

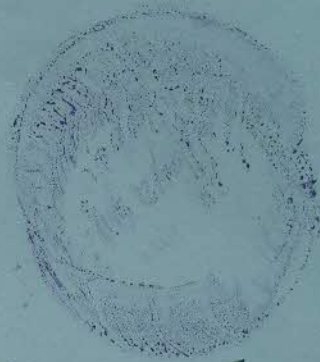
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MANGO CULTIVATION INDUSTRY OF INDIA: PROBLEMS AND PROSPECTS

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ABSTRACT

India is the largest producer of mango in the world, contributing to nearly 46% of the total world production. India has an edge over other countries when it comes to mango production in terms of natural resources required and climatic conditions. Despite all this mango cultivators of India are facing grave challenges leading to negative growth rate.

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 fifty cultivators was chosen. In depth interviewing mechanism guided through structured interview schedules was being used. Various statistical, mathematical and computational tools and techniques were being used.

Major reasons for ill growth of this sector include: non availability of sapling / seedling of right varieties of mangoes that are ideal for processing; lack of necessary infrastructure; lack of cooperative effort amongst farming 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 cultivation 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 cultivation 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 in terms of natural resources required and climatic conditions. 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 cultivators. The research reveals that China and Philippines have experienced highest growth rate (11.3% and 9.08% CGR respectively), 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 cultivation 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%. India, unfortunately, is the only country that has experienced a negative growth of -0.86% CGR, 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.

Mango cultivators of India are facing grave challenges including; very small land holdings, non-availability of quality seedlings / saplings, huge post-harvest loss due to dearth of infrastructure, middle men menace, lack of support by the concerned nodal bodies, lack of cooperative effort, poor profitability of the cultivation activity, etc., leading to negative growth rate (-0.86%). This has catalyzed the research work in this area.

Major reasons for ill growth of this sector include: non availability of high yield, high pulp containing varieties of mangoes that also have high resistance towards pest attack, which are ideal

for processing; lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging and marketing of the output; lack of cooperative effort amongst farming 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 detailed study on 'challenges facing mango cultivators of India and the feasible solutions'. The problems / challenges facing mango cultivators have to be looked in to and to be analyzed holistically than adopting a piecemeal approach. The feasible solutions to the problems / challenges facing mango cultivators need to be 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.

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% 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 1000 to 2500 man-days per hectare per annum, the researcher added.

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.

TIFAC Report (2000), 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 32mmt. TIFAC study has focused on 12 selected vegetables which accounts for about 65% of the total production in India. It is estimated that around 20-25% 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.

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%. 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.

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;

India is the second largest producer of vegetables and third largest producer of fruits.

Thirty percent of the fruits and vegetables get wasted due to lack of proper processing and packaging facilities. Only two to three percent of the total produce is being processed in India.

Total cultivation area under fruit and vegetables is around 12.0 million hectares and accounts for 7% of the total cultivation area. Main fruits produced in India are Mango, Banana, citrus, Guava and apple. These fruits account for 75 to 80 percent of total fruit production.

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.

Manish Jain (2002), in his article explained that India accounts for 10% 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%. Similarly production increased from 28.63 mmt (million metric tonnes) to 44.02 mmt recording an increase of 53.83%. During the same period, productivity of fruits increased by 18.4%. Further he listed five largest fruit producing states of the country viz. Maharashtra (17.08%), 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% is consumed by the local population or marketed in the nearby market yards and only about 40% 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% 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 strengthened together with sound post-harvest management of the highly perishable horticultural commodities.

McKinsey and CII study report, (2001), in their article reported that, according to a joint study conducted by Mc Kinsey 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.

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 43.00 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 ecofriendly 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.

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

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.

Primary research involves collecting first-hand information directly from the cultivators through structured interviews guided by detailed interview schedules. Once collected, information is put to analysis using MS-Excel and SPSS software packages.

Research objectives

- To assess the availability of necessary infrastructure to the farming community (mango cultivators) of India
- To study the problems faced by the mango cultivators of India.
- To study the investment pattern, extent of adoption of advanced technology, penetration level of co-operative movement, financial viability and profitability, amongst mango cultivators of India.
- To study the various processes involved like procurement, storing, grading, cleaning, packing etc. and also to study the management practices followed by mango cultivators of India.
- To study the functioning of concerned nodal agencies / Government departments / other concerned institutions of India.

Lastly to suggest recommendations to all the stake holders involved, *i.e.* mango cultivators, all concerned nodal agencies / Government departments / other concerned institutions, and lastly to Ministry of Agriculture, Government of India based on the findings of the study for the healthy growth of the fruit processing industry of India.

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 cultivators, *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) 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 farming community (mango cultivators). 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 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.

Hypothesis 02:

(Ho-02): Null hypothesis 02: Indian fruit cultivation industry, especially mango cultivation 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 cultivation industry, especially mango cultivation 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.

Hypothesis 03:

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

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 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 of India from attaining the desired growth.

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.

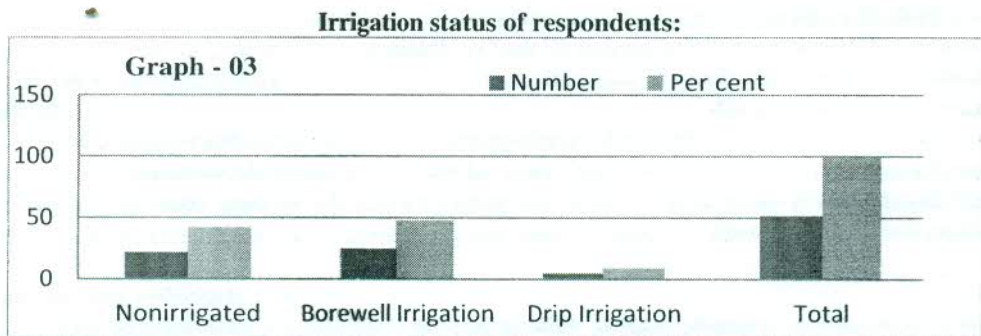
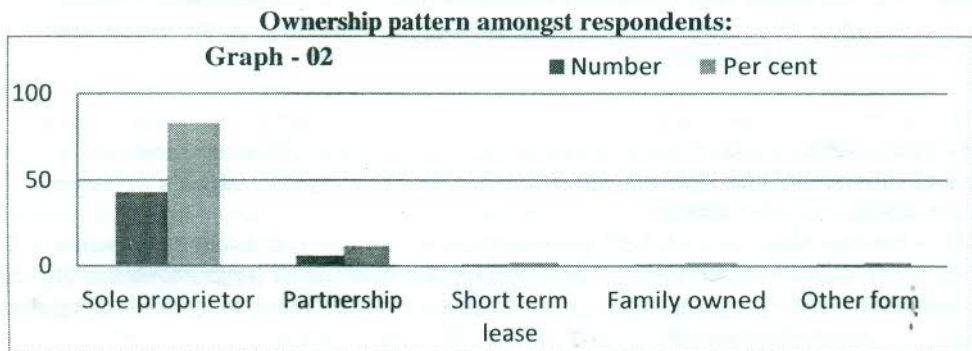
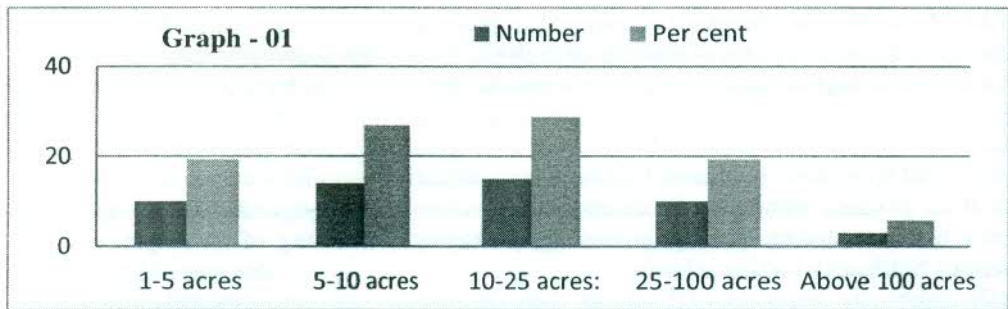
The first part where-in Primary information gathered from 52 mango cultivators is analyzed in four stages listed as below;

