant Difference
	2.306	-5.55	Reject Ho: Significant Difference
	2.306	-5.499	Reject Ho: Significant Difference
6	2.144	-18.81	Reject Ho: Significant Difference
	2.144	7.952	Reject Ho: Significant Difference
	2.144	-9.39	Reject Ho: Significant Difference
	2.144	36.48	Reject Ho: Significant Difference
	2.16	-3.57	Reject Ho: Significant Difference
	2.144	5.46	Reject Ho: Significant Difference
	2144	5.42	Reject Ho: Significant Difference
	2.144	-3.11	Reject Ho: Significant Difference
	2.[44	13.48	Reject Ho: Significant Difference
	2144	14.64	Reject Ho: Significant Difference
	2.144	5.12	Reject Ho: Significant Difference

❋ ❋ ❋

References

1. **Source:** The little green and red data book series by World Bank publications.
2. **Source:** FAO production year book series by UN publications.
3. **Source:** *American Farm Bureau,* November 2002 edition.
4. **Source:** "Measurement of F&V losses - a case study" by M. Fehr, *et.al., Agriculture Today,* June 2006 edition.
5. **Source:** International Trade Center statistics from www.itc.com, the official website of ITC (International Trade Centre).
6. **Source:** Fact sheet (1998-99) of Ministry of Food Processing Industries, New Delhi
7. **Source:** Excerpts from the Joint study conducted by McKinsey & Co & CII. *The Hindu* – August 01, 2001 edition.
8. **Source:** Report titled "Food and Agriculture Integrated Development and action (FAIDA)" by McKinsey & Co, *Agriculture Today,* August 2006 edition.
9. **Source:** Statement by Dr. M.S. Swaminathan, eminent Indian Scientist. *The Hindu* – July 03, 2007.
10. **Source:** Horticulture - Golden revolution on the anvil" by Manish Jain. *Agriculture Today*, Dec. 2002.
11. **Source:** *Agriculture Today,* June 2002 edition.
12. **Source:** "Fruit and vegetable processing in India" by G.K. Kaul from NFA Archives.
13. **Source:** *Agriculture Today,* March 2002 edition.

Annual Report (1996): 'Annual reports for 1995-96', Central Institute for Subtropical Horticulture, Lucknow.

Annual Report: (2000-01): 'Fruits and vegetables exporters, Fruits and vegetables suppliers, India'; Department of Food Processing, Ministry of Agriculture, New Delhi, 2001.

Ashok Gulati, *et.al.*, (2008): 'Transforming Agri-food system: Role of organized retail in India', presented at the first annual conference of the Indian Society of Agri-Business Management on emerging trends in Agri-Business Management, Bangalore; 25 – 27 September, 2008.

Assis, *et.al.*, (2004): "Nutritional balance and physiological disorders in mango 'Tommy Atkins'", *Revista Brasileria De Fruticultura;* August 2004, Vol. 26 (2) ppp. 326-329.

Atteri B.R. (1994): 'A study on physical and economic losses of Dashehari and Chausa varieties of mango in Delhi market', *The Bihar Journal of Agricultural Marketing,* 2, pp. 325-329.

Bastine L.C. and Palanisami. K, (1994): 'An analysis of growth trends of principal crops in Kerala', *Indian Journal of Agriculture Economics;* 48, pp. 885-891.

Biodiversity International News of Brazil, (2006): 'Brazil's gene bank expanded': Plants and Animals, Regions, themes, publications, information and sources from Biodiversity International: News.

Brunini, Maria Amalla, *et.al.*, (2002): 'Quality of 'Tommy Atkins' mango pulp frozen and stored at -18 degree Celsius', *Revista Brasileria De Fruticultura;* December 2002, Vol. 24 (3), pp. 651-653.

Castro Neto, *et.al.*, (2003): 'Effect of water deficit on the transpiration and stomatal resistance of mango tree', *Revista Brasileria De Fruticultura;* April 2003, Vol.25 (1), pp. 93-95.

Channappagouda B. A. (1995): 'Integrated approach for post harvest management and marketing of horticultural produce', National seminar on post harvest technology of fruits, New Delhi.

