

Primary Research Pertaining to Farmers/Cultivators

Research Plan

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

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

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

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

Method of Data Collection

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

Tools Used for Collecting Data

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

Tools and Techniques used for Analyzing Primary Information

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

1. Correlation

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

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

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

Where,

r = correlation coefficient

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

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

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

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

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

$$r_{x,y} = \frac{n \sum xy - \sum x \sum y}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

Where; y = Dependent variable

x = Independent variable

n = Number of pairs of observations

r = the correlation coefficient

Interpretation of the strength of correlation:

0.00 - .20 – Very Weak

.21 - .40 – Weak

.41 - .60 – Moderate

.61 - .80 – Strong

.81 - 1.00 – Very Strong

2. Pearson Chi-square

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

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

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

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

$$\chi^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$

Where,

O_i = observed frequency of i th cell

E_i = expected frequency of i th cell

k = number of cells.

3. Tabular Presentation Techniques

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

- (i) Percent of different responses marked by the respondents
- (ii) Total number of similar responses as marked by the respondents.

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

Presentation of Research Findings

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

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

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

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

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

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

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

Part A: Analysis of Introductory Information: Mango Cultivators

Table F01: Land holding pattern of respondents

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

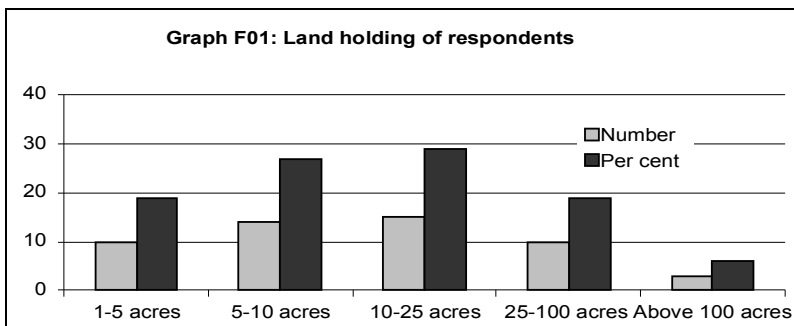


Table F02: Ownership pattern amongst respondents

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

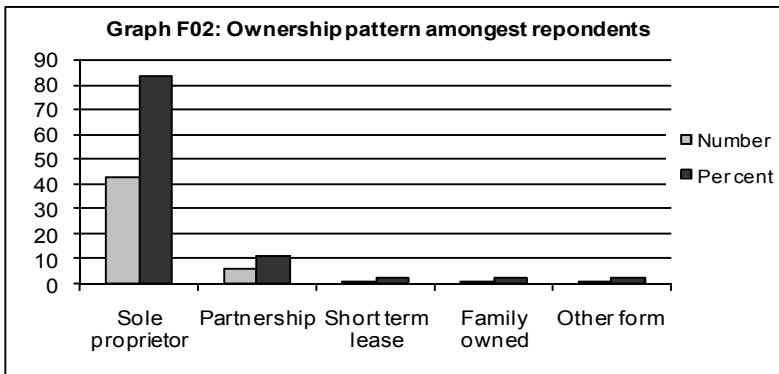
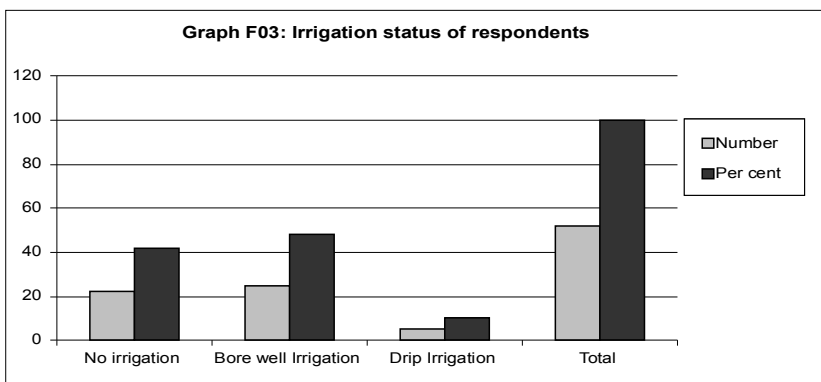