- a. Analysis of general / introductory information
- b. Analysis of specific information
- c. Analysis of information pertaining to collaboration and cooperation
- d. Analysis of concluding information

And the outcome of the analysis is being discussed at the end of each stage and interpreted critically.

Part A: Analysis of Introductory information: Mango cultivators:

Land holding pattern of respondents:



Research Findings and Discussion:

From the graphs (01 to 03) shown above, following inferences can be drawn: Average land holding is significantly small: Around 46% 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. Middle men (traders between growers and processors) have capitalized on this weakness of growers and exploiting them. This is the reason middle men 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 but lot more needs to be accomplished in this direction.

From the Graph-03, it is clear that 42% of the respondents have no irrigation facility and only 10% 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:

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.

Reaping the benefits of larger economies of scale and higher value addition will become possible.

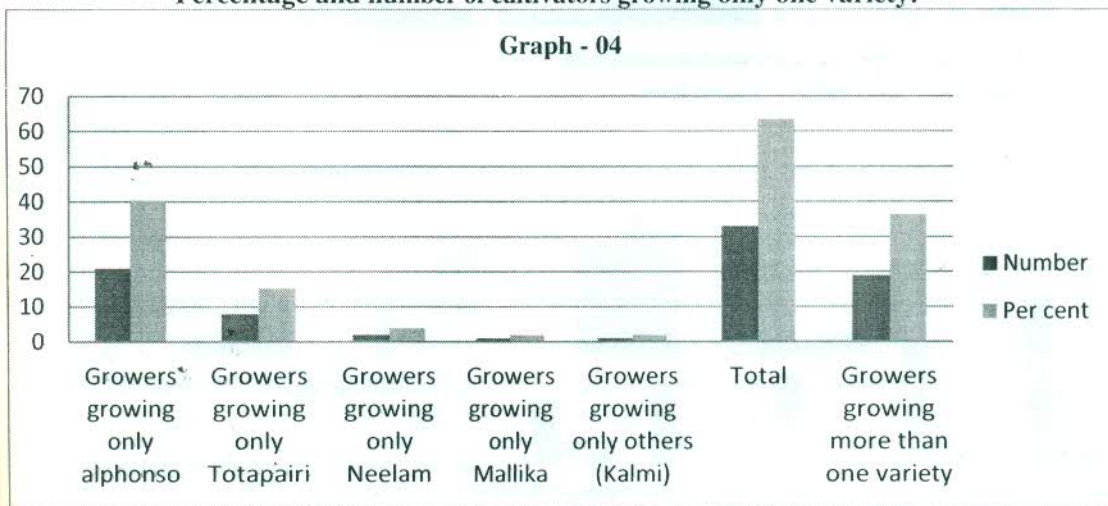
Adopting an integrated approach right from the farm gate till final consumer encompassing all the activities like planting the right variety quality seedling, harvesting at right time, proper grading, proper storing, processing, innovative packaging, marketing and selling, etc., will become possible.

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.

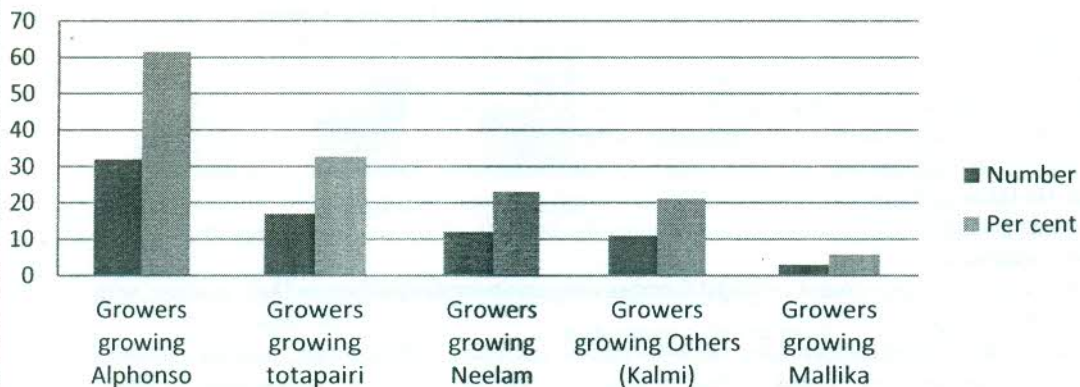
Part B(a): Analysis of Specific Information: Mango cultivators:

Percentage and number of cultivators growing only one variety:



