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SR. NO.	PARTICULARS	PAGE NO.
13	PROSPECTS AND CHALLENGES OF SEAFOOD EXPORTS OF MARINE FISHING INDUSTRY IN THOOTHUKUDI DISTRICT <i>Dr. M. JULIAS CEASAR B. SHINY</i>	81 - 91
14	MANGO PROCESSING INDUSTRY OF INDIA: PROBLEMS AND PROSPECTS <i>PURUSHOTTAM BUNG</i>	92 - 107
15	SERVICE QUALITY OF PRIVATE HOSPITALS: A FIELD STUDY IN TIRUNELVELI DISTRICT <i>Dr. M. JULIAS CEASAR M. SIVASANKARI</i>	108 - 117
16	SOCIAL MEDIA: A NEW ELEMENT OF PROMOTION MIX <i>HARDIK BABEL GAUTAM DONGA RIPAL PATEL</i>	118 - 121
17	NUTRITION LABELLING COMPLIANCE OF BRANDED BISCUITS WITH INDIAN FOOD LAWS <i>GAUTAM DONGA RIPAL PATEL</i>	122 - 126
18	PILGRIMAGE TOURISM IN MALNAD REGION OF KARNATAKA AND ENVIRONMENTAL ISSUES <i>SRINIVASA MURTHY B.V. Dr. NOOR AFZA</i>	127 - 133



MANGO PROCESSING INDUSTRY OF INDIA: PROBLEMS AND PROSPECTS

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ABSTRACT

India is the largest producer of mango in the world, contributing to nearly 46% of the total world production. Despite all this mango processors of India are facing grave challenges including; middle men menace, huge post-harvest loss, lack of support by the concerned nodal bodies, poor profitability and seasonality of the processing activity, etc., leading to processing of just 2% of total production. This has catalyzed the research work in this area. Primary research is made using single stage cluster sampling coupled with non-probabilistic convenience based selection within the cluster, where-in Karnataka state was chosen as a cluster. Sample size of twenty five processors was chosen. In depth interviewing mechanism guided through structured interview schedules was adopted to gather the necessary information. Various statistical, mathematical and computational tools and techniques were used for analysis.

Major reasons for ill growth of this industry include: non availability of right varieties of mangoes that are ideal for processing; lack of necessary infrastructure; lack of cooperative effort amongst processing community; and 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.

A coordinated, integrated and strategic effort of all the stake holders is must to turnaround this industry. Mango 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. Problems / constraints have to be studied in wholesome, integrated and strategic manner rather than adopting piecemeal approach.

Key words: Mango Processing Industry, India, Problems, Prospects

Introduction

India is the largest producer of mango in the world, contributing to nearly 46% of the total world production. 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'.

Despite all this mango processors of India are facing grave challenges including; middle men menace, huge post-harvest loss, lack of support by the concerned nodal bodies, poor profitability and seasonality of the processing activity, etc., leading to processing of just 2% of total production. This has catalyzed the research work in this area. Major reasons for ill growth of this industry include: non availability of right varieties of mangoes that are ideal for processing; lack of necessary infrastructure; lack of cooperative effort amongst processing community; and 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.

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. This calls for a primary research on 'problems facing mango processors of India and the prospects'. The problems facing mango processing industry have to be looked in to and to be analyzed holistically than adopting a piecemeal approach. The prospects for this industry need to be identified and explored.

Literature Review

Literature available pertaining to the subject matter is being discussed in brief, which throws light on the contributions made by the prominent researchers in this study area. This will set the guidelines for the present research work and indicate the tremendous scope for the further research in this particular area. 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% 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 Rs. 678 crores.

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% of India's GDP and employs more than 70% of its work force.

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 one 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. 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 fifty 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 Rs.23000.00 crores a year.

SurinderSud (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% Export Oriented Food Processing Units and joint ventures since the beginning of the economic reforms, i.e. in the early 1990's. These would involve an investment to the tune of Rs.43040 Million including foreign direct Investment worth Rs.7880 Million.

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 led 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. GouriSundaram (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% of the fruits and vegetables perish at various stages viz. harvesting, storage, grading, transport, packaging and distribution. Only 2% 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.

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, whereas 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. 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% (3.5% at the orchard or farm; 4.9% during transportation; 4.1% during storage; and 5.3% 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.

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 as well 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. Primary research involves collecting firsthand information directly from the processors through structured interviews guided by detailed interview schedules. Once collected, information is put to analysis using MS Excel and SPSS (version17) software packages.



