SURVEY REPORT OF FARMERS ON VALUE CHAIN ANALYSIS IN MOKOKCHUNG AND WOKHA DISTRICTS OF NAGALAND

Submitted by

Hindustan Insecticides Limited (HIL)
A Government of India Enterprise
Scope Complex, 2nd Floor, Core-6 7, Lodhi Road, New Delhi-110003
Passion fruit, an edible berry, has three species namely purple passion fruit (Passiflora edulis Sims), yellow passion fruit (Passiflora edulis f. flavicarpa Deg.) and Giant granadilla (Passiflora quadrangularis L). Passiflora edulis is a vine species of passion flower that is native to southern Brazil through Paraguay to northern Argentina. Its common names include passion fruit or passionfruit (English). It is cultivated commercially in tropical and subtropical areas for its sweet, seedy fruit. The passion fruit is a pepo, a type of berry, round to oval, either dark purple or yellow at maturity, with a soft to firm juicy interior filled with numerous seeds. The fruit is both eaten and juiced, passion fruit juice is often added to other fruit juices to enhance aroma and quality. Passion Fruit is an intriguing and mysterious fruit that has a surprising number of health and medicinal benefits for those fruit lovers who aid it to their diet. Some of these benefits include passion fruit’s ability to prevent cancerous growth, enhance digestion power, boost immune function, improve eye sight, improve skin health, regulate fluid balance in the body, lower blood pressure, normalise blood circulation and improve bone mineral density. Furthermore, it reduces signs of premature aging, lessens inflammation, improves sleeping habits and eliminates asthma, treats insomania and is rich in vitamin A.

Passion fruit may be grown in frost free warm climate of tropical and subtropical locations in the world. Appropriate soil for passion fruit cultivation is sandy loam soil. Major Passion fruit producing states are Manipur, Nagaland and Mizoram which contribute 70% of the national production in India. As per latest available data for the year 2015-16 passion fruit is cultivated in India in 13 thousand ha and production is 78 thousand MT. The area and production of this crop is in the descending trend as the total cropped area and production in the year 2014-15 had been 19 thousand ha and 129 thousand MT respectively [1].

Fruits harvested should be disposed off quickly to prevent the loss of weight and appearance. About 10-20% loss in not results from storage and fruits wrinkle and give a bad appearance. To avoid this they can be stored in polythene bags and for transport to distant markets polythene - lined crates may be used. Passion fruit juice is sold to juice manufacture and other processors as a single strength aseptic juice (14 – 16° brix) or frozen concentrate (50° brix). Its consumption is much more localized and is not adequately popular in the country inspite of being very rich in nutritional quality. The reason being unawareness of the common people about this fruit resulting in a low

demand. This is observed that in the north east region the area and production has initiated a decreasing trend. The cause of this descending trend appears to be low consumptive domestic demand and lack of processing facilities and proper organized marketing chain. Apart from this productivity of passion fruit is very low in India which is 5.02 t/ha. This implies that the production constraints is another very important aspect. Processing of passion fruit is limited only to produce juice concentrate in the country which is used in making fruit juice mix and other beverages. The experimental testing and validation of various processing technologies including conventional thermal processing, novel thermal processing technique, non-thermal processing technologies which incorporates dense phase carbon dioxide processing, pulsed electric field processing, ozone processing, high hydrostatic pressure processing, radiation processing and degradation mechanism and possibility of their commercialization may be explored. Efforts of developing seedless / rudimentary seeded varieties may be initiated / intensified. Passion fruits void a vital role in human health due to presence of bioactive compounds, phytonutrients and antioxidants. Therefore, development of its production, preservation and processing technologies and to streamline its marketing strategies are very important aspects to be addressed. Researches to generate INM and IPM packages are required to be intensified. Greater emphasis is required for formation, execution and establishment of Farmer Producer Organizations (FPOs) to eliminate intermediaries and streamlining a desired marketing system for maximum return to passion fruit growers.
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**Introduction**

In India though passion fruit (*Passiflora edulis*) was introduced in early part of twentieth Century [2] but its cultivation was limited to few districts of Karnataka, Kerala and Tamilnadu. Since last one decade its cultivation started in some parts of north east states. The area under this crop is rapidly increasing in Mizoram, Nagaland, Manipur and Sikkim and there is great potential for its cultivation in these states. However, a little decreasing trend in area and production in Nagaland was noticed in the year 2014-15. Presently passion fruit is cultivated in Munnar and Waynad of Kerala, Nilgin hills and Kodaikanal of Tamilnadu, Kodagu (Coorg) region of Karnataka and parts of Mizoram, Nagaland, Manipur and Sikkim.

Passion Fruit prefers a tropical and sub-tropical climate with moderate rainfall ranging between 100 and 250 cm. It is found growing at an altitude of 800-1500m above sea level. In purple passion fruit, cool temperatures are favourable for flower initiation and fruit set (18-23°C), while relatively high temperatures seem necessary for promoting juice production (18-23°C) and improvement in quality. Yellow passion fruit grows under low land tropical conditions, whilst, the purple type tends more to be cultivated in subtropical areas or at higher altitudes in the tropics. The low temperature effects fruiting of the vines and upper parts suffered cold injury. It generally requires an average annual rainfall of 100 cm. In India, it is found to be grown in areas of receiving rain from between 100 cm and 250 cm. Passion fruit is grown on many soil types but light to heavy sandy loams, of medium texture are most suitable. Soil with a pH of 6.5 to 7.5 is the most suitable. If the soil is too acid, lime must be applied. The soil should be rich in organic matter and low in salts because the vines are shallow rooted. Good drainage is essential to minimize the incidence of collar rot. Water logging and soil without drainage should be avoided.

There are more than 500 species of *Passiflora* in the family Passifloraceae, but only one *Passiflora edulis* Sims, is known as passion fruit. There are two distinct forms of *Passiflora edulis* Sims, the standard yellow (*Passiflora edulis* f. *flavicarpa* Deg.) and the purple (*Passiflora edulis* f. *edulis*), differing in acidity and starch content. The yellow are more acidic and less starchy while the purple are less acidic and more starchy. Both two varieties, viz., purple Passion Fruit (*P. edulis*) and yellow Passion Fruit (*P. edulis* var. *flavicarpa*) are of commercial importance. The hybrids of these two have also been developed for cultivation.

The vines of purple passion fruit are moderately vigorous and vines are more productive at higher elevation. Generally fruits are smaller than yellow passion fruit. about 4 to 5 cm in diameter and deep purple in colour when ripe. The average fruit weight ranges between 37-50 g. The juice content of the fruit varies from 35-38% and has a better flavour and aroma as fresh, canned and frozen juice or pulp than the yellow one. The seeds are black in colour. The Commercial cultivars of the purple form
are Ouropretano, Muico, Peroba, Pintado etc. in South America. In India there is no standard cultivar. The local lines such as Ooty Purple, Coorg Purple, Moodabidri Purple, Thrissur Purple, Cherapunji Purple, Thaliparamba Purple and Ambalavayal Purple are cultivated by the growers.

The yellow form has a more vigorous vine. This type is suitable for lower elevation and is less productive at higher elevation due to its sensitivity to low temperature. The fruit is generally larger (weighs about 60 g.) than the purple variety, round in shape with yellow mottled spots and turns to golden yellow when ripe. Juice is more acidic and its recovery is comparatively less than the purple variety. Seeds are brown. This form is inferior to the purple one with regard to juice content (25-30%) and flavour. The Commercial cultivars of the yellow are Mirim or Redondo and Guassu or Grande in South America and Golden Star in USA. There is no standard cultivar In India. The local lines such as Ooty Yellow, Coorg Yellow, Munnar Yellow are cultivated by the growers.