Table F03: Irrigation status of respondents

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



Research Findings and Discussion

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

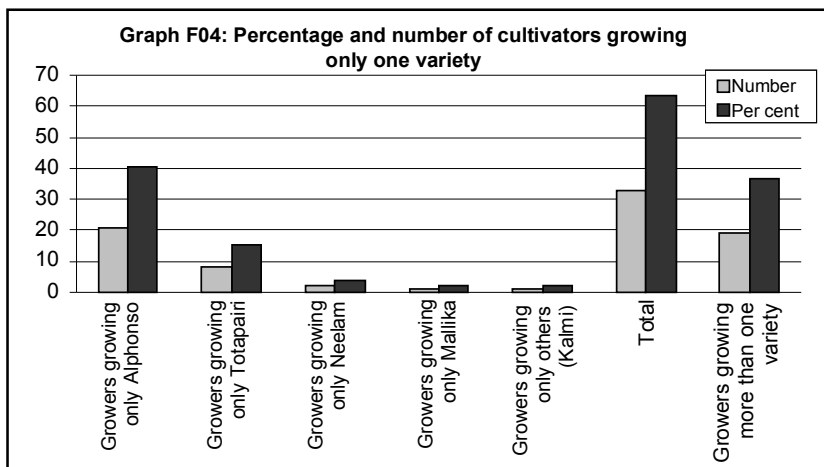


Table F05: Percentage and number of cultivators growing particular variety

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

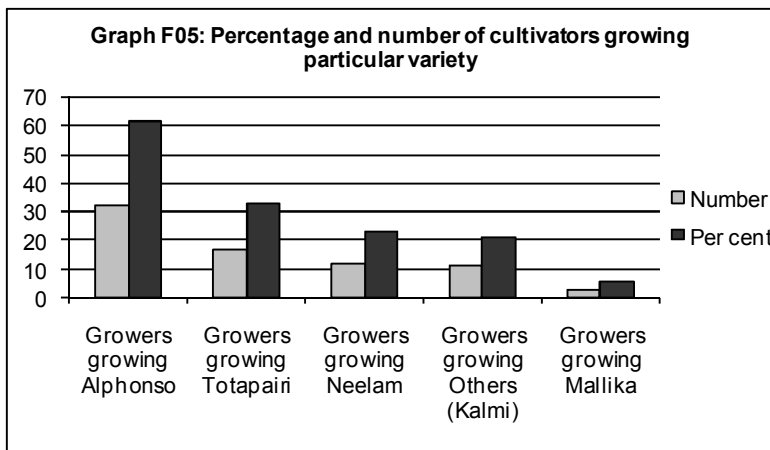


Table F06: Cultivators growing more than one variety

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

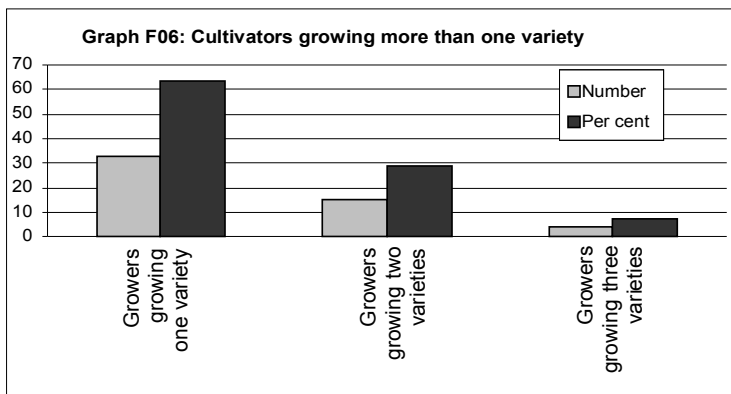


Table F07: Variety wise average yield, Market price and average revenue per plant