Research objectives

- To assess the availability of necessary infrastructure to the mango processing industry (mango processors) of India
- To study the problems faced by the mango processing industry of India.
- To study the investment pattern, extent of adoption of advanced technology, penetration level of cooperative movement, financial viability and profitability, amongst mango processors of India.
- To study the various processes involved like procurement, storing, grading, cleaning, destalking, peeling, pulping, processing, packing, marketing, *etc.* and also to study the management practices followed by mango processors of India.
- Lastly to suggest recommendations to the mango processors.

Description about Primary research

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%, whereas Karnataka ranks second with its share of 12.37%. 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% of total mango cultivation of India. Thus Karnataka is a major mango growing state and 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 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 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 schedule is used to gather the first hand information about the processing industry. Wherever we had difficulty in reaching the respondents, responses were being collected through mail with ongoing clarifications if necessary.

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 (version 16.00) for primary data analysis.

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 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 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.

Hypothesis 02:

(Ho-02): Null hypothesis 02: Indian 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 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.

Data Analysis

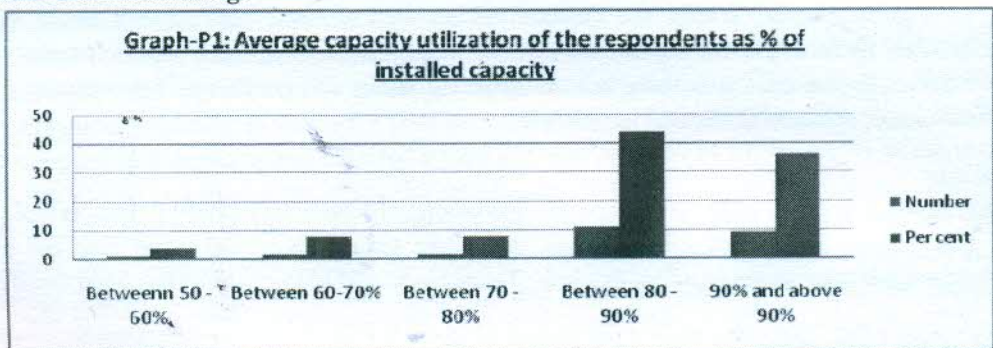
Tabular and graphical analysis coupled with appropriate statistical, mathematical, and computational analysis for each important question that is being asked in the interview, is being used to arrive at meaningful interpretations and conclusions.

The Primary information gathered from 25 mango processors is analyzed in three stages listed as below;

- A. Analysis of general / introductory information
- B. Analysis of specific information
- C. Analysis of concluding information

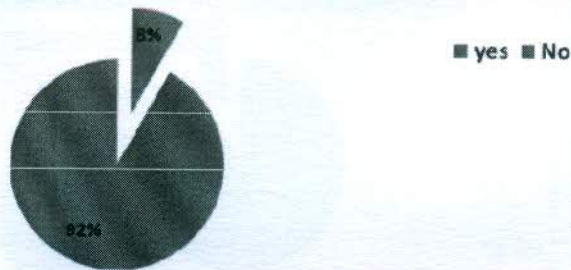
And the outcome of the analysis is being concluded in the end.