The hybrids of yellow and purple form have been developed for combining the desirable characteristics of both the forms of passion fruits. Several hybrid varieties have been developed in Brazil, Australia, South Africa, etc. In India a hybrid of purple and yellow form was developed at Central horticultural Experimental Station, which is very popular among the farmers. This variety is a high yielding hybrid developed from Central Horticultural Experiment Station, Chettalli in 1986. This is a cross between purple and yellow varieties. Each plant bears 40-60 fruits per annum and produces 200 tonnes yield/ha over a three-year cropping period. Fruits ovoid to round and purple dotted. Fruits contain 25-30 per cent juice, 11.5-12.0 percent sugars and 3.0-3.5mg citric acid/100ml Juice. This is tolerant to Alternaria leaf spot, Fusarium collar rot and nematodes [2].

Passion fruit is propagated through seed, stem cutting as well as grafting. Recently serpentine-layering techniques has been standardized at IIHR, Bangalore. Seedlings and grafted plants are more vigorous than the plants raised by cuttings. Passion fruit vine originating from cutting or grafting starts fruiting much earlier (7-6 months) than those from seeds (10-12 months). In case of grafting on resistant rootstocks (yellow Passion Fruit) can be used to avoid damage due to wilt or root rot.

Passion fruit vines are usually grown from seeds but seed propagation is not preferred for commercial multiplication as lot of variable is found in seed propagated plants. For seed propagation, fruits are collected from vines known for their performance in term of yield and quality. The seeds are extracted by fermentation method by heaping up the pulp for 72 hours and extracting the seeds and drying in shade. Sowing is done preferably during the month of March-April in a well-prepared seedbed. The seeds start

sprouting in about 12-15 days after sowing and germination is completed in about a month. In some cases germination extends even up to 50-60 days. When the seedlings attain four to six leaves, they are transplanted in 10 x 22 cm. polythene bags filled with a mixture of soil, compost and sand in 2: 1 : 1 proportion. The seedlings are ready for transplanting in the field in about three months.

This is the most popular method of multiplication of passion fruit. Passion fruit is not a easy to root plant but rooting is satisfactorily under favourable conditions. The 30-35 cm long mature portion of the vines having 3 to 4 nodes is selected for the cutting. It should be raised in a suitable media preferable equal mixture of sand soil and farmyard manure. Rooting may be hastened by hormone treatment. It has been found that treatment cutting with 200 ppm NAA for very short period(3-5second) or 80 ppm NNA for 12 hour increased the rooting in cutting. Rooting takes place within a month and can be transplanted to the field in about three months.

Grafting is used to multiply hybrid varieties on disease resistance rootstocks. The yellow passion fruit is resistant to nematode infestation and diseases and found to be a good rootstock for hybrid varieties. The seed yellow passion can be sown either in March or in October for raising the seedling depending upon the availability of the seed. Seedlings can be raised in seedbed or in pots. The plants became ready for grafting in 3 months. Scions from healthy young vines are preferred to those from mature plants. Generally both stock and scion should be of pencil thickness for grafting. The diameter of the selected scion should match that of the rootstock. Cleft graft, whip graft or side wedge graft methods can be used.

In this method, the lateral shoots emerging from the main branches are given partial slanted cut below the nodes and shoots are allowed to root in rooting medium consisting of soil, sand and compost (1:2:1) with regular irrigation. This should be done in the month of February. The roots emerge profusely with in 45 days. These plants should be separated during April _May. The method has been found highly successful with 90-95 percent success with 75 days of layering. The field survival of the plants propagated by this method is higher.

The land should be well prepared by deep ploughing, leveling and incorporation of manures. Proper spacing should be provided as this greatly influences the growth of the vine and production. A spacing of three metre from row to row and two metre plant to plant from is suitable. Pits of 45 x 45 x 45 cm size are dug and filled with a mixture containing three parts of top soil and one part of compost. Planting is done preferably on cloudy days during June-July after the onset of monsoon so that the plants are well established by the end of the monsoon.

Passion fruit is a woody vine it needs support for good growth and fruiting. For commercial cultivation, the vines are trained on a frame of wires and poles 1.5 to 2 meter above the soil surface. Among the different types of trellising, Kniffin system is the most economical. In which 2½ metre long poles are erected six metre apart and a wire is fixed on the top. Trellis should always run across the slope or in the direction
of North-South for maximum and even exposure of vines to sunlight. In order to withstand the weight of the vines it is necessary to use eight or ten gauge wire, turning buckles and also strong stone pillars or cement or wooden poles. This is required for regulating yield of Passion fruit as the to support a heavy weight of vines and fruits under all conditions of weather at least for five years. Weak and faulty construction of trellis may result in sagging and loss of vines. If wooden pole is used it has to be treated with tar up to the portion that is buried in the soil to prevent deterioration and white ant attack. The vines are supported with hardwood stake or gunny twine, which may be stretched vertically from the bottom of the plant to the top of the wire. Plants start growing very fast just after establishment and several branches arise from the base of the plants. All the shoots leaving only two vigorous shoots are removed as and when they appear. The main shoots are bound on stake or twine and all the lateral growth in these shoots are removed till they reach the wire. Once the main vines reach the wire, the tips are pinched so as to encourage leader formation. Two leaders are directed on either side of the wire, and are tied with loops around the wire until the leader of the adjoining plants meet, when the tips of the leaders are cut. This forces the leaders with laterals which are trained downwards hanging from the wire and all the tendrils obstructing downward growth of the laterals are to be removed as and when they come. Passion fruit vines bear fruits only on current season's growth and systematic pruning of vine encourages new growth resulting in regular and higher yield of fruits. The lateral branches coming from leader branches are allowed to grow and fruit. Once the laterals have produced the fruits, they are cut back to four to six buds so as to induce regular bearing. Pruning is generally done twice in a year, first in March and April and another in October-November depending upon the harvest of the crop. Pruning is confined only to the cutting back of the laterals or buds of those laterals that have fruited. In the case of old laterals cutting back is limited to the nearest active bud as otherwise with increasing age of the lateral, the basal buds become dormant or sterile. Indiscriminate and drastic pruning of inactive or dormant vine may lead to a setback in growth and reduction in yield.

The Nutrient removal pattern on whole plant (including fruits) analysis revealed that from an hectare area accommodating 1500 plants averaging 37 tons fruit yield the amount of different nutrients removed were : 202.5 kg N – 17.4 kg P, 184.2 kg K – 151.6kg Ca – 14.4 kg Mg – 25.0 kg S – 770. 4 g Fe, 2810.2 g Mn, 198.7 g Cu – 316.9 g Zn –295.8 g B.. This suggests the nutritional requirements of passion fruit in order to determine the optimum fruit yield and to improve the longevity of passion fruit vine and to recommend an optimum dose of fertilizer for the crops.. However, this may vary according to the fertility status of the soil. The fertilizer recommended for south Indian states is more than the recommended fertilizer schedule for Northeastern states. A fertilizer dose of 110g N, 60g P2O5 and 110g K2O per vine per annum is recommended for the 4 year old orchards in South India. For Kaveri hybrid 100g N, 50g P2O5 and 100g K2O per vine per annum is recommended. While 80g N, 40g P2O5 and 50g K2O per vine per annum is recommended for the 4 year old orchards for North Eastern States. Nitrogen should be applied in 3 split dozes in the months of February-March, July-August and October -November along with farmyard manure
evenly spread in a circle of 50-45 cm radius about the stem having sufficient moisture in soil at the time of fertilizer application to ensure better use efficiency, while potash should be given in the two split doses. In addition to this, 2-3 sprays of 0.5% Urea can be given during summer months. The foliar application of micronutrients is recommended for deficient areas.