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

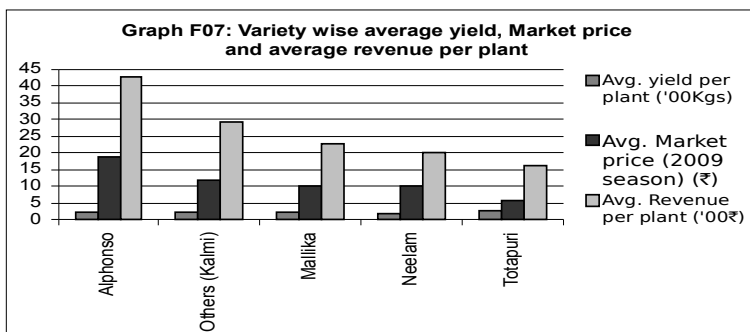


Table F08: Percentage of total no. of plants based on age of the plant

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

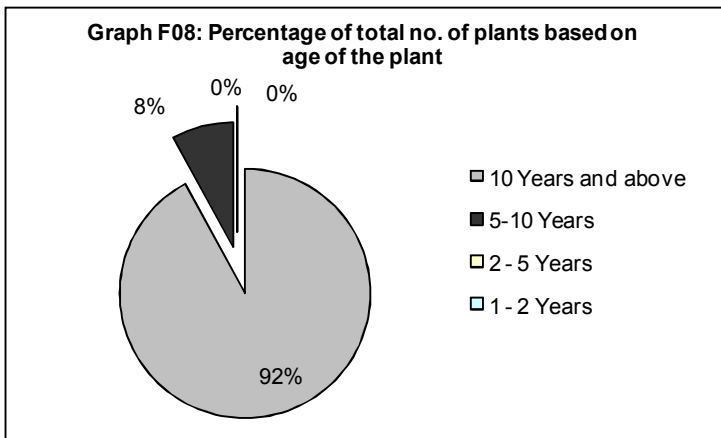


Table F09: % contribution of each variety grown by all the cultivators surveyed

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

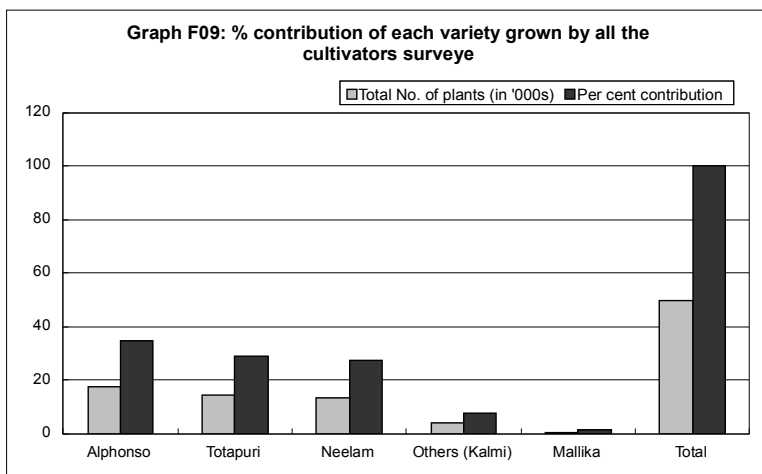


Table F10: Application of fertilizers per plant in a year

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

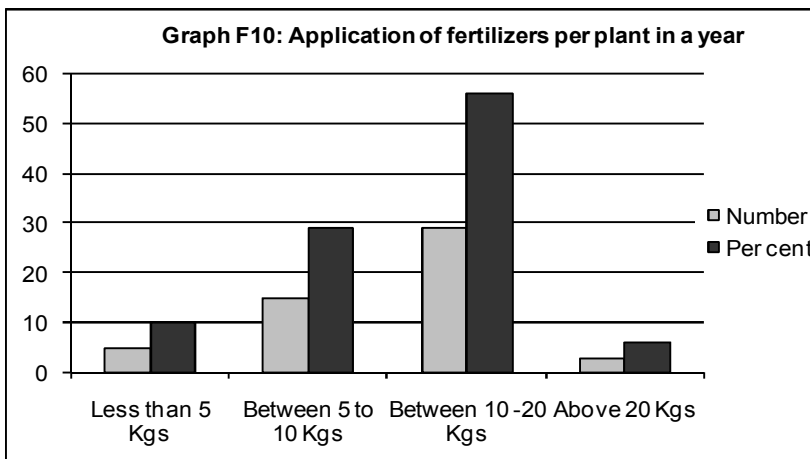


Table F11: Major diseases encountered frequently

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

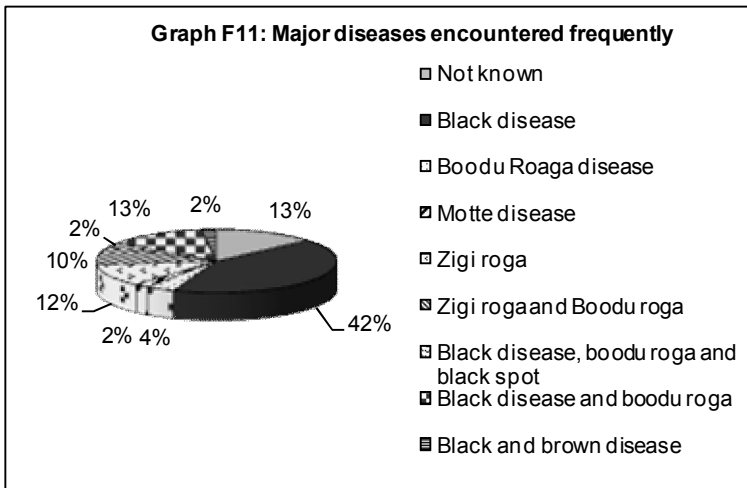
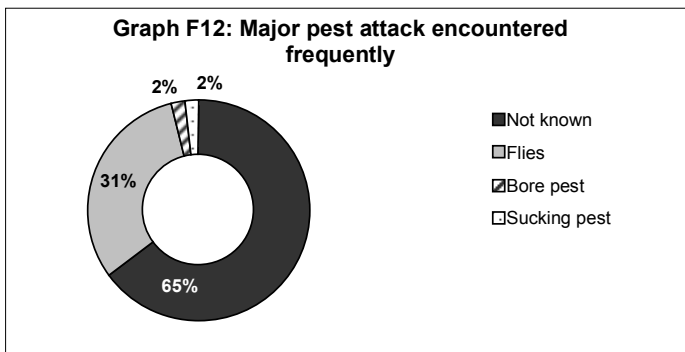


Table F12: Major pest attack encountered frequently

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



Research Findings and Discussion

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

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

- (i) Pulp content (pulp recovery) is very high.
- (ii) Mouth watering taste, right texture, appealing color, and unique aroma.
- (iii) Sucrose and Fructose content is high compared with other varieties.
- (iv) Size is neither too big nor too small: Just right for processing.
- (v) Comparatively lesser yield but higher market price and hence higher profit.
- (vi) Ever increasing demand for Indian Alphonso (both as fresh fruit and processed fruit products, especially pulp and juice).

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

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

- (i) Cultivators may be choosing a specific variety considering specific benefits like; higher yield, less maintenance, less managerial effort, etc.
- (ii) Lack of knowledge, awareness, etc., about the relative advantages of other upcoming varieties.
- (iii) They may be considering demand from the local markets only and try to fulfill the same.

- (iv) They don't want to replace existing varieties with new varieties when the plants become old (As revealed from the table and graph F 08: 92 percent of the plants were of age 10 years and above. This implies that plants are not being replaced even after 20 years resulting in orchards/farms becoming senile). This in fact is a serious issue which needs to be addressed.
- (v) Non availability of seedling/sapling of required variety during the time for plantations.
- (vi) Lack of extension support to cultivators from the nodal bodies and institutions like; NHM, NHB, Agriculture Universities, State Horticulture Department, etc. with regard to the following;
 - (a) Which variety to grow (suitability of the variety)
 - (b) How to cultivate (farming practices)
 - (c) From where to buy the seeds/seedling/sapling
 - (d) How to cultivate (pruning, feeding, nurturing, watering, etc.)
 - (e) How to manage the farm (farm management practices)
 - (f) How to control the weeds, pests, insects, etc.
 - (g) When to harvest and how to harvest (harvesting practices)
 - (h) How to store and how to process (building necessary processing capabilities)
 - (i) How to pack (packaging methods and practices)
 - (j) How to market (marketing approaches), etc.