Important research findings



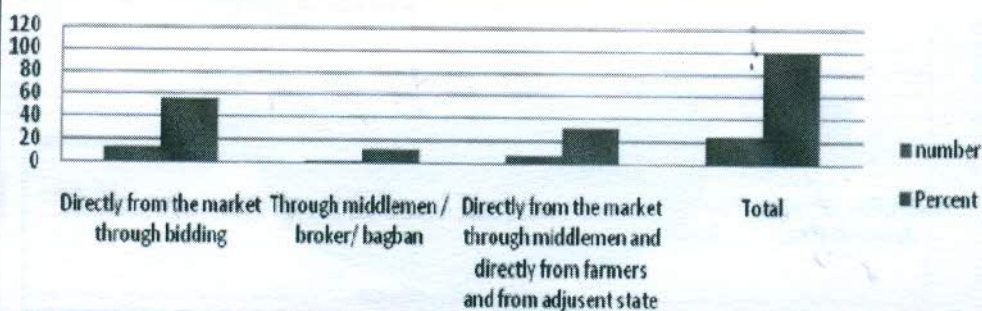


Graph-P2: Number of respondents indulged in under contract farming

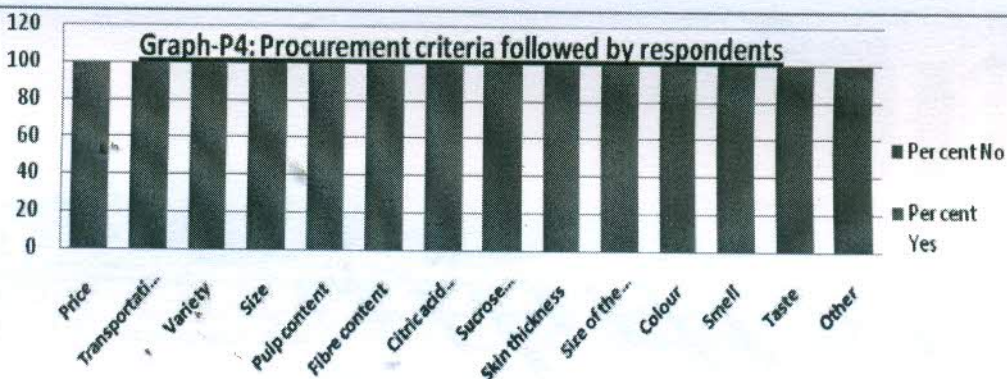


4.2 Part B: Analysis of specific information

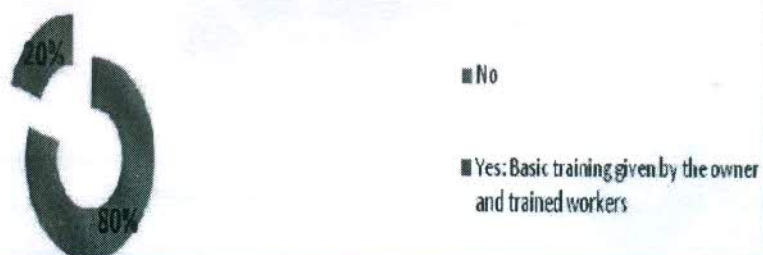
Graph-P3: Procurement method adopted by respondents



Graph-P4: Procurement criteria followed by respondents



Graph-P5: Training facility to procurement officials / agents



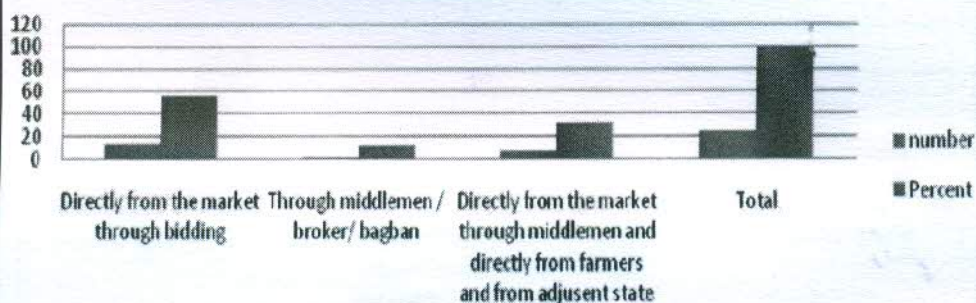


Graph-P2: Number of respondents indulged in under contract farming

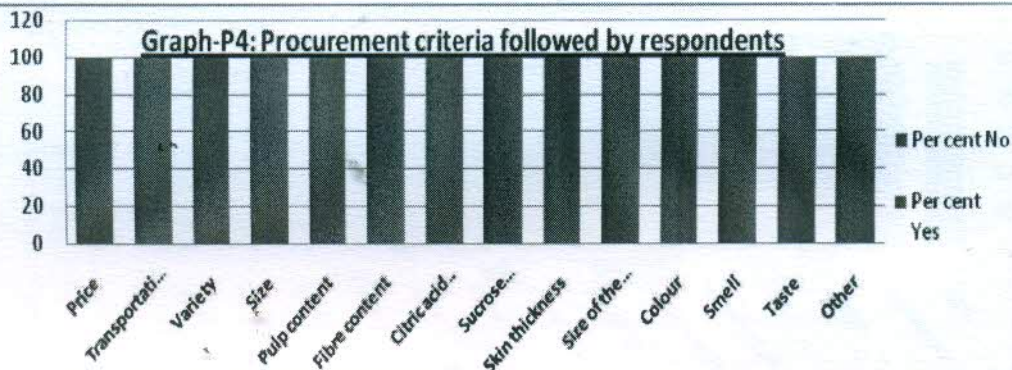


4.2 Part B: Analysis of specific information

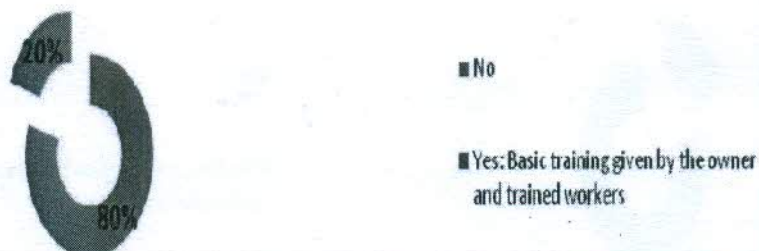
Graph-P3: Procurement method adopted by respondents