Prolonged dry spell during January-March may reduce main summer crop and may also affect adversely the development of flowering laterals. If there is no rainfall during the dry months, supplementary irrigation may be given at fortnightly intervals. On an average, passion fruit requires irrigation of 12-15 litre /vine/day in summer and 6-8 litre /vine/day) in winter. Drip irrigation is very useful. Passion fruit vine responds significantly to fertigation. In a study on response of passion fruit to K fertigation showed highest commercial production.

Passion fruit being shallow rooted having most of the feeder roots within 15 cm of the soil surface require light digging. Deep digging is avoided and weed growth is checked by surface weeding or by scraping and scuffling. Mulching with dried leaves or grass is done to conserve moisture during summer months.

The flowers are borne singly in the axils of the leaves in the terminal region of the new growth. Passion fruit flowers and fruits throughout the year under favourable conditions, yet there are two main periods of fruiting: the first harvest extends from August to December and the second one from March to May. The first fruits are obtained from the ninth month and full bearing is reached in 16-18 months. About 60-70 days are required from fruit set to the harvest of fruit. The fruit when ripe falls down from the vine. Harvesting is done when fruit turned slightly purple. Fruit should be harvested along with the stem. On an average, yield of 10-12 tonnes per hectare per year can be obtained. The vines are perennial and can produces yield for 10 to 15 years but maximum production can be obtained up to six years after which the yield declines.

Besides passion fruit transportation for domestic demands many industrialist prefer to soura frozen concentrate (50° brix) to use in ice cream, syrup, tropical cocktails and juice blonds. Demand for passion fruit concentrate is estimated by industry sources to have grown to 16,000 MTs. Growth in the European and US markets is estimated at around 6-8 percent annually. However, production frequently exceeds or falls short of demand as a result of erratic weather patterns and price reactions in Ecuador, the world’s largest exporter of passion fruit juice. The market is therefore subject to “boom and bust” production cycles: as shortages lead to higher market prices and, surplus leads to lower prices.
Objectives of Survey

The main objectives of the studies are as follows:-

- To understand on-farm and off-farm constraints.
- To identify the factors affecting supply chain of Fruits & Vegetables.
- Maximize growers gains/income.
- Minimize processing loses and value addition in supply chain of Fruits & Vegetables.
- Reducing the number of intermediaries in the supply chain of Fruits & Vegetables.
- To suggest mitigation strategies for the identified challenges in Supply Chain of Fruits & Vegetables.
Survey Materials and Parameters

A survey with the aforementioned objectives was undertaken by us under the directives of Hindustan Insecticides Limited (HIL). The survey was based in Wokha & Mokokchung District of Nagaland. Banana was selected as the commodity for studying value chain analysis in Wokha & Mokokchung, Nagaland as it is one of the major passion fruit producing district of the state.

A total of 1334 surveys of farmers were conducted in Wokha & Mokokchung District of Nagaland. The distribution is given below.

<table>
<thead>
<tr>
<th>State</th>
<th>District</th>
<th>Commodity</th>
<th>No. of Farmers Surveyed</th>
<th>No. of Traders Surveyed</th>
<th>Total Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nagaland</td>
<td>Wokha, Mokokchung</td>
<td>Passion Fruit</td>
<td>1334</td>
<td>1334</td>
<td>1334</td>
</tr>
</tbody>
</table>

A total of 15 villages were selected for conducting this survey based on the average number of banana farmers in the villages. Surveyors with marketing and agricultural background and experience were selected for this survey.

Frequency of answer to a particular question in the questionnaire was computed and the percentage of frequency out of persons interrogated were also computed in order to present the result of the survey. Calculation of frequency and percentage as mentioned above was done on all India basis and the results and conclusion are given.
Approach and Execution

Approach:

SELECTION CRITERIA ON LOCATION & ROUTE MAPPING
- Identification of the villages in consultation with state horticulture department
- Selection of villages showing substantial banana production
- To collect a survey of different farmers in a village

IDENTIFICATION & TRAINING
- Identification of local team
- Providing them a day training
- Educating them what is the importance of the questionnaire and how it is to be filled
- Mandates post filling up the survey (complete form filled by the farmer, attestation by the farmer (Signature/thumb impression), ID Proof, Photograph

EXECUTION & MONITORING
- Placement of Supervisors to check the execution of the field team
- Field Monitors/back checkers on the quality check of the filled forms
- Train the team if additional training is required

Controlling Mechanism:

PROJECT MANAGER
- Responsible in project planning & control & bridge between field team & client

AGRICULTURE SPECIALIST
- Training the field team on the technicalities & final report submission analysis

SUPERVISORS
- To check on the field Execution

SURVEYORS
- To get the forms filled from the farmers & educating the farmers on the importance of the survey and to collect the necessary document post survey

BACK CHEKERS
- To check on the quality of Job & provide field training if required

MIS TEAM
- Data Compilation & Report analysis generation
Detailed Analysis Report
Results for extent of education of the farmers surveyed in Nagaland indicated that a large proportion 42.13%, of the 1334 farmers were found to be educated up to a secondary standard followed by 22.19% higher secondary and 21.74% up to primary standard and very little percentage of graduate standard. This indicated, by and large, that over 80% of the farmers were literate and communication with them may hardly be a problem.

**Age Profile**

![Age Profile Of Farmers (Years)](image)
<table>
<thead>
<tr>
<th>Age</th>
<th>Graduate</th>
<th>Higher Secondary</th>
<th>Secondary</th>
<th>Primary</th>
<th>No Schooling</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-35</td>
<td>0</td>
<td>131</td>
<td>326</td>
<td>167</td>
<td>74</td>
<td>698</td>
</tr>
<tr>
<td>35-50</td>
<td>1</td>
<td>138</td>
<td>187</td>
<td>30</td>
<td>48</td>
<td>404</td>
</tr>
<tr>
<td>50-60</td>
<td>2</td>
<td>21</td>
<td>35</td>
<td>51</td>
<td>27</td>
<td>136</td>
</tr>
<tr>
<td>60-75</td>
<td>0</td>
<td>6</td>
<td>14</td>
<td>42</td>
<td>34</td>
<td>96</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>296</td>
<td>562</td>
<td>290</td>
<td>183</td>
<td>1334</td>
</tr>
</tbody>
</table>

Table 4: Age group – Education profile of the farmers

Data for education in relation to age indicated that extent of education to be secondary and higher secondary level showed better penetration in the population of farmers surveyed within the age groups of 25-35 and 35-50 years as compared to 50-60 and 60-75 years of age groups. This indicated that the education of the fruit growers, in general, had a rising trend as compared to a baseline of 50 years back.

### Asset Profile of the Farmers

#### Asset Profile - Land

![Pie chart showing land area distribution](image)

Figure 3: Area profile of surveyed farmers

Results for land holdings possessed by the fruit growers indicated that 90% of the farmers were having area under cultivation from 0.2 to 5.2 acres. It is evident from this data the a very big majority of passion fruit growers comes under marginal & small farmers group.
**Land Profile of the Farmers**

Data for type of passion fruit orchard indicated that 1205 fruit growers (90%) were having their own small orchards in the area ranging from 0.2 acre to 5.2 acre i.e. the results showed confirmity of the afore mentioned findings that a greater majority (90%) is from marginal farmers to small farmers groups.