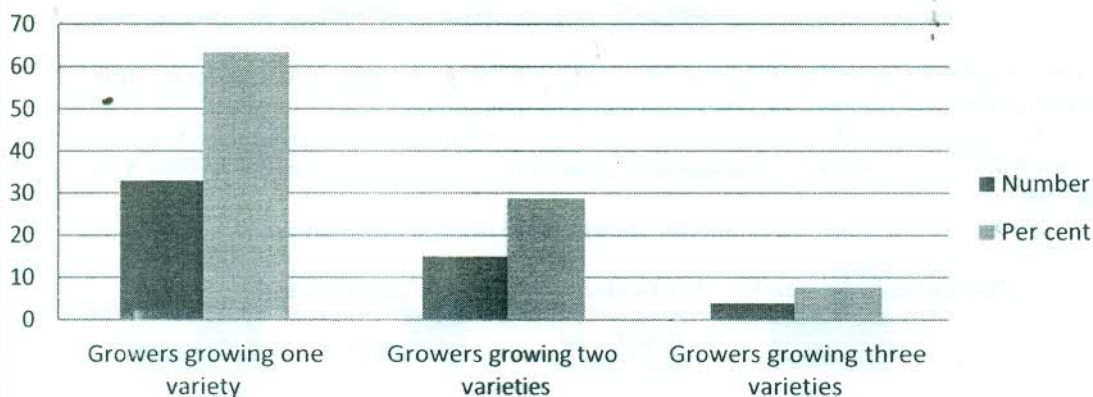
Percentage and number of cultivators growing particular variety:

Graph - 05



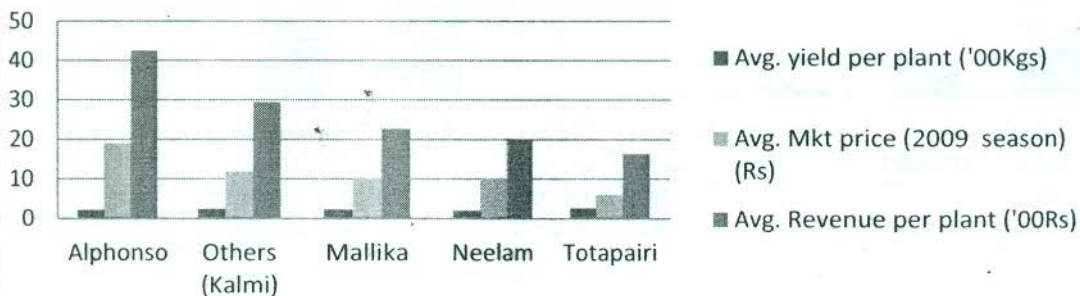
06: Cultivators growing more than one variety

Graph - F06

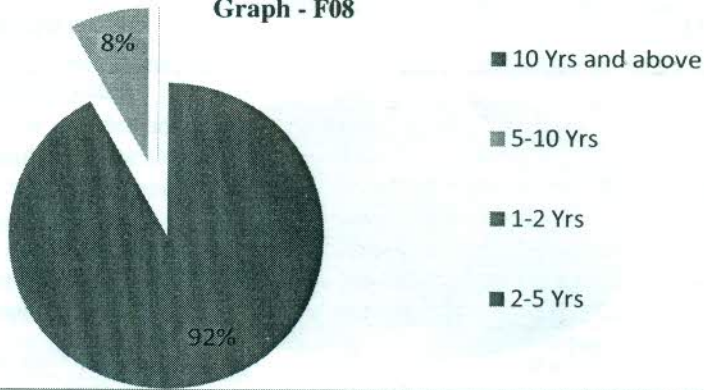


07: Variety wise average yield, Market price and avg. revenue per plant

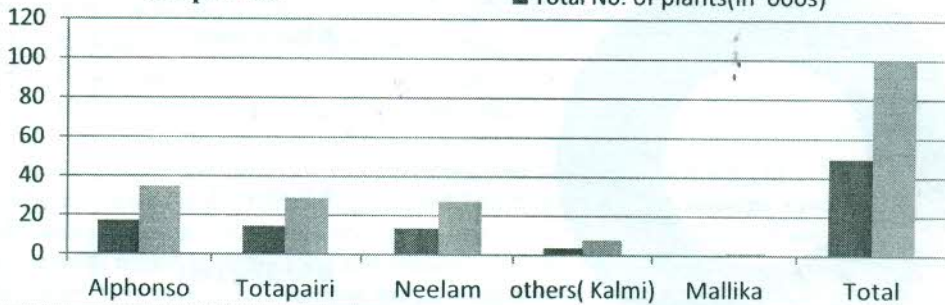
Graph - F07



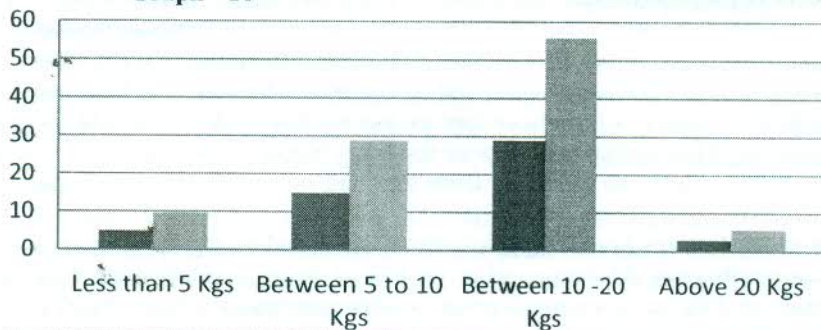
08: Percentage of total no. of plants based on age of the plant

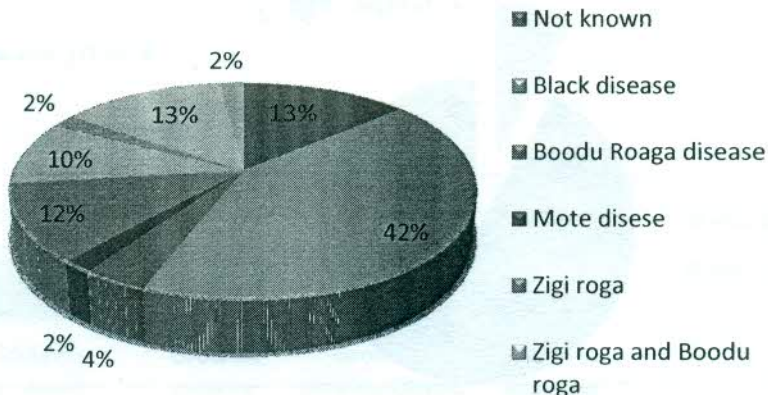
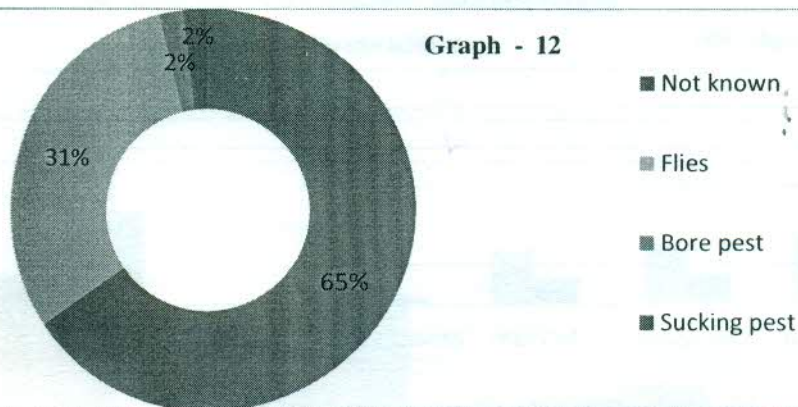
Graph - F08**09: Percentage contribution of each variety grown by all the cultivators surveyed****Graph - 09:**