Graph-P4: Procurement criteria followed by respondents

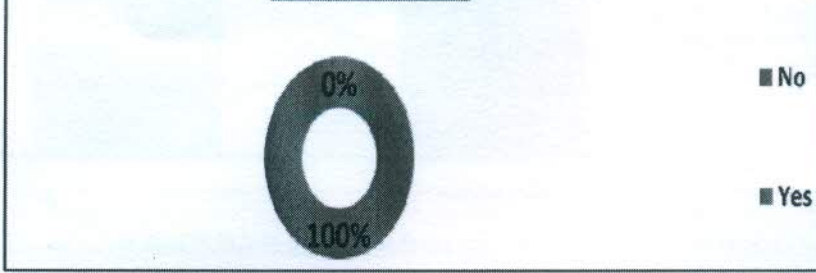


Graph-P5: Training facility to procurement officials / agents

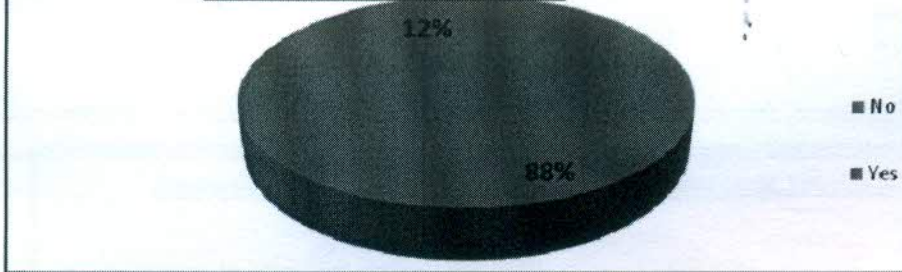




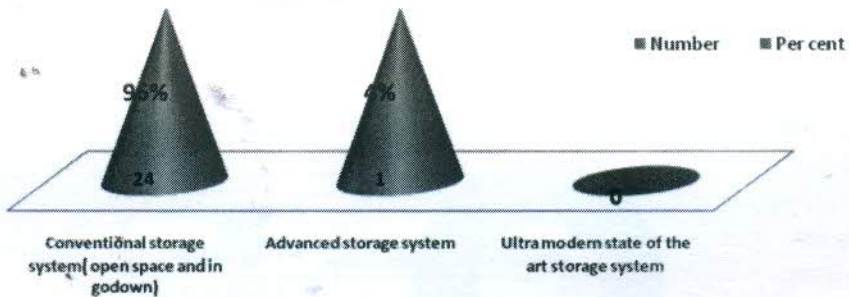
Graph-P6: Availability of necessary infrastructure like cold chain during procurement phase



Graph-P7: Application of computer software packages by the respondents for procurement



Graph-P8: Type of the Storage facility at the respondents' units

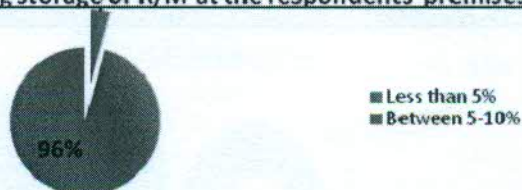


Graph-P9: Duration of R/M storage by the respondents





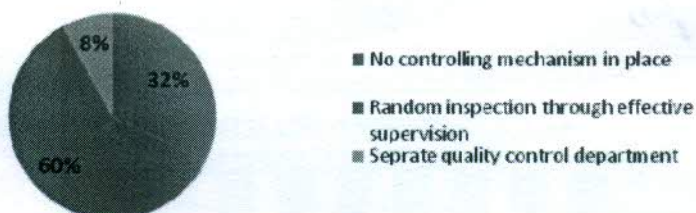
Graph-P10: Wastage during storage of R/M at the respondents' premises