Data for leased in crop orchard area indicated 99.63% of the farmers grew the passion fruit crop in their own land while a negligible percentage 0.37% established orchard in leased in area. This implies that establishment of orchard in the leased in area is not in the liking of farmers due to, perhaps, low remuneration.

A reverse query to the above mentioned question regarding leased in orchard indicated that negligible percentage (0.15%) for leased out could be computed. This corroborated that fruit growers, in general, opted for their own land to establish passion fruit orchard.
In conformity with the results aforementioned it is clear once again that 99.70% passion fruit growers have their own orchard established on their own land.

Data for year of orchard plantation indicated that 96.10% of the people responded that they planted their orchards in the year 2017 while 3.6% in the year 2016 and 0.30% in the year 2015. The data showed a steep rise in the number of orchard plantation which is a good sign in the production for having a big leap in the current year and years to come.

A substantial percentage, 48.5%, of the 1334 fruit growers indicated that they invested Rs. 1,000 to Rs. 20,000 each to plant their orchards and 32% invested Rs. 20,000 to 50,000. This data implies that 80% of the fruit growers fell into the marginal to small farmers group. Facilities under SFAC operational guidelines are strongly recommended.
Current value estimates of orchards indicated that moderate to small level orchards were in greater frequency i.e. about 76% for estimated current value ranging from Rs. 50,000 to 5,00,000. Rest about 24% orchards fell in the category of marginal level farmers’ orchards. By and large all the orchards are required to be upgraded through area expansion and intensifying facilities therein like introduction of drip irrigation system and modern cultural implements.

**Trees and Production**

![Diagram showing distribution of surveyed trees planted](image)

Data for variety of fruit crops in an orchard indicated that 15 i.e. 1% of the orchards owned by the growers were found to have banana + passion fruit mixed fruit cropping and 99% farmers established their sole passion fruit orchard. This also insights that, in general, passion fruit alone cultivation could be a priority liking of the fruit growers.

Results for number of passion fruit trees in an orchard indicated that 56% of the growers were having their orchard with trees number ranging from 50 to 500 only and 41% for number of trees 500 to 1500 and 3% only were found having their orchards with number of trees ranging from 1500 to 5000 and above. These observations further validate aforementioned findings that fruit growers, in general, belong to marginal to small fruit growers categories.
Data for passion fruit production in the last season indicated that fruit growers producing passion fruit from 0.1 quintal to 6 quintals were in greater frequency followed by 10 q. to 30 q. 28% and 6 q. to 10 q. 25% only. The observations implied that productivity needs an increase substantially mitigating production constraints of the growers.

Estimates of production in the current season indicated that 45% of the growers hoped production from 0.1 to 5 q, 26% estimated 5 to 10 q, 22% estimated 10-20 q and above 20 q. could be estimated by 7% of the passion fruit growers.

**Orchard Maintenance**

Observations for protection of passion fruit crop indicated that only 62 growers (5% only) of the entire growers fenced their crop. This is, therefore, is a sound reason to provide a Governmental support on fencing. Fencing is an important component in viny crops, especially, wherein damage occurred is difficult to recover. For fencing length indicated that 25 farmers did wall fencing 128 M. each, 35 growers did 192 M. and only 2 growers did wall fencing to an extent of 198 M. Observation indicated that a majority of passion fruit growers who fenced their crop invested in a range of Rs. 10,000 to 14,400. It revealed that they were interested in fencing their orchard. Financial constraints may be a reason which could restrict the passion fruit growers to fence their crop. Govt. may like to look into it under SFAC operational guidelines.

Data for site preparation for orchard maintenance indicated that 55% fruit growers did site preparation while 45% did not. Awareness regarding advantages of site preparation may be done among the passion fruit growers.
Extent of site preparation indicated that 51% of the passion fruit growers prepared site area ranging from 2.5 to 5 acres while 49% prepared 6 to 7 acres. A 61% of the total growers who invested on site preparation spent in a range of Rs. 3,000 to 7,000 while 39% only spent Rs. 500 to 2,500. Again the interpretations of these observations are similar to those as aforementioned in the text.

Information on manual ploughing indicated that 77% of the growers opted for manual ploughing and 23% did not use manual ploughing. Data for no. of manual ploughing indicated that 59% of the growers ploughed their site 4 to 5 times and 41% only ploughed 6 to 9 times. It appeared that the frequency of ploughing could have been need based and as per texture of the soil.

This is evident with the above observations that 67% of the farmers invested in a range of Rs. 2,500 to 10,000 and 33% invested in a range of Rs. 200 to 2,500 on manual ploughing. It implies that the growers intended to invest on site preparation but financial constraints, probably, disallow them. Financial support from the Govt. side is required to be rendered.

Adoption of tractor as a means of ploughing indicated that only 8% of the farmers surveyed used tractor in ploughing. Reason could be an unaffordable cost of tractor to purchase and / or higher cost of tractor to be hired for field operations.

Observations for saplings plantation in their orchard indicated 61% of the farmers used 200-1000 saplings, 37% used saplings from 1000 to 2000 and 2% only more than 2000.
These results are the indicators that the passion fruit growers are at large in the category of marginal to small farmers groups.

Results for cost of saplings indicated that 53% passion fruit growers invested in a range of Rs. 3,500 to 10,000 on sapling while Rs. 10,000 to 20,000 invested by 40% of the growers and a meagre number i.e. 7% invested Rs. 20,000 to 64,500. In order to boost production level of passion fruit it is imperative to upgrade the existing orchard by expansion of area and intensifying facilities concerned in the orchard.

![Figure 15: Different types of fertilizers and spray used by the farmers](image)

This is very important observation on the use of organic fertilization in the orchards of passion fruit. Results indicated that 84% of the growers used organic manures / vermicompost. This is also evident that in proportion use of organic manure had been more as compared to vermicompost. 16% of the growers used other organic manures. Use of organic source of nutrient supply to the fruit orchard is good sign towards an easy adoption of INM and IPM packages. Referring to the quantity of organic manures indicated that a low quantity of manure users had been in greater frequency, probably, it depended on size of the orchard and financial status of the growers. This also needs a financial support from the Govt.

Data on cost incurred on organic manures indicated that 62% of the growers invested Rs. 100 to 1,000, 17% Rs. 1,000 – 10,000 and 21% Rs. 10,000 to 50,000. The variation in the investment on organic manure may be attributed to variable orchard dimensions.
and financial status of the growers. In any case financial support from the Govt. is envisaged.

Observations for chemical pesticide / fertilizers spray indicated 72% of the passion fruit growers opted for this. This has to be noted that these growers may be persuaded to use chemical sprays judiciously under the INM/IPM packages.

Observations on quantity of chemical used indicated no pattern and the inferences may hardly be drawn from the data. However, it may be understood that the growers used chemicals in accordance to the financial resources they have instead of scientific recommendations.

As regards cost investment on chemical pesticides / fertilizers 86% of the growers invested Rs. 150 to 5,000. 6% invested from Rs. 5,000 to 8,000 and rest above to this. Low cost investors were shown to be in higher frequency.

**Irrigation Methods Adopted by Farmers**

![Irrigation Methods Diagram](image)

Results for irrigation sources indicated that about half of the fruit growers did not irrigate their passion fruit orchard and depended mainly on rain water, about 40% used ground water applying some means of lifting the water and about 8% used electric tube wells. There required an improvement in the irrigation pattern and judicious use of drip irrigation may also be initiated. Govt. support in this context is required.
Labour is an important input entering the production process. Agriculture also provides a lot of employment to labour in our country. But extensive use of labour in production process also increases the time and cost of production. Machineries such as tractor can reduce the time and cost of the production and thus improve profit margins for the farmers.