■ Total No. of plants(in '000s)

**10: Application of fertilizers per plant in a year****Graph - 10**

■ Number ■ Per cent

**11: Major diseases encountered frequently**

Graph - 11**12: Major pest attack encountered frequently****Graph - 12****Research Findings and Discussion:**

From the graphs (04 to 12) depicted above, the following major inferences can be drawn:

Following features of Alphonso variety makes it very popular not only in domestic market but also in international markets including developed nations: Pulp content (pulp recovery) is very high Mouthwatering taste; right texture, appealing color, and unique aroma Sucrose and Fructose content is high compared with other varieties Size is neither too big nor too small : Just right for processing Comparatively lesser yield but higher market price and hence higher profit 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% of the respondents grow Alphonso, where-in 40% of the respondents grow only Alphonso (out of 62%). Remaining 38% 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% in total when we consider variety wise total number of plants. Other varieties account for remaining 65%.

Graph-07 clearly indicate that Alphonso fetches average revenue of around Rs.4256.00 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:

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

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

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

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% 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.

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

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;

- Which variety to grow (suitability of the variety)
- How to cultivate (farming practices)
- From where to buy the seeds / seedling / sapling
- How to cultivate (pruning, feeding, nurturing, watering, etc.)
- How to manage the farm (farm management practices)
- How to control the weeds, pests, insects, etc.
- When to harvest and how to harvest (harvesting practices)
- How to store and how to process (building necessary processing capabilities)
- How to pack (packaging methods and practices)
- 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;

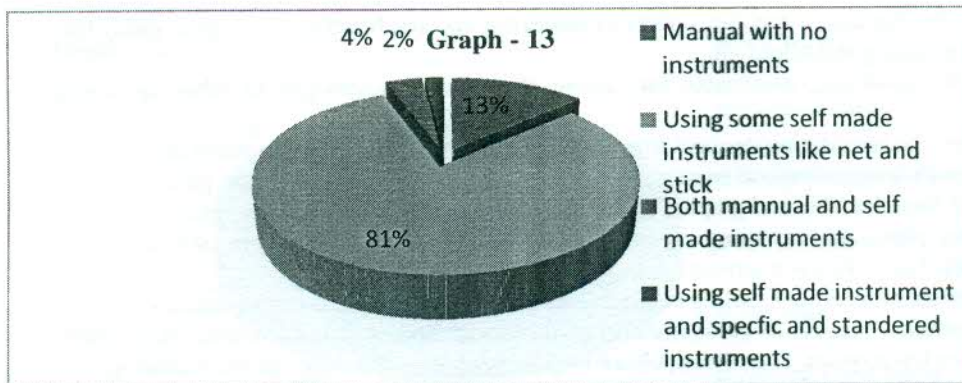
'Farming community should be provided with the required extension support with respect to providing right variety quality seedling/sapling at the time of plantations, adopting effective and efficient farm management practices, seeking the benefits of economies of scale, etc., from the concerned departments 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.

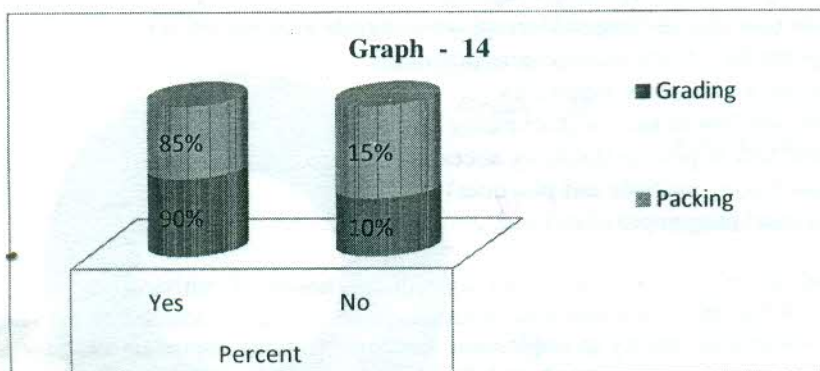
It can be further noted that 70% of the Brazilian cultivators grow only one variety i.e. 'TOM ATKINS' a variety similar to 'Alphonso', which is ideal for processing.

Part B(b): Analysis of Specific Information continued

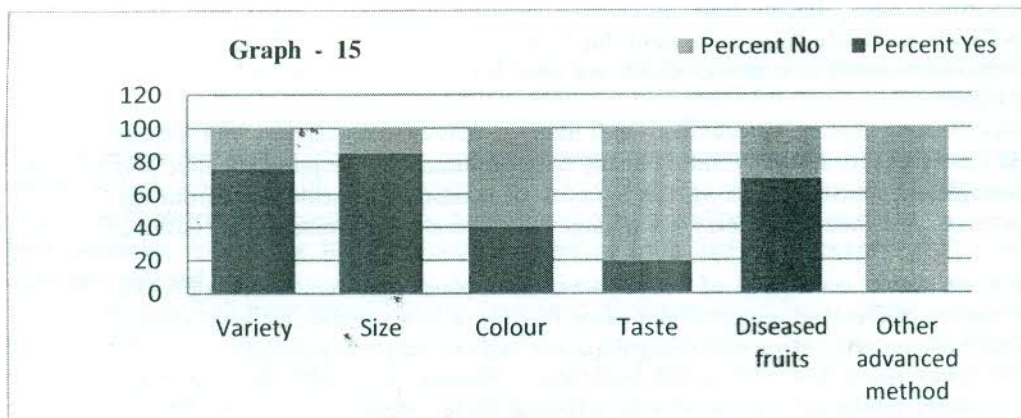
13: Method of harvesting followed by the respondents