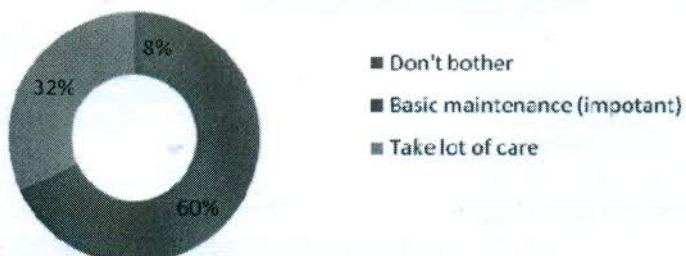
Graph-P11: Is there any process control mechanism like SPC/KAIZEN in place or not



Graph-P12: Mechanisms of controlling the various processes involved



Graph P-13: Importance given on maintaining higienic environment

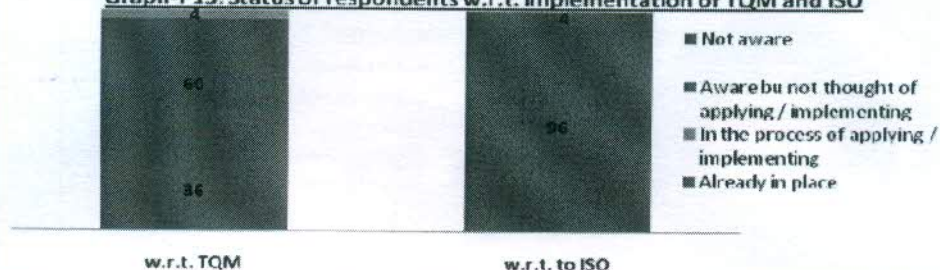


Graph-P14: Upgradation of technology undertaken or not in the last five years





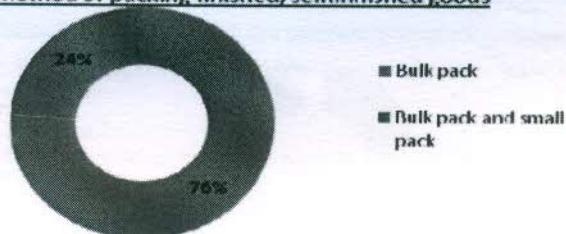
Graph-P15: Status of respondents w.r.t. implementation of TQM and ISO



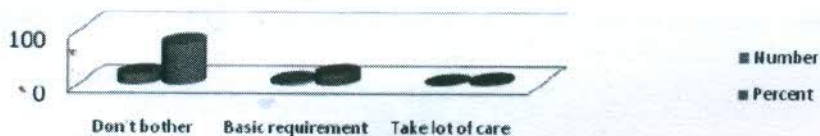
Graph-P16: Whether training been given to employees in last five years



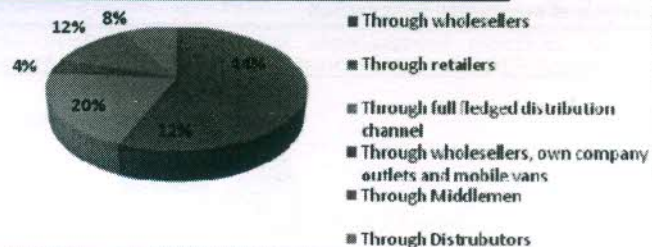
Graph-P17: Method of packing finished/semifinished goods