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

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

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

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

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

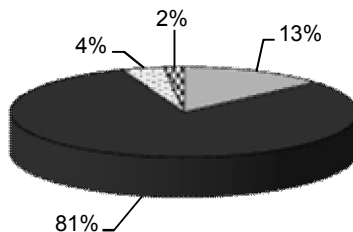
It can be further noted that 70 percent of the Brazilian cultivators grow only one variety i.e., ‘TOM ATKINS’ a variety similar to ‘Alphonso’, which is ideal for processing.

Part B(b): Analysis of Specific Information Continued

Table F13: Method of harvesting followed by the respondents

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

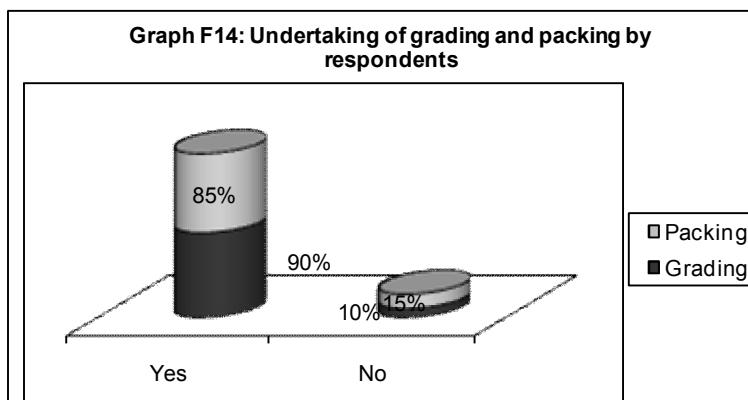
Graph F13: Method of harvesting followed by the respondents



- Manual with no instruments
- Using some self made instruments like net and stick
- ▨ Both mannual and self made instruments
- ▩ Using self made instrument and specific and standered instruments

Table F14: Undertaking of grading and packing by respondents

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

**Table F15: Respondents undertake grading based on**

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

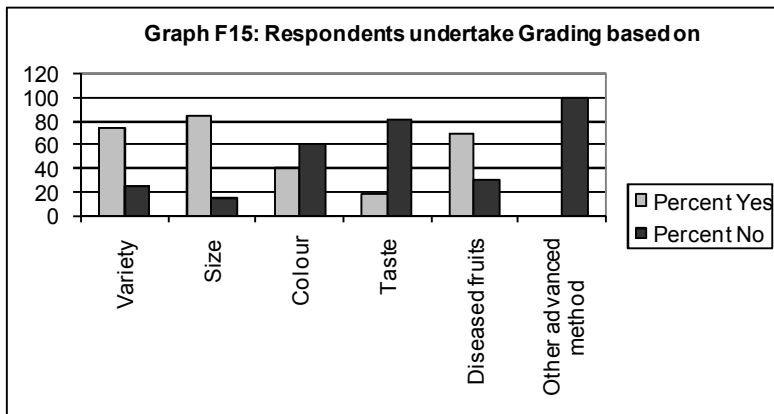


Table F16: Type of packing followed by mango cultivators

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

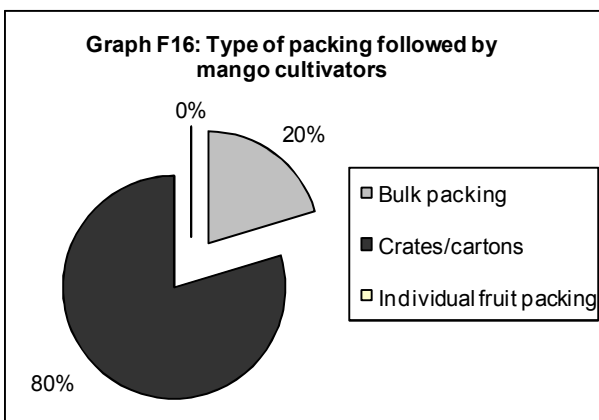
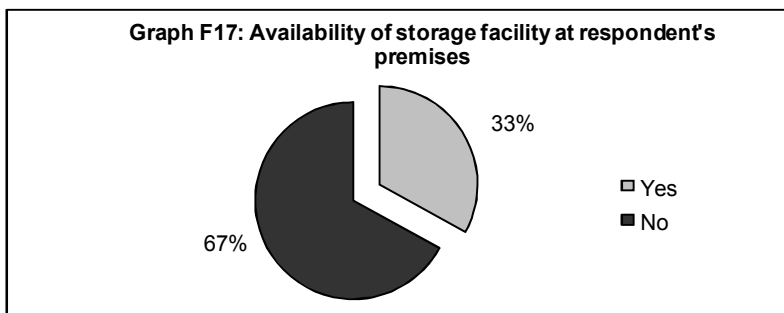