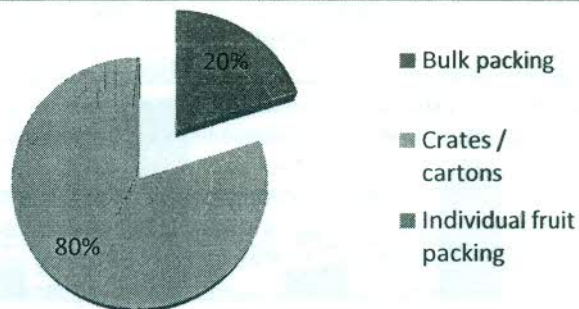
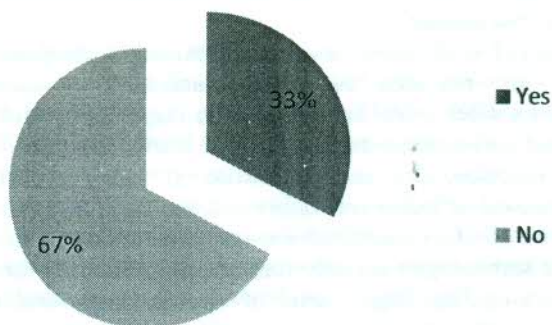
14: Undertaking of grading and packing by respondents

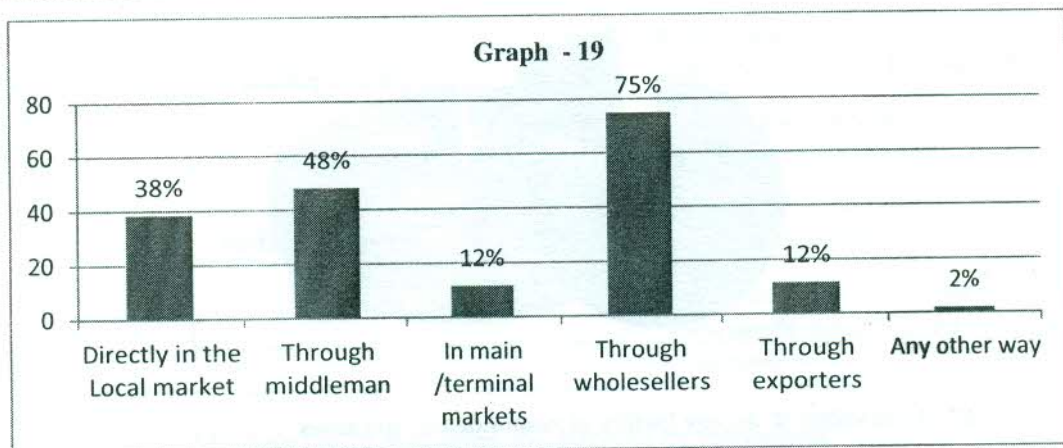


15: Respondents undertake grading based on



16: Type of packing followed by mango cultivators

Graph - 16**17: Availability of storage facility at respondents' premises****Graph - 17****18: Details about the storage facility at respondents premises****Graph - 18****19: The method of marketing/selling followed by respondents**



Research Findings and Discussion:

From the graphs (13 to 19) shown above, the following inferences can be drawn:

From the graph-13, 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 equipment's like net and stick and entire process is 100% 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.

From the graph-15, it becomes clear that none of the respondents undertake individual fruit packing and small attractive handy packaging. Majority of the respondents (80%) pack their 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 for e.g. 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.

It becomes clear from the graph-17 that 33% 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% 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% of the respondents had necessary infrastructure), clearly rejects null hypothesis Ho-

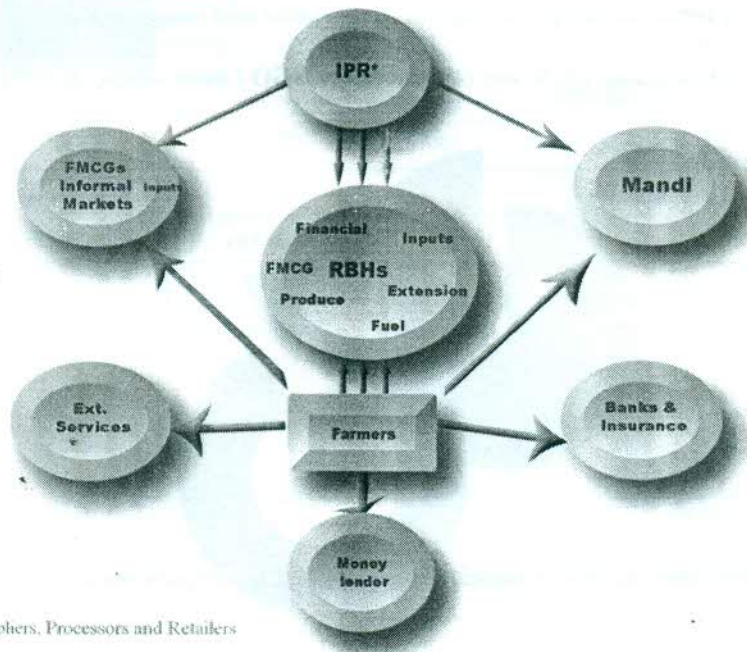
02 and accepts alternate hypothesis Ha-02, which focuses on availability of necessary infrastructure to growers.

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.

It becomes evident from the graph-19 that only 24% of the respondents market / sell their produce in the main / terminal markets, either to processors or to exporters. Whereas remaining 76% of the respondents market / sell their produce in the local market itself or to wholesalers, 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.

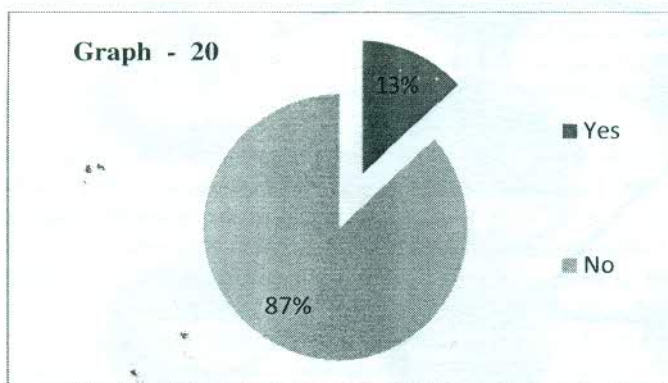
Cultivators should also be equipped with knowledge about market movements through internet and commodity exchanges.

The above discussion clearly reject null hypothesis Ho-02 and accept alternate hypothesis Ha-02 which state 'Indian fruit cultivation industry especially mango cultivation 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.