Data for type of labour indicated that 62% of passion fruit growers used casual labours 35% used their own family members as the labours in their own orchard. Only 3% fruit growers used permanent labours. It appeared that the passion fruit cultivation depended on the own family members and casual labours. This is a country wrote practice commonly adopted throughout.

About 50% of the fruit growers used casual labours ranging from 5 to 10 and rest 50% used about 10-20. Practically, there appeared a little requirement of employing a casual labour.

Regarding cost incurred on casual labours indicated that 54% growers invested Rs. 5,000 to 20,000, 42% invested Rs. 1,000 to 5,000 and 4% only could spent Rs. 100 to 1,000.
The results for production from an orchard indicated that 0.1 to 6 q. producers of passion fruit, at large, were found to be in a greater proportion i.e. 47% followed by the producers of 10 to 20 q. This is may also be explained as 47% of growers may be categorized as marginal passion fruit growers and 53% as small fruit grower.

Observations for sale of passion fruit indicated that 54% of the producers sold passion fruit ranging from 0.1 to 5 q., 31% sold ranging from 5.5 to 10 q. and 10 to 20 q. sold by 15% growers. Data implied lack of a certain pattern in the sale.
In India, there are mainly 4 categories of buyers who purchase crops from the farmers namely Processors, Middle-man, Small traders and consumers. Data for type of buyers indicated that 50.22% growers replied that the buyers were consumers. 43.18% responded small village traders were the buyers and 5.92% told that middle men were buyers of their produce. The processors, however, could be observed to be 0.67%. This implies that there is a great need for setting up processing units so that produce of the farmers may be sold at a reasonable cost.

Information for fruit crop mixture indicated that 99% of the orchards were having sole passion fruit orchard and 1% passion fruit + banana. Such an information has already been discussed earlier.

The data on the produce sold in the market indicated that 54% of the farmers sold their produce ranging from 0.1 to 5 q., 31% sold from 5 to 10 q. and 15% sold 10 to 30 q. each. This indicated a gradual decrease in the farmers as the capacity of production of passion fruit increases. It means there are ample no. of marginal to small passion fruit producers.

Results for value of produce sale indicated that there had been 32% of the passion fruit producers who sold their produce from Rs. 2,000 to 50,000, 29.79% sold from Rs. 50,000 to 1,00,000 and 38.13 % sold from Rs. 1,00,000 to 5,00,000. This again justified that the majority of farmers fell into the category of marginal to small farmers.

The data on the place of selling of the passion fruit crop produce revealed that 58% of the growers sold their produce most conveniently within the village and on farm. This is
important to note that only 2.47% of the growers only liked to sell their produce on farm. 21.59% sold their produce in the nearest mandi within the block. About 30% of the produce they could sell either on district level or within the state level. Reason could be perishable nature of fruit and inconvenient transportation.

Information on travel cost indicated that about 49% of the growers spent Rs. 200 to 900 and about 26% spent Rs. 3,000 to 4,000 on transport and about 24% spent Rs. 1100-2000 only. Although, this did not show a definite trend, however, as the distance of travel increased cost on transport also increased.

**Transportation**

As regards mode of transport it could be evident that private pick up vans/trucks were used in transport by 69.79% and public vehicles by 26.76%. This is to note that tractor was used in transport by 0.15% persons only. This implies that a subsidy in the purchase of tractors and pick up vans by the growers may be rendered by the Govt. to mitigate marketing constraints.

![Bar chart showing the percentage of farmers using different modes of transportation.](image1)

![Bar chart showing the distance traveled by farmers to selling points.](image2)

As regards distance of selling point 84.56% of the passion fruit growers sold their produce within 5 km and 9.22% within 10 km. The reverse trend, as per increase in distance the decrease in quantum sale was observed. The reason could be a transportation constraint. This constraint may be addressed by providing transport vans on subsidized rate to growers as a quick remedy.
Packaging

Packaging is defined as a means or system by which a fresh produce travels between buyers in a safe and sound condition minimizing the wastage and damages and the quality of the products. Packaging of fresh fruits is one of the most important steps in the long and complicated journey from grower to consumer. Various bags, baskets and other packaging materials are used for handling, transporting and marketing fresh produce. The use of properly designed containers for transporting and marketing of vegetables can significantly reduce their losses and maintain their freshness succulence and quality for longer period. Packaging also provides protection from mechanical damage and undesirable physiological changes and pathological deterioration during storage, transportation and marketing.

Data for type of baskets used in packing indicated that plastic recycled baskets were used by 50% of the passion fruit growers, 24% bamboo baskets, 15.14% used jute bags and 9.97% used plastic (food grade) baskets. Promotion of bamboo baskets, jute bags and plastic (food grade) may be carried out by the Govt. awarding subsidy to the growers as norms laid out under SFAC.
How is the Price Fixed?

Figure 25: Who decides the price of the produce?

The prices of the farm produce are mostly fixed by middleman or traders who buy and sell the commodities in mandis. It is just like share market where the actual price of the commodity has no relation with the cost of production and their utility.

Government of India can play an important role of being a regulatory authority in these mandis so that the middle man are forced to buy produce from farmers at maximum selling price. The cost of production of farm produce is dependent on local factors and hence maximum selling price should be fixed locally at state level.

Observations on price fixation revealed 64% growers to have admitted that buyers decided the price of their passion fruit produce, 33% growers replied that they were the price fixers of their own produce. Only a very meager percentage, 3% only could get price as per mandi rates. This marketing problem regarding fixing of price of growers’ produce by others (buyers) may be taken care of by the Govt. through Farmer Producer Organizations (FPOs).
Farmers Difficulties in Selling Crop

Observation regarding selling difficulties in previous season revealed 41% of the growers to have experienced difficulties while 59% did not. Reason for difficulty in selling the passion fruit produce indicated that 47.99% of fruit growers have sensed that market was too far and about 49% opened that monopoly of the buyers was the major reason of difficulty in sale. Govt. may take care of this very efficiently forming FPOs as per operational guide lines of SFAC.

Observations recorded on searching of new buyers even after experiencing difficulties revealed that only 19% of the growers searched new buyers. Reasons could be again difficulties in searching also. Such things are required to be addressed by the Govt.

Reason for searching of new buyers are very much natural i.e. to get better price as admitted by 81.42% of the growers. Such queries do not do much good to growers, only the answer lies in the formation of FPOs.
Crop Production Expansion

Increase in Crop Production in Last 5 Years

Data on crop production whether it increased during last five years indicated that 73% farmers opined that there was no positive change in the production whereas 27% admitted that the crop production has increased during these days as compared to last 5 years. The reason for some improvement in yield could be attributed to one or the cumulative effect of more than one factors.
Observations for reasons of increase in production indicated that 51.12% of growers were of the opinion that application of better technical know-how had been the reason for increase in production. 37.64%, however, admitted better orchard maintenance the reason of increase in production. A small section, 11.24%, opined that developing new orchard could have been the reason for production increase. Infact, all these reasons cumulatively may have enhanced production.

Results of survey as to what were the motivation factors which caused thirst among the farmers to increase the production indicated that the better price could be the major one. As the total no. of growers responded to this were 356 only. Out of this number 71% replied in affirmative for having better price that led a motivation at large for greater production. This was followed by an assured market.

Observations for not increasing the production level indicated at first the lack of capital as responded by 46.73% of the growers out of 978 total responded. 31.49% however attributed to lower price of the crop. And 10% each of the growers assigned scarcity of labour and decreasing orchard land. Deficiency in capital issue already is being taken care of under SFAC operational guidelines and bank loans too are readily available. Among the remaining issues low price is suggested to be addressed through FPOs. Rest two issues are the local issues which may be tackled by growers themselves.