Table F17: Availability of storage facility at respondents' premises

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

**Table F18: Details about the storage facility at respondents premises**

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

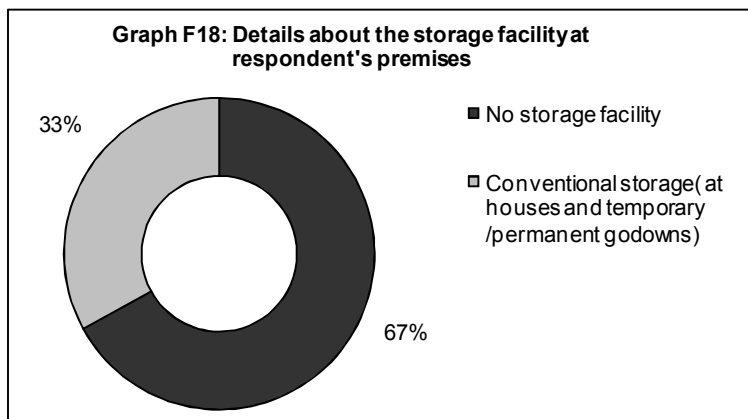
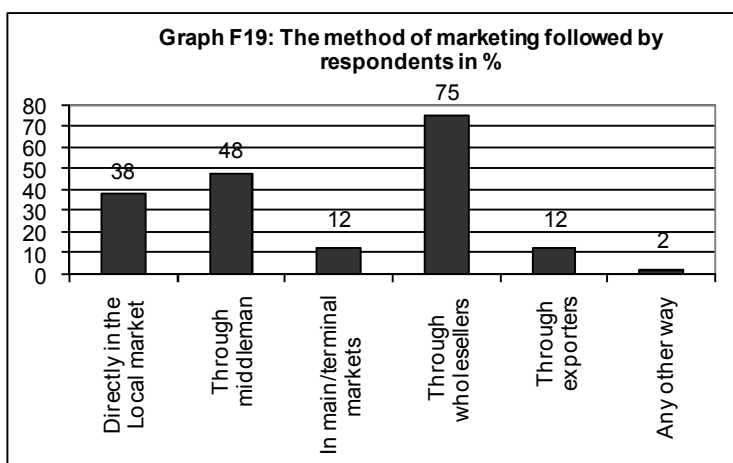


Table F19: The method of marketing/selling followed by respondents

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



Research Findings and Discussion

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

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

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

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

2. From the table and graph F15, it becomes clear that none of the respondents undertake individual fruit packing and small attractive handy packaging. Majority of the respondents (80%) pack 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 undertake individual fruit packing. Moreover majority of the Brazilian cultivators are so big that they have their own processing units and the processors who don't own farms will enter in to buy back agreement with big cultivators. This means that all cultivators are processors and all processors are cultivators in Brazil, whereas, there lies a huge gap between these two sects in India. They are not as closely tied as in Brazil.

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

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

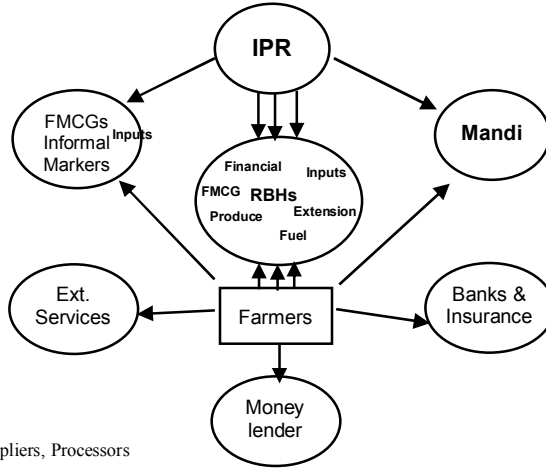
The calculated Chi-square value: 6.23, being higher than the table Chi-square value: 3.841 (assuming 50 percent of the respondents had necessary infrastructure), clearly rejects null hypothesis Ho-02 and accepts alternate hypothesis Ha-02, which focuses on availability of necessary infrastructure to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

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

4. It becomes evident from the table and graph F19 that only 24 percent of the respondents market/sell their produce in the main/terminal markets, either to processors or to exporters. Whereas remaining 76 percent of the respondents market/sell their produce in the local market itself or to 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 processing industry especially mango processing industry is plagued with lack of