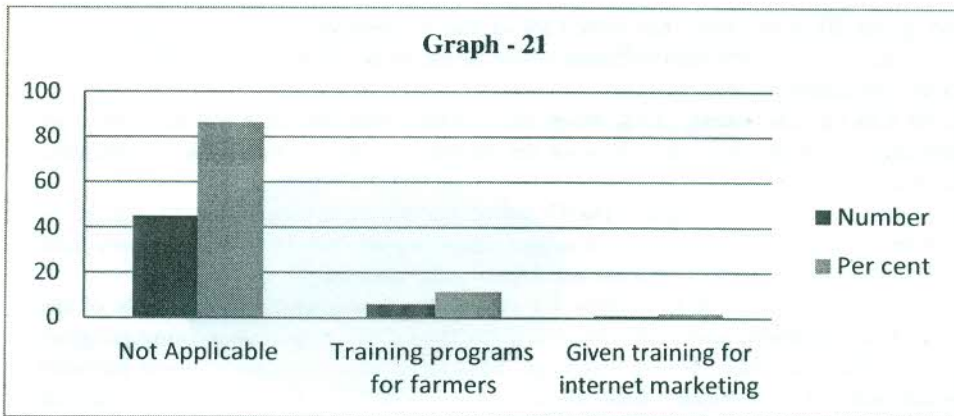
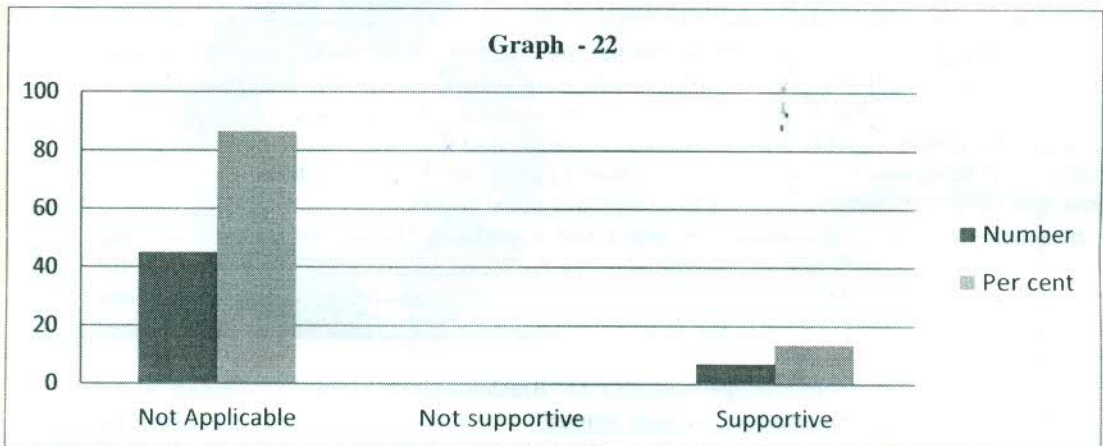
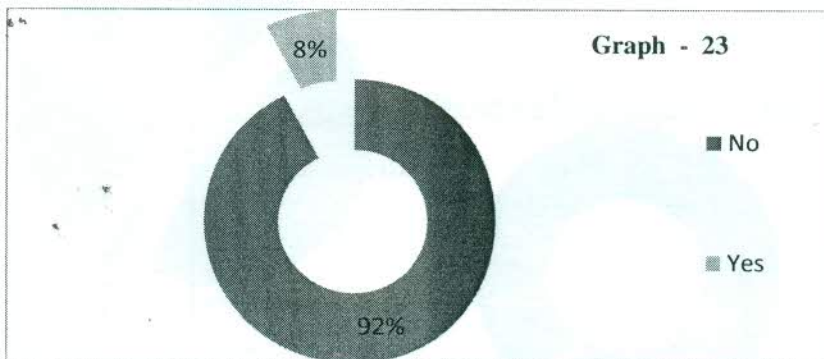
'There lies a tremendous scope to revamp this industry by adopting well proven strategies and channelizing the funds properly, to create the necessary infrastructure that is required. This certainly calls for a co-operative effort amongst farming community. Traditional practices need to be replaced with 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:

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



21: Key activities undertaken by association as revealed by respondents

Graph - 21**22: Availment of support received from the Association/s****Graph - 22****23: Availment of support from the nodal agencies****Graph - 23****Research Findings and Discussion:**

From the graphs (20 to 23) displayed above the following inferences can be drawn.

From the graph-20 it is clear that only 13% of the respondents are the members of a cooperative society / association, whereas remaining 87% 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% 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*".

From the graph-21 and 22, it is evident that cooperative societies to which 13% 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.

From the graph-23, 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.

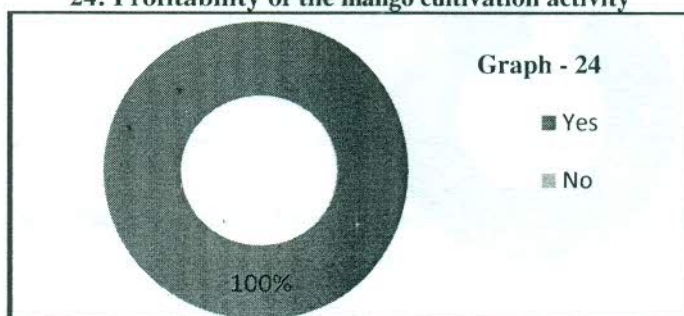
Above discussion together with Chi-square test applied to table F23 whose calculated Chi-square value: 37.2, being much higher than table value: 3.841, we reject null hypothesis which state that at least 50% of farmers availed support from the Govt. nodal bodies.

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;

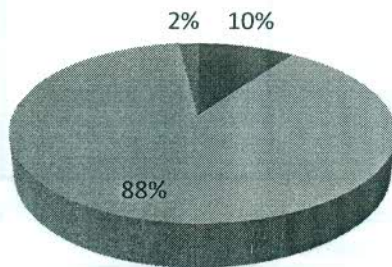
There lies a most promising scope to import the 'Brazilian model' where in a single nodal agency 'EMBRAPA' takes complete care of both farming community and processing industry by having a fool proof mechanism/system in place to address all their concerns/problems and working in an integrated fashion, 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

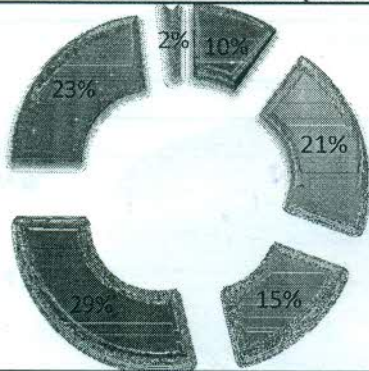
24: Profitability of the mango cultivation activity



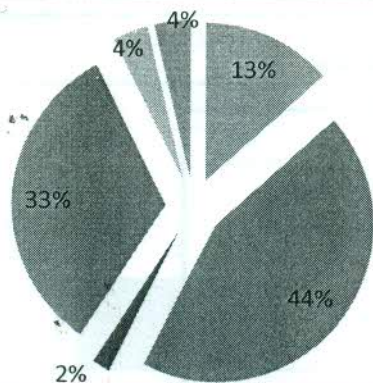
25: Respondents treatment towards this business