### Planning for expansion of Crop Production

![Planing For Crop Production Expansion](image)

**Figure 31: Number of farmers planning to expand their crop production**

Response to the question whether the growers plan to expand the passion fruit crop production level, 69% replied in negative and 31% admitted to plan an expansion in
production. The planning to increase production by only 31% growers speak itself that there are definitely production and marketing constraints which hinder the growers to step ahead for a higher production level. This is a serious issue and needs an efficient address by the Govt.

The means and ways of expansion of scale of production indicated that 38% of the total 407 growers who planned to expand the scale of production stated that by applying better technical know-how, 35% by doing better orchard maintenance and 27% by developing new orchard they would do the task they sought.

Regarding opinion of growers about current year’s production, 59% of the growers expected an increase in production while 41% did not hope for any positive change. Expectations for increase may have certain basis which may be explained here under.
OPINION OF FARMERS ON CURRENT YEAR PRICE & PRODUCTION
Opinion of Farmers

Change in Current Year Crop Production

Regarding opinion of growers about current year’s production, 10% of the growers expected an increase in production while 73% did not hope for any positive change. Expectations for increase may have certain basis which may be explained here under.

Potent reasons for expected increase in passion fruit production indicated that expected favorable weather may be a reason as hoped by 49.87% of the respondents. However, 20% of the growers assigned reasonable price to be a cause of motivation resulting in
higher production. Expansion in area may be another substantial reason for increase in production as expressed by 19% of the growers.

Reason for decrease in price appeared to be low price as one of the most important observation as 34.49% of the farmers admitted it. Price is an important motivational factor for the farmers, if prices are good, production may likely be increased failing which a decrease is likely to occur. This reason was followed by fund shortage as expressed by 22.86% of the farmers and 24.45% opined stable/decrease of area may cause decrease. Bad weather condition weather was also conceived by 9.12%.

**Change in Current Year Price**

Data for expected status of price in the current year indicated that there would be a decrease in price as expressed by about 86% of the growers. However, only 4% percent hoped a positive increase in price and 10% only, a very little proportion, sensed that there would hardly be a change in the price.
Reasons for expected increase in price of current year included inconvenient market, low demand, traders’ monopoly and bad weather conditions may be factors. Weightage of these factors respectively may be enumerated as 31.79%, 25%, 23.33% and 15% opinions of farmers.

Price Determining Factors
Results for basis for price determination on fruit quality indicated that thickness of fruit coat and ripeness are the two major basis followed by appearance, colour, size, pulp content and seedlessness. Colour, size and pulp content appeared to be equally important and have a reasonable edge over the variety of the passion fruit. These factors on cumulative basis appeared to have a deciding impact on price determination.

### Post Harvest Loss Factors

#### Post Harvest Losses

![Bar chart showing post harvest losses with percentages and values](image)

<table>
<thead>
<tr>
<th>Loss Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing loss</td>
<td>35.88%</td>
</tr>
<tr>
<td>Storage loss</td>
<td>23.41%</td>
</tr>
<tr>
<td>Transportation loss</td>
<td>15.61%</td>
</tr>
<tr>
<td>De-topping</td>
<td>10.99%</td>
</tr>
<tr>
<td>Drying</td>
<td>7.96%</td>
</tr>
<tr>
<td>Harvesting injury</td>
<td>6.15%</td>
</tr>
</tbody>
</table>

Figure 41: Factors responsible for post harvest losses

Results of estimated post harvest losses indicated that packing losses appeared to be 35.88 and losses in storage had been 23.41% followed by transportation, de-topping, drying and harvesting injury in chronological descending order. The post harvest losses may be taken care of by the Govt. extending facilities under SFAC operational guidelines, formation of FPOs and their successful working may solve many problems at a time in one stroke.
Improvement Measures for Quality & Safety of Crop

Response to information on buying inputs from a reliable source indicated that 54% already used to buy inputs from a reliable source and 46% did not consider it. This is, by and large, has to be mandatory for everyone that if an input material has to be purchased at all it should be purchased from a reliable source.

Information generated on the use of organic manure or biopesticides indicated that 51% of the passion fruit growers used organic source of fertilization / biopesticides while 49% could not. This is important to mention here that the education on the advantages of organic sources of nutrients and pesticides may be imparted to the growers by the Govt. machinery and a gap of adoption of INM and IPM recommendations may be filled up in turn.

Response to replacing chemical pesticides indicated 52% of the growers admitted to have replaced chemical pesticides by organic manures / biopesticides. This is an important issue that substantially higher proportion of growers could not adopt organic.
sources of inputs. This is, therefore, important to suggest a promotion of INM/IPM packages.

Observations for use of recommended ripening materials indicated that 66% used recommended ripening materials and rest 34% did not. In this connection education regarding recommended ripening materials may be imparted to them by the Govt/SAUs/ICAR research complex in order to adopt the safety measures in the interest of human health.

Response on maintaining hygene conditions of the workers indicated that 87% of the workers maintained hygenic condition and 13% could not. The percentage of this unawareness may be improved by educating them.

Observations for keeping produce away from infected materials indicated that 57% of the growers opted for this practice and they kept their produced material away from the infected one. This awareness needs to be proliferated among all the growers.

Response to staggered harvesting revealed that 69% of growers opted this practice in order to avoid harvesting of over ripened or under ripened. This staggered harvesting may be popularized by educating the growers.
PRODUCTION AND MARKETING CONSTRAINTS
Production & Marketing Constraints

Production Constraints

Results for enlisting of 5 major constraints by everyone out of 1334 passion fruit growers indicated that production constraints were prevailing which were faced by one or the other separately. Out of them high wages of casual labours were faced by 54.6% growers and bad weather by 50.7%. Storm was reported by 34.6%, lack of capital by 33.4%, lack of labour and monopoly of buyers each by 29% of the growers and was followed by insects and soil fertility by 25.3% and 24.1% respectively. Weather and storm incidences are the nature based and may hardly be controlled. All the remaining constraints may be well addressed by the Govt. through formation of FPOs under SFAC norms and by INM/IPM packages.

Marketing Constraints

Results indicated that by enlisting five major constraints by everyone a total of eight marketing constraints could be evident. Out of these constraint low price appeared a most glaring constraint followed by distance of market, marketing skill, transport problem and so on. Out of eight problems lack of labour is a local problem which has to be tackled by the orchard owners/fruit growers themselves. Bad weather and storms are natural calamity which are uncontrolled and human intervention is not possible.
Remaining constraints may be taken care of by the Govt. through rendering help under SFAC norms and formation of FPOs.

Figure 44: Major marketing constraints faced by the farmers

Income Profile of Farmers

Figure 45: Income profile of the farmers
Income profile of farmers of Nagaland revealed that all the farmers invariably were growing passion fruit and this is a major source of their income. 54% of the farmers also opted for husbandry and dairying also as a second source of income, 22% opted for an alternate small business in addition to passion fruit cultivation. A section of 20% of the farmers were found to be in regular jobs as side source of business besides cultivation of passion fruit as a main source of their income.
MAJOR FINDINGS OF SURVEY
Major Findings of the Survey

- A majority of passion fruit growers, 64%, are educated to a secondary to higher secondary level and, consequently, verbal communication may hardly be a problem.

- Results on area under cultivation of passion fruit crop indicated that 90% of the growers had orchards of size from 0.2 to 5.2 acres. Categorically, they may be grouped into marginal to small growers.