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

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

Part C: Analysis of Information Pertaining to Collaboration and Cooperation

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

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

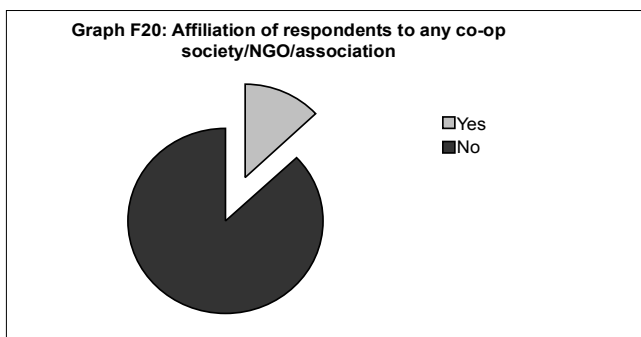


Table F21: Key activities undertaken by association as revealed by respondents

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

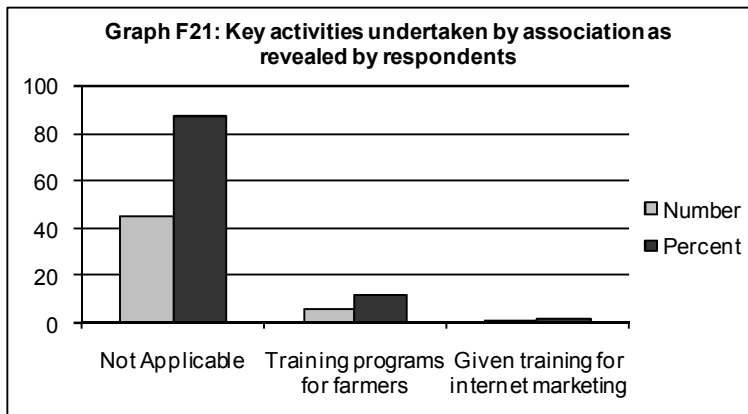


Table F22: Whether the association is supportive or not

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

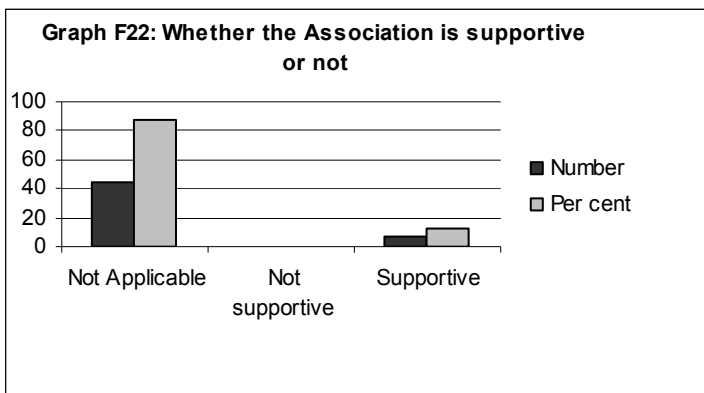
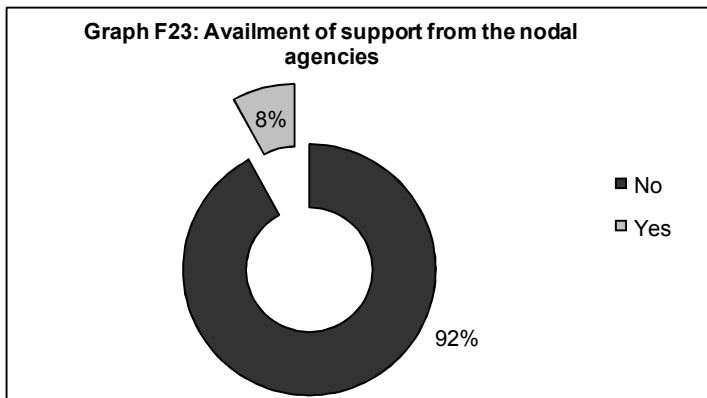


Table F23: Availment of support from the nodal agencies

<i>Sr. No.</i>	<i>Particulars</i>	<i>Number</i>	<i>Percent</i>
1	No	48	92
2	Yes	4	8
	Total	52	100



Research Findings and Discussion

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Part D: Analysis of Concluding Information

Table F24: Profitability of the mango cultivation activity

<i>Sr. No.</i>	<i>Whether Profitable or not</i>	<i>Number</i>	<i>Percent</i>
1	Yes	52	100
2	No	0	0
	Total	52	100