Graph - 25

- Simply an asset
- Profit making centre
- Not given

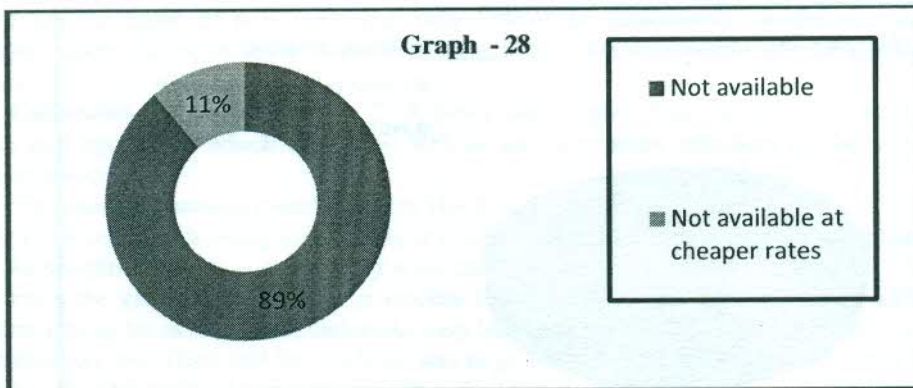
26: Investments made by the respondents in last five years**Graph - 26**

- Zero
- Less than Rs. ten thousand
- Less than Rs. 50000
- Rs. 50000 - 1.0 lacs
- Rs. 01 to 5 lacs

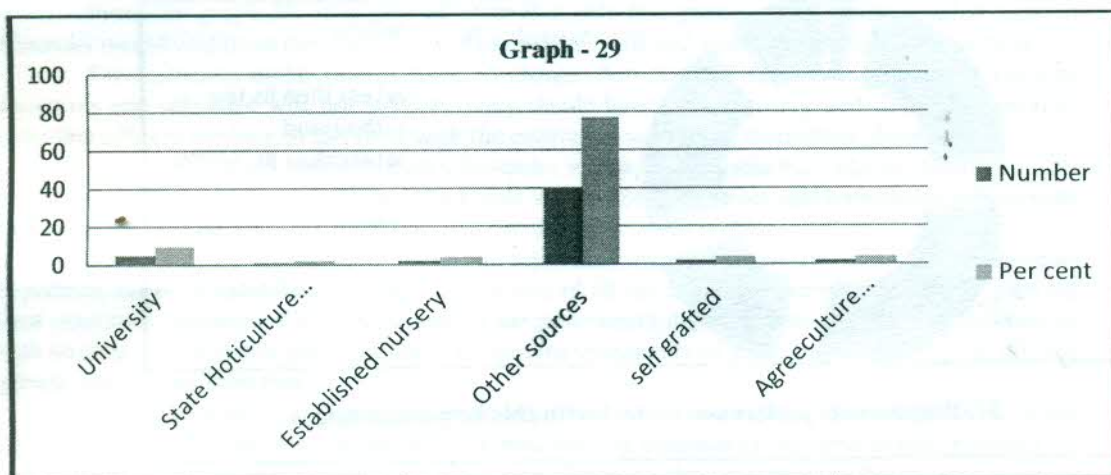
27: Respondents preference to deal with this business in future**Graph- 27**

- No remarks
- Continue with no further tangible investments
- Sell it

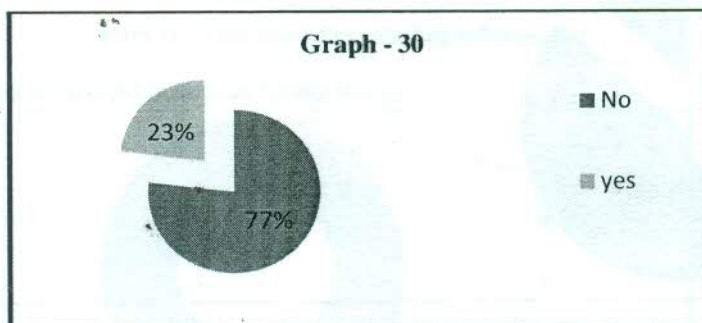
28: Problems pertaining to Availability of certified seedling / sapling



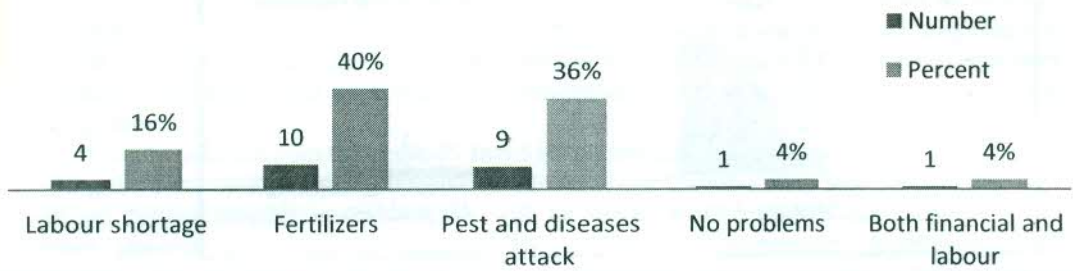
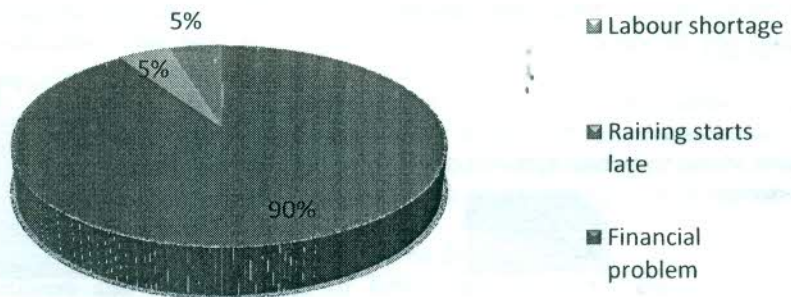
29: Details about the agency from whom seedling or sapling is being purchased

