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.