Chengappa P. G. (1981): 'Growth rate of area, production and productivity of coffee in India', *Journal of Coffee Research;* 11 (4), pp. 19-26.

Chowdhary R., Gupta S., Pant M., Baikarkati D., Masood K. and Sarkar S. (1987): 'Present state of horticulture processing industry in India – an agricultural exports strategy, problems and prospects', Sangon Books Ltd., London; pp. 262-276.

Deepak Shah (2000): 'Marketing pattern of grapes in Maharashtra – An appraisal', *Indian Journal of Agricultural Marketing;* 14 (1), pp. 40-48.

Deepak Shah and Narayanmurthy A. (1998): 'Marketing pattern of horticultural crops – An economic analysis', *Indian Journal of Agricultural Economics;* 53, pp. 388-389.

Dias, Nilma Oliveira, *et.al.,* (2003): 'Incidence and severity of mango flower malformation in six cultivars', *Revista Brasileria De Fruticultura;* April 2003, Vol. 25 (1), pp. 179-180.

Gajanana T. M. (2002): 'Marketing practices and post harvest loss assessment of Poovan variety of banana in Tamil Nadu', *Agricultural Economics Research Review;* 15 (1), pp. 56-65.

Gouri Sundaran (2006); 'Processed tropical fruits – A product profile', Agricultural and Processed products Export Development Authority (APEDA) reports; pp. 2-29.

Government of India Report (1999): 'Food Processing - Fact sheet', MOFPI reports, 1999; pp. 01-03.

Indian Institute for Horticultural Research (IIHR) Report (1992): 'Estimates of post harvest losses of some horticultural crops and their economic implications', Indian Institute for Horticultural Research News; 13 (1), pp. 01-03.

Jatosti. A and Spina P, (1992): 'Evaluation of citrus fruit production worldwide', *Rossegna agrimicoltura Italia;* 10(2) pp. 43-46.

Junquiera, Nilton Tadeu, *et.al.,* (2004): 'Effect of soybean oil in the control of anthracnose and on post harvest conservation of mango, cv. Palmer', *Revista Brasileria De Fruticultura;* August 2004, Vol. 26 (2) pp. 222-225.

K.P. Prabhakaran Nair (2006): 'The SEZ debate – how valid is it!'; *The Times of India,* November 30, 2006 edition.

Karwasra J. C., Gangawar A. C. and Singh S. N. (1997): 'Production, export and post harvest management in fruits and vegetables in India', *Indian Journal of Agricultural Marketing;* 11(1), pp. 31-32.

Katar Singh and R.S. Pundir (2002): 'The role of banks in promoting India's export of fruits and vegetables', National Banks News Review; 2002, pp. 31-38.

Kaul. G. K. (1997): 'Fruit and vegetable production in India, 1997', NFI archives.

Madan M. S. and Subramanyam K. V. (1987): 'A commodity loss profile for mango in Karnataka', *Indian Journal of Agricultural Marketing;* 1, pp. 81-86.

Madan M. S. and Ullasa B. A. (1991): 'Post harvest losses in mango – causes and control measures', *Mysore journal of agricultural sciences,* 25 (4) pp. 458-463.

Mandal N. C. and Dasgupta M. K. (1981): 'Post harvest diseases of perishables in West Bengal and losses', *Journal of Agricultural Research;* 2, pp. 73-85.

Manish Jain (2002): 'Horticulture: A golden revolution on the anvil', *Agriculture Today;* December 2002, pp. 17-23.

Marchal J. (1990): 'Post harvest constraints and prospects for the improvement of handling, storage and processing of plantain and other cooking Bananas in West Africa', *Fruit Paris;* 45(5), pp. 439-445.

McKinsey and CII Report (2001): 'Fruit and vegetable losses alarmingly high', *The Hindu;* August 01, 2001 edition.

Ministry of Food Processing Industries Report (2001): 'Fruits and vegetables processing: capacity and production"; MOFPI report.

MOFPI Report (1998): 'Document in fruit and specific agriculture business sectors', MOFPI; 1998.

Munir A., Siddiqui F.A., Shafi M. and Aziz A. (1989): 'Food crop system in Uttar Pradesh with respect to post-harvest technology', *Food systems of the world,* pp. 297-306.