- Majority of the growers liked to raise a sole orchard of passion fruit in their own land area.

- There appeared a steep rise in the year 2016-17 in raising new orchards as compared to previous year i.e. 2015-16.

- Farmers looked to be interested in investing on different production and quality parameters to get higher returns but the finances appeared to be constraint with them.

- Adoption of traditional manual ploughing still prevails with the majority of growers instead of mechanization using tractor as the higher investment and maintenance cost appeared a hinderance.

- Organic manures/vermicompost and biopesticides more or less have been used by majority of growers. This is a good sign for an easy adoption of INM and IPM packages.

- Results for irrigation resources indicated that about half of the growers could have been dependant on rain water and about 40% used ground water lifting by one or the other means. Electric tube wells were used scanty. Scope to initiate drip irrigation is noticed at large.

- Apart from biopesticides chemical pesticides / fertilizers were also used by 72% of the growers. A need of an effective persuasion to adopt INM/IPM packages appeared necessary.
• As for use of manpowers it could be evident that passion fruit cultivation in Nagaland is based on self family members used as labours and hired casual labours.

• Growers producing 0.1 to 6 q. passion fruit were found in greater frequency. It meant that marginal level of growers cumulatively contributes significantly in total production of passion fruit in Nagaland.

• Most of the growers sell their produce on farm and within the village in routine and avoid to travel beyond 5 km. inconvenient and unaffordable transport appeared a bottleneck compelling them to dispose of their produce within village or mandi situated at a short radius.

• Recycled plastic baskets had been used in packing by about 50% growers. There is a need to educate them to intensify use of bamboo, jute bags and plastic food grade baskets in order to maintain safety for human consumption.

• Buyers, by and large, as a routine had been price fixers of their produce as reported by 64% of the growers. Govt. support for formation of functional FPOs. is required under SFAC guidelines. FPOs may be proved on answer to many of the marketing constraints at a time in a single stroke.

• Better technical know-how, improved orchard maintenance and developing new orchards could have been the major aspects to increase production level of passion fruit.

• Major production constraints as evident by the survey were high labour wages, undesirable weather, natural calamities including storms/hailstorms, lack of capital, lack of labour, monopoly of buyers, pests and exhausting soil fertility.

• Major marketing constraints based on survey were noticed low prices, distant markets, lack of marketing skill, problematic transport, monopoly of buyers and lack of labour.

• The productivity in passion fruit is much lower in India i.e. Nagaland because of frequent unfavourable weather and natural calamities which may hardly be human controlled. This is not only our problem but a world wide problem that is why production of passion fruit experiences “boom & boost” consequences. This is, however, worth to mention
that inspite of above common factors influencing productivity worldwide we are lagging much behind to Brazil, Australia and Columbia as global information speak like this. We may improve the productivity by mitigating human controlled production constraints streamlining the marketing system ending an assured disposal of the crop produce at a reasonable price and selling up processing units in public sector. This is worthless to pipe a huge money to the state instead concentrated efforts are required to motivate the producers by setting up FPOs in the state. Example of successful society FPOs of the countries like “MAHA BANANA” and “AMUL” may be taken as the ideal guide. Recommendations and operational guidelines of SFAC may be followed for assistance and Government intervention is necessary in this for success.

- The production of Passion Fruit in Nagaland appeared a decreasing trend. The major reason is lack of motivational factors. One of the greatest motivational factor is the disposal of their produce at a reasonable price. Again, not have to emphasize above mentioned aspects which may positively reverse the trend of production in the state.

- Income profile of the farmers / fruit growers indicated the passion fruit cultivation is a main source of their income followed by animal husbandry and dairying.

- In order to mitigate production and marketing constraints and in turn, eventually, to raise the income of farmers through passion fruit cultivation this is suggested that the financial assistance from the Govt. right from plantation of orchard to the final disposal of the produce may be rendered as per operational guideline laid down under MIDH. Formation, establishment and an efficient functioning of FPOs may be promoted under SFAC guidelines by the Govt. through MIDH with the help of SAUs/ICAR Research Complex/State Horticulture Deptt.
### Projected Support - Recommendations

A substantial support is required from Mission for Integrated Development of Horticulture to passion fruit growers of Nagaland so as to increase the quantity and quality production of passion fruit and streamline the marketing chain in order to enhance the income of growers. The support category is detailed hereunder.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Pattern of Support/Assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>PLANTATION INFRASTRUCTURE DEVELOPMENT</strong></td>
<td></td>
</tr>
<tr>
<td>1(a).</td>
<td>Production of Planting Materials</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>Hi Tech Nursery</td>
<td>Public sector owned Hi-Tech Nursery is required to be established.</td>
</tr>
<tr>
<td>(ii)</td>
<td>Small Nursery</td>
<td>Small nurseries in the private sector have to be established. Financial support in terms of credit linked back ended subsidy of cost may be awarded.</td>
</tr>
<tr>
<td>(iii)</td>
<td>Setting up New Tissue Culture (TC) units</td>
<td>New Public sector owned Tissue Culture units are required to be established especially to multiply as such a hybrid named, ‘Kaveri’, a cross of purple x yellow passion fruit.</td>
</tr>
<tr>
<td>(iv)</td>
<td>Strengthening of existing Tissue Culture (TC) units</td>
<td>Already existing Public sector owned TC units if any may be strengthened. In case of private sector owned existing TC units 50% subsidy credit linked back ended to the cost of strengthening may be awarded.</td>
</tr>
<tr>
<td>(v)</td>
<td>Hybrid</td>
<td>Promotion/popularization of ‘Kaveri’, a hybrid of a cross purple x yellow passion fruit, developed in Karnataka may be done as per MIDH operational guidelines.</td>
</tr>
<tr>
<td>1(b)</td>
<td>Establishment of New Orchard (Area expansion – for a maximum area of 4 ha. per beneficiary)</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>Integrated package with drip irrigation and trellis</td>
<td>Fruit growers may be awarded financial support for meeting expenditure on planting material, drip irrigation and trellis and cost of material for INM / IPM as per Govt. norms.</td>
</tr>
<tr>
<td>(ii)</td>
<td>Without integration</td>
<td>Fruit growers unable to afford drip</td>
</tr>
</tbody>
</table>
irrigation may be provided finances for meeting expenditure on planting materials and cost incurred for INM / IPM.