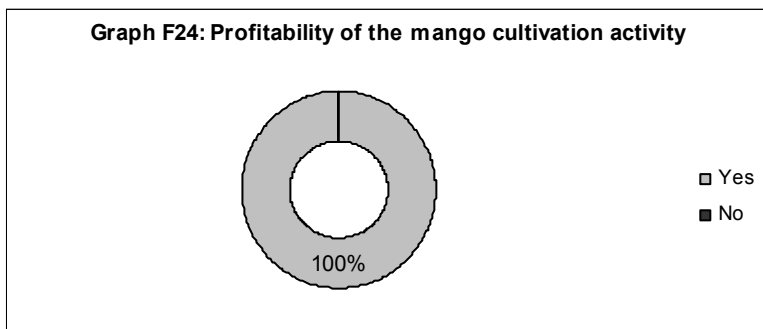


Table F25: Respondents treatment towards this business

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

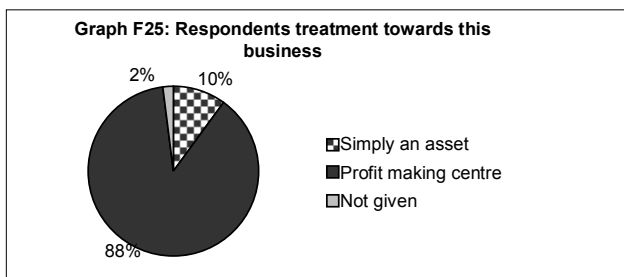


Table F26: Investments made by the respondents in last five years

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

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

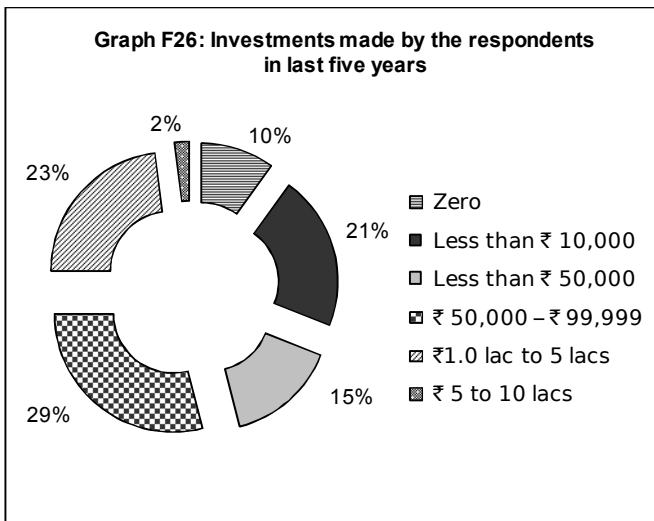


Table F27: Respondents preference to deal with this business in future

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

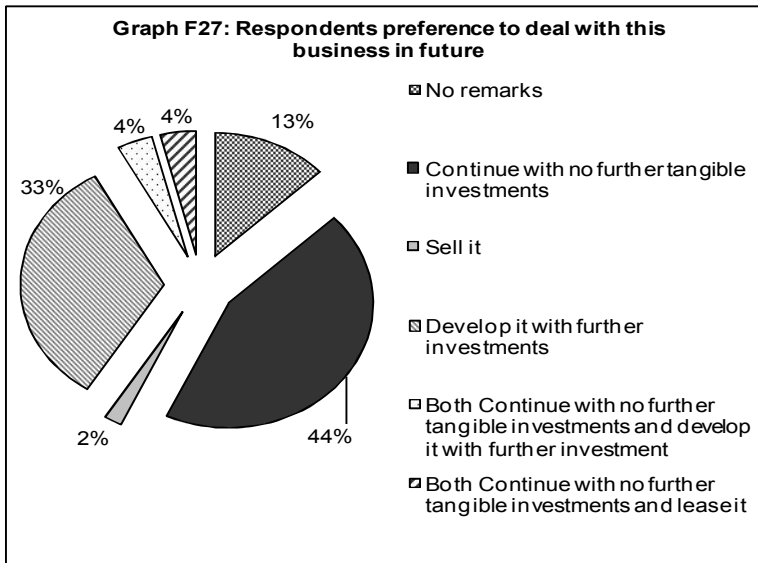


Table F28: Problems pertaining to Availability of certified seedling/sapling

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

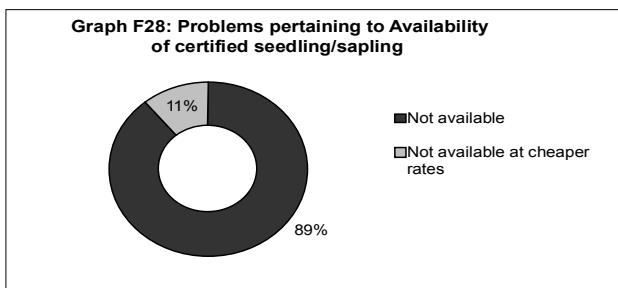
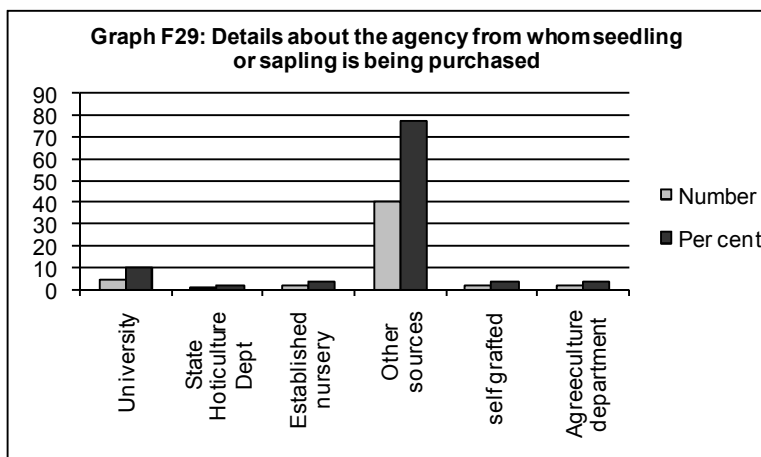


Table F29: Details about the agency from whom seedling or sapling is being purchased

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

**Table F30: Certification of the sapling/seedling**

<i>Sr. No.</i>	<i>Whether sapling was certified</i>	<i>Number</i>	<i>Percent</i>
1	No	40	77
2	yes	12	23
	Total	52	100

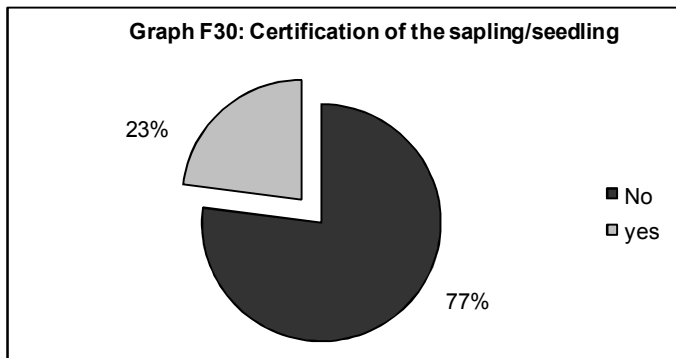


Table F31: Problems faced by respondents during cultivation/production

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

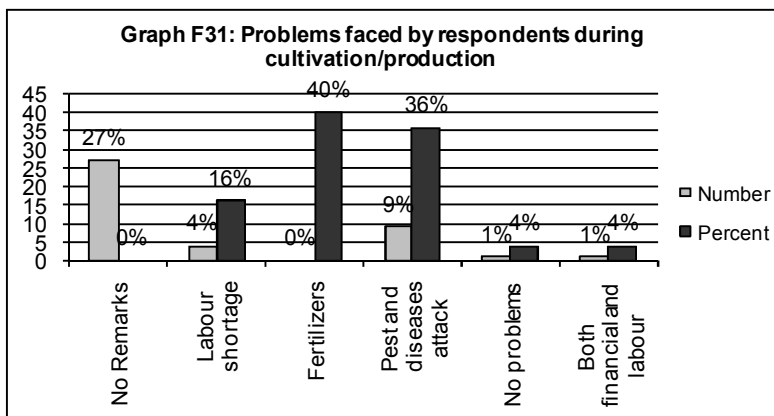
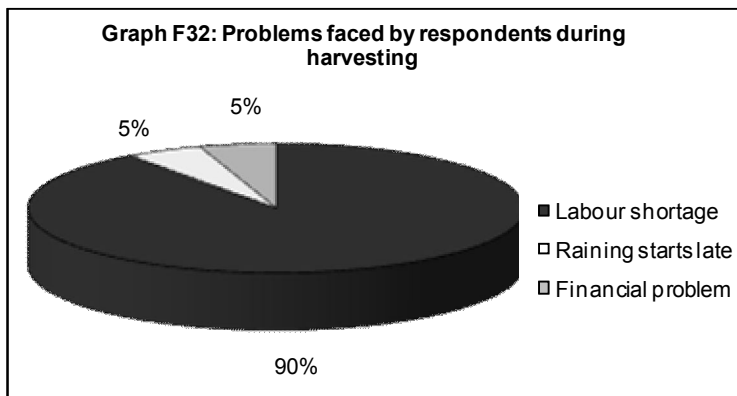