Nagraj N., Chandrakanth M. G. and Ramanna R. (1985): 'Market appraisal for a few fruits and vegetables', *Indian Journal of Marketing;* 16 (4), pp. 13-19.

NFI Archive Report (2003): 'Horticulture is the future, Post-harvest technology: Making the most of what we grow'; NFI archives, 2003.

Paulo Faveret Filho, *et.al.,* (1998): 'Brazilian fruit product: In search of an export model', Agro Industrial Studies, Department of BNDES, *Fruit Production – Brazil*; 1998,
pp. 1-42.

Perosa, Jose Matheus Yelenti, *et.al.,* (2002): 'Post harvest techniques and expansion of the mango culture in the Sao Paulo state – Brazil', *Revista Brasileria De Fruticultura*; Auguat 2002, Vol. 24 (2), pp. 381-384.

Pfaffenbach, Luciana Bittencourt, *et.al.,* (2003): 'The effect of modified atmosphere and refrigeration on post harvest of mango red espada.', *Revista Brasileria De Fruticultura*; December 2003, Vol. 25 (3), pp. 410-413.

Pina, Miguel Gulherme Martins, *et.al.,* (2003): 'Mango processing and conservation by combined methods', Revista Brasileria De Fruticultura; April 2003, Vol. 25 (1), pp. 63-66.

Pinheiro, Neuma Maria de Souza, *et.al.,* (2005): 'Evaluation of microbiological quality of fruits minimally processed commercialized in super markets in Fortaleza - Brazil', *Revista Brasileria De Fruticultura*; April 2005, Vol. 27 (1), pp. 153-156.

Rao K. K. and Mnohar K. R., (1995): 'Losses in packing and transportation of fruits : causes and remedies', National seminar on post harvest technology of fruits, pp. 318-320.

Renata Tieko Nassu, *et.al.,* (2001): 'Consumers acceptance of fresh and processed melon, mango and cashew apple', *Revista Brasileria De Fruticultura*, 2001, Vol. 23 (3).

Rocha, Railene Herica Carlos, Menezes, *et.al.,* (2001): "Use of the starch degradation index for determining maturity in Mango 'Tommy Atkins'", *Revista Brasileria De Fruticultura*, August 2001, Vol. 23 (2), pp. 302-305.

Roy S. K. and Pal R. K. (1991): 'Multi locational studies to reduce post harvest losses during harvesting, handling, packaging, transportation and marketing of mango in India', *ACTA Horticulture*, 291, pp. 499-503.

Saraswat S. P (1996): 'Economics of marketing of orange in Himachal Pradesh', *Bihar Journal of Agricultural Marketing*; 4, pp. 207-222.

Shepherd A. W., (1993): 'A market oriented approach to post-harvest management', pp. 216-222.

Silva, Davi Jose, *et.al.,* (2001): 'Effect of earthworm excrements and cattle manure on leaf nutrient concentration and on the production of mango', *Revista Brasileria De Fruticultura*; December 2001, Vol. 23 (3), pp. 748-751.

Sreenivas R. N., Venkatesh Reddy T., Ravi P. R., Lalith A. and Chinnappa Reddy B. V. (1997): 'Post harvest loss assessment of Totapuri and Alphanso mangoes', *Journal of Food Sciences and Technology;* 34, pp. 70-72.

Sreenivasa Murthy D., Gajanana T. M., Sudha M. and Subramanyam K. V. (2002): 'Post-harvest loss estimation in

mango at different stages of marketing: A methodological perspective', *Agricultural Economics Research Review;* 15 (2), pp. 188-200.

Subramanyam K. V. and Mrityunjaya R. (1978): 'Marketing of fruits and vegetables around Bangalore', *Agricultural Marketing Journal;* 9 (1), pp. 09-16.

Surinder Sud (1998): 'India's revolutionary progress in food production, Indian perspectives', *NFI archives.*

TIFAC Report (2000): 'Agro-food processing: technology vision 2020: fruits and vegetables-current status and vision', *TIFAC report*; 2000.

US Commercial Services Report (2000): 'The Best Prospects /Industry Overview', The US commercial service, 2000, pp. 01-02.

Vinodchari (2003): 'Food processing: policy initiatives', India Info-line sector studies; May 2003, pp. 1-4.