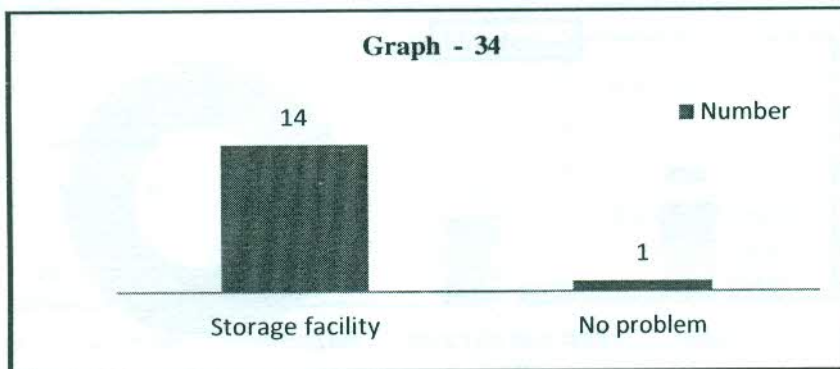


30: Certification of the sapling /seedling

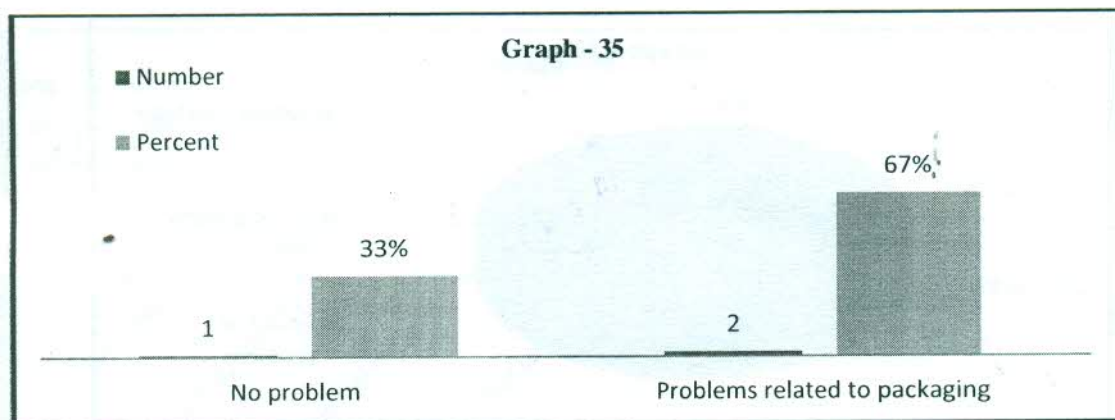


31: Problems faced by respondents during cultivation/production

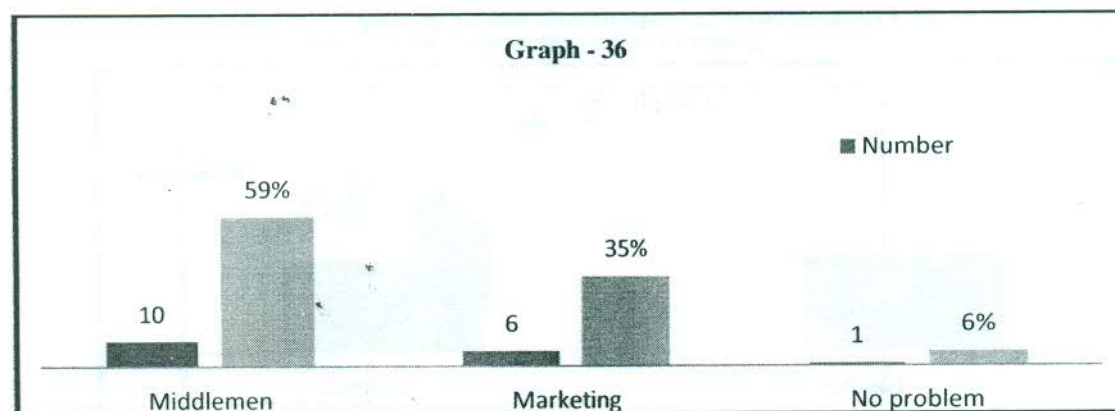
Graph - 31**32: Problems faced by respondents during harvesting****Graph - 32****33: Problems faced by respondents during grading****Graph - 33****34: Problems faced by respondents during storage**



35: Problems faced by respondents during packaging



36: Problems faced by respondents while marketing his / her produce



Research Findings and Discussion

From the graphs (24 to 36) shown above, the following inferences can be drawn: It becomes clear from the graph-24 that mango cultivation is a profit making activity. It can be inferred from the graphs 25 and 26 that majority of the respondents (88%) would like to treat their farming activity as a profit making center, 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% of the respondents had invested less than Rs.50000, which questions the above finding about the treatment of farming activity in general. Investment of around Rs. 50000 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.

It can be inferred from the graph-27 that 51% 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.

It is evident from the graphs (28 to 30) 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% 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^aHa-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.

From the graphs (31 to 36) following inferences can be drawn:

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.

Acute labor shortage is a serious problem faced by 90% 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.

Lack of storage facility is another 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.

Middle men menace is another serious problem facing this industry. As discussed before, the middle men 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 cultivation industry, especially mango cultivation 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 government departments/nodal bodies/institutions with no clear direction and goals prohibit the farming community of India from attaining the desired growth.”*

Conclusion of the study

Based on the thorough evaluation of the findings of the research and critically analyzing their interpretations and subsequent discussions following conclusions have been drawn:

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.

The researcher accepts alternate hypothesis Ha-02, which is restated here-in-under;

(Ha-02): *“Indian fruit cultivation industry especially mango cultivation 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 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.

The researcher accepts alternate hypothesis Ha-03, which is restated here-in-under;

(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."

This in turn mean smallness of individual cultivators and processors is the prime cause for their exploitation and is preventing Indian fruit cultivation 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;

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.

Reaping the benefits of larger economies of scale and higher value addition will become possible. 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.

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.

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.

Changing the attitude and mindset (negative) of Indian consumers towards packed and processed fruit products can be accomplished through massive advertisements and awareness campaigns.

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.

The researcher accepts alternate hypothesis Ha-04, which is re-stated here-in-under;

(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 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 120000 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 'middle men 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 employs 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% 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;

- India has the right soil to grow almost all varieties of fruits
- India has the right climatic condition, quiet ideal to grow fruits of almost all kinds.
- India has abundant source of spring water (underground source) that is required to grow fruits.
- 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 cultivators in reaping benefits, which this sector has in store for them.

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% (approximate) of total production in Brazil. Whereas 'Alphonso' and 'Totapuri' which are supposed to be ideal for processing, together account for around 5% (approximate) in India. Brazilian cultivators grow finger count varieties, whereas we will find more than 3000 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 air ports, terminal markets, pre cooling centers, nurseries, full-fledged laboratories with all the technologically advanced equipment's, 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.

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, led 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.

Recommendation to Agriculture Ministry, Government of India:

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.

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. Smaller sample size (50 cultivators) is another important limitation of this particular study.

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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