Table F32: Problems faced by respondents during harvesting

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

**Table F33: Problems faced by respondents during grading**

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

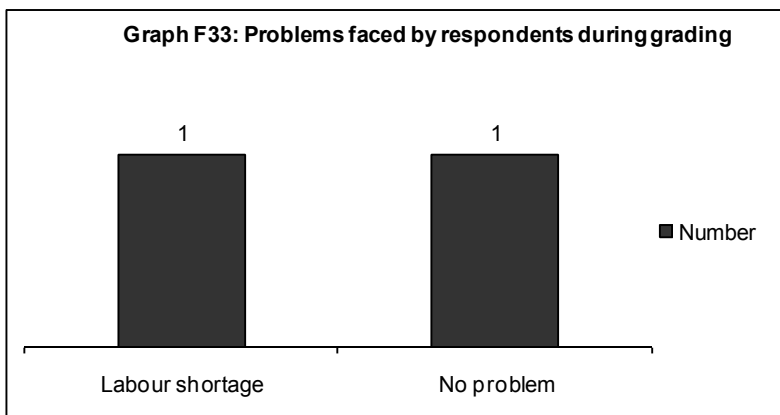


Table F34: Problems faced by respondents during storage

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

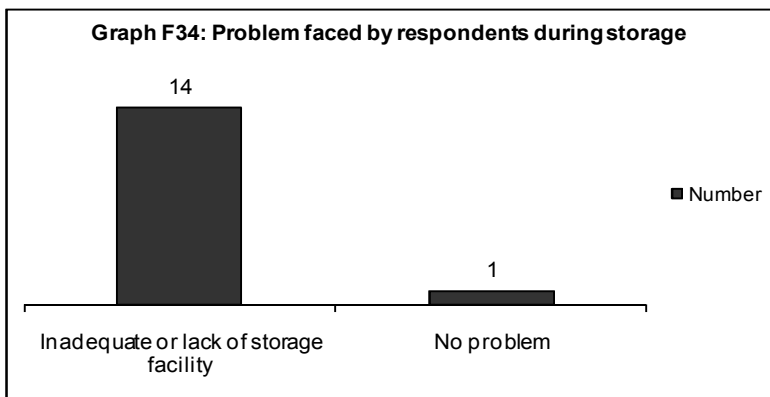


Table F35: Problems faced by respondents during packaging

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

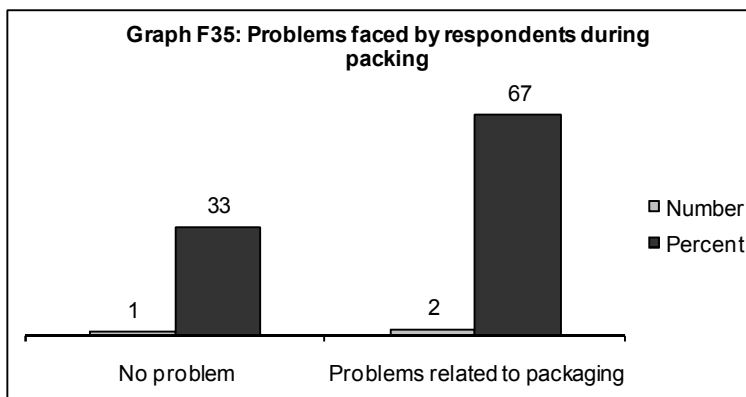
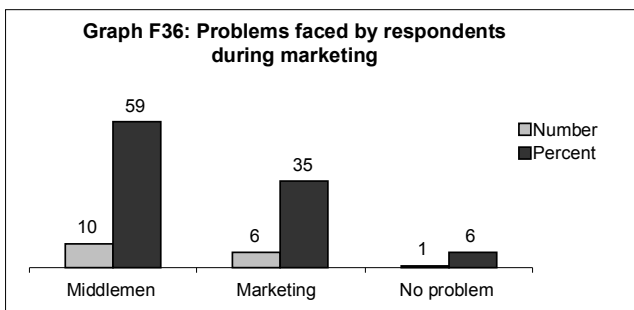


Table F36: Problems faced by respondents while marketing his/her produce

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



Research Findings and Discussion

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

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

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

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

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

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

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

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

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

- (Ha-02):** “Indian fruit processing industry, especially mango processing industry is plagued with lack of necessary infrastructure that is required for harvesting, transporting, raw material storing, grading, processing, packaging and marketing of the output, etc. This is a serious bottleneck for this industry.”
- (Ha-03):** “Lack of cooperative effort amongst farming community is a serious hindrance that prohibits this industry from reaping the benefits of larger economies of scale and higher value addition.”
- (Ha-04):** “Lack of integration of all the activities starting from farm gate till final consumers because of ill functioning of the government departments/nodal bodies/institutions with no clear direction and goals prohibit the farming community of India from attaining the desired growth.”