Graph-P18: Level of importance given towards developing innovative packing

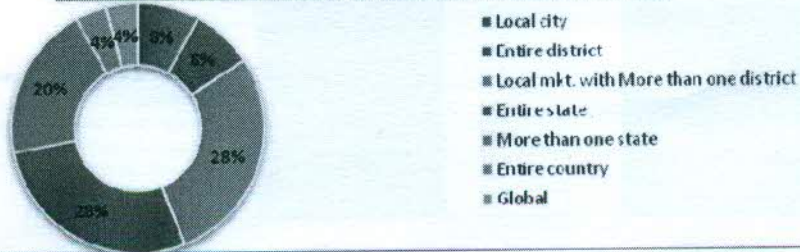


Graph-P19: Type of marketing / selling adopted by respondents

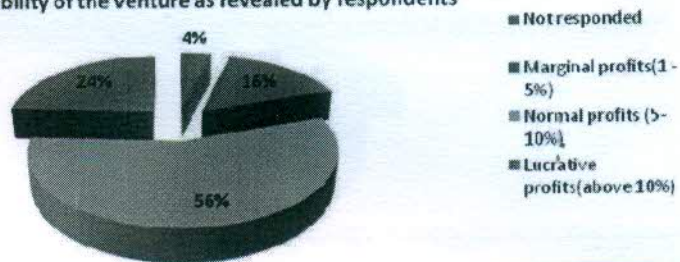




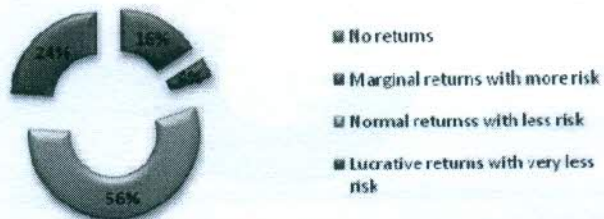
Graph-P20: Extent of market coverage by the respondents



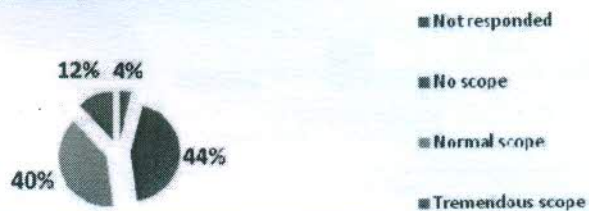
Graph-P21: Profitability of the venture as revealed by respondents



Graph-P22: Returns considering the risks involved as revealed by respondents

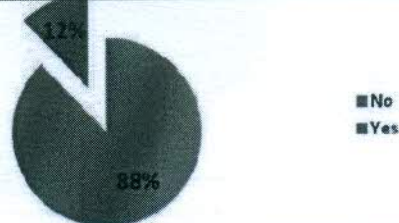


Graph-P23: Scope for the expansion as revealed by respondents



4.3 Part C: Analysis of concluding information

Graph-P24: Whether respondents undertake regular exports or not

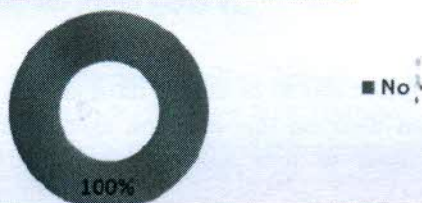




Graph-P25: % of SR spent on advertisement by the respondents



Graph-P26: Whether respondent possess full fledged lab, R&D facilities, tie up with cargo handling co., patents, etc.



Conclusion

Based on the thorough evaluation of the findings of the research, applying chi-square test wherever possible and critically analyzing their interpretations, following conclusions have been drawn:

1. The researcher accepts alternate hypothesis Ha-01, which is restated here-in-under;

(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;

- Providing right variety quality seedling/sapling in right quantity at right time. Necessary arrangements have to be made to ensure this.
- Careful monitoring of the growth
- Using effective and efficient farm management practices
- Using right mode for harvesting at the right time
- Employing effective and efficient post-harvest management practices and post-harvest technologies.
- Seeking the benefits of economies of scale.
- 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 researcher accepts alternate hypothesis Ha-02, which is restated 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.”*

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.

Recommendations

India the second largest producer of fruits (contributing to 9.54% of world production and growing at the CGR of 3.04%) and the topmost producer of mango (contributing to 45.47% of world production but growing at CGR of – 0.86%), 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%) and also the processed mango products (exports are growing at the CGR of 12.87%) 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 processors in reaping benefits, which this sector has in store for them.

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% aggregate) and exports of processed mango products (CGR of 13.25% 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 USD 114 million compared to Indian exports of the same which stands at USD 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 piggy 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 post-harvest losses to international standards (from existing level of 35 – 40% to 20%). **India needs to follow the footsteps of Brazil in this regard.**

3. Indian fruit processors should undertake and speed up technology up gradation. 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. (30% of Brazilian imports pertaining to FPI constitute food processing machines and other agricultural machines, whereas the same is 10% 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 cooperatives 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 cooperative movement throughout the nation. Creation of advanced, capital intensive, and state of the art infrastructure facilities like; cold chain, cargo air ports, logistic support systems, full-fledged laboratories and testing centers with all the technologically advanced equipment, etc., is possible only through such cooperative 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.

Limitations

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;

- A given sample (chosen using a given sampling scheme) may not represent the entire population completely (i.e., 100%).
- There might be biases, judgment errors, sampling errors, etc. while conducting sample surveys.
- Results may not be 100% valid.
- Results may not be 100% 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. Other obvious limitations include;

- The researcher 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 led to marginal errors in the outcome of the study.
- 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.



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