<table>
<thead>
<tr>
<th><strong>1(c) Creation of Water Resources</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(i)</strong> Community tanks/on farm ponds / on farm water reservoirs with use of plastic / RCC lining</td>
</tr>
<tr>
<td>Financial aids may be awarded to passion fruit growers for creating such water resources with plastic / RCC lining or without plastic / RCC linings as the case may be in accordance to the Govt. norms.</td>
</tr>
<tr>
<td><strong>(ii)</strong> Water harvesting system for individuals – for storage of water in (20m x 20m x 3m) ponds/tube well/dug wells</td>
</tr>
<tr>
<td>Financial assistance is required to be awarded to passion fruit growers by the Govt. for creating defined water harvesting system as per Govt. norms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1(d) Precision Farming Development</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(i)</strong> Promotion of Integrated Nutrient Management (INM) and Integrated Pest Management (IPM)</td>
</tr>
<tr>
<td>Financial assistance to passion fruit growers as per area coverage according to Govt. norms may be awarded.</td>
</tr>
<tr>
<td><strong>(ii)</strong> Plant Health Clinic</td>
</tr>
<tr>
<td>Public sector controlled / or Public private partnership owned clinics may be awarded to Nagaland.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1(e) Organic farming</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(i)</strong> Adoption of organic farming</td>
</tr>
<tr>
<td>Financial assistance to passion fruit growers as per Govt. norms may be awarded.</td>
</tr>
<tr>
<td><strong>(ii)</strong> Organic Certification</td>
</tr>
<tr>
<td>Project based and area based assistance to banana growers is required as per Govt. norms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1(f) Horticulture Mechanization</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(i)</strong> Tractor</td>
</tr>
<tr>
<td>Passion fruit growers are required to award financial support in terms of subsidy to purchase a tractor.</td>
</tr>
<tr>
<td><strong>(ii)</strong> Land Development tillage and seed bed preparation equipments</td>
</tr>
<tr>
<td>Passion fruit growers may be awarded financial assistance as per Govt. norms.</td>
</tr>
<tr>
<td><strong>(iii)</strong> Plastic mulch laying machine</td>
</tr>
<tr>
<td>Passion fruit growers may be awarded financial assistance to purchase the machine.</td>
</tr>
<tr>
<td><strong>(iv)</strong> Power Tiller (below 8 BHP)</td>
</tr>
<tr>
<td>Financial assistance as per MIDH operational guidelines may be considered.</td>
</tr>
</tbody>
</table>
(v) Plant protection equipments
- Manual Sprayer
- Knapsack/Foot operated sprayer

Since large no. of passion fruit growers are small to marginal farmers, therefore, these two types of sprayer would suffice the need for which financial assistance may be awarded as per Govt. norms.

2. INTEGRATED POST HARVEST MANAGEMENT

<table>
<thead>
<tr>
<th>(a) Pack Houses</th>
<th>Financial assistance as per MIDH guidelines may be remitted.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Precooling unit</td>
<td>Credit linked back ended subsidy as per MIDH norms may be considered.</td>
</tr>
<tr>
<td>(c) Cold room (staging)</td>
<td>Credit linked back ended subsidy as per MIDH guidelines may be remitted to the beneficiaries.</td>
</tr>
<tr>
<td>(d) Ripening Chamber</td>
<td>Credit linked back ended subsidy in the capital cost of project as per norms of the Govt. may be awarded to the growers.</td>
</tr>
<tr>
<td>(e) Technology induction and Modernization</td>
<td>Credit linked back ended subsidy as per MIDH norms may be remitted.</td>
</tr>
</tbody>
</table>

3. ESTABLISHMENT OF MARKETING INFRASTRUCTURE FOR HORTICULTURE PRODUCE

<table>
<thead>
<tr>
<th>(a) Rural Marketing/Apni Mandies/Direct markets</th>
<th>Credit linked back ended subsidy in the capital cost of project is required to be awarded for passion fruit growers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Retail Markets/Outlets (environmentally controlled)</td>
<td>Credit linked back ended subsidy in the capital cost is required to be awarded to the passion fruit growers.</td>
</tr>
</tbody>
</table>

4. MISSION MANAGEMENT

<table>
<thead>
<tr>
<th>(a) District level exhibition and Kisan Mela</th>
<th>These are required to be organised by the Govt. / SAU sponsored by MIDH collectively both the events in one stroke two times in a year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Information dissemination through publicity, printed literature etc and local adventures</td>
<td>This information dissemination part may be clubbed with the above 4(a).</td>
</tr>
<tr>
<td>(c) Promotion of Farmer Producers Organisation (FPO) / Farmer Interest Groups (FIG) of 15-20 farmers / 20 ha. Growers Association and tie up with financial Institution and Aggregators</td>
<td>As per norms issued by SFAC finances are required to be provided.</td>
</tr>
</tbody>
</table>
Annexure 1: Survey Questionnaire

HINDUSTAN INSECTICIDES LTD
New Delhi-110003

(Farmer Survey Questionnaire)

1. Farmer's Details:
   - District: ___________________________  Block: ___________________________
   - Village: ___________________________  State: ___________________________
   - Name of Farmer: ___________________  Age: ___________________________
   - Education: _________________________  Contact Number: _______________________
   - Category: GENERAL [ ]  OBC [ ]  SC [ ]  ST [ ]  ID Card Type: _______________________
   - Years of experience in growing crop: ___________________________
   - Signed any contract with processors/traders: YES [ ]  NO [ ]
   - If yes, Name of the processor/trader: ___________________________

2. Assets Profile:
   - Area under cultivation
   - Own crop orchard area
   - Leased-in crop orchard area
   - Leased-out crop orchard area
   - Tractor
   - Pick-up van/truck
   - Others

3. Trees and Production under orchard area:
   - Type of orchard
   - When was orchard planted?
   - Total planting cost
   - Current Value of orchard
   - Variety of crop in orchard
   - No. of trees of surveyed crop
   - Production in last season (in quintal)
   - Production estimate of current season (in quintal)

4. Orchard Maintenance:
   - Fencing: Yes [ ]  No [ ]  Specify: ___________________________
   - Site preparation: Yes [ ]  No [ ]
   - Ploughing: Manual [ ]  Tractor [ ]
   - No. of sapling
   - Type of Fertilizer
   - Irrigation
   - Spraying: Chemical [ ]  Non-Chemical [ ]
   - Hormone: Yes [ ]  No [ ]  Specify: ___________________________
   - Labour

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5. Production and Consumption

<table>
<thead>
<tr>
<th>Variety</th>
<th>Total Production (in Qtl)</th>
<th>Total Sale (in Qtl)</th>
<th>Self Consumption (in Qtl)</th>
<th>Wastage (in Qtl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. (i) Crop Marketing

a) Buyer Type: Consumers □ □ Small village traders □ □ Middle man Processor □ □ Others, specify ____________

b) Crop Variety

c) Total quantity sold (in quintal)

d) Total value of sale (in rupees)

e) Where sold
     On farm □ □ Within the village □ □ Within the block □ □ Within the district □ □ Within state □ □ Outside state □ □

f) Distance to selling point (in Km)
     Less than 5 kms □ □ More than 10 kms □ □ More than 50 kms □ □ More than 100 kms □ □

g) Travel time per visit (in minutes)

h) Cost of travel (in rupees)

i) Transport mode
     On-foot □ □ Bullock-cart □ □ Rickshaw/thela □ □ Tractor □ □ Public vehicle/bus □ □ Private pickup van/Truck □ □ Others, specify ____________

j) Cost of transport (in rupees)

k) Terms of payment
     Cash □ □ Credit □ □ Full advance □ □ Partial advance □ □ Others, specify ____________

l) Types of baskets
     Bamboo □ □ Plastic (recycled) □ □ Plastic (foodgrade) □ □ Jute bag □ □ Metal □ □ Open bundle □ □ Others, specify ____________

m) Other facilities by the buyer
     Orchard maintenance □ □ Loans □ □ Any subsidy □ □ Other facility □ □ Others, specify ____________

n) How is price fixed?
     As per mandi price □ □ Seller decides □ □ Buyer decides □ □ Others, specify ____________

o) Is there written contract
     Yes □ □ No □ □

p) Penalty for violation of contract
     Rejection of supply □ □ Price reduction by x% □ □ Termination □ □ Suspension for x period of time □ □ None □ □

(ii) Did you have difficulties selling your Crop name during last Season? Yes □ □ No □ □

   If yes, reasons for difficulty
      Market is too far □ □ Monopoly of buyer □ □ Buyer stopped buying □ □ Price is too low □ □ Loss of Production □ □
      Bad Quality of production □ □ Other □ □

(iii) In the Season, have you searched for new crop buyers? Yes □ □ No □ □

   If yes, why?
      For better price □ □ Want a single buyer of larger quantity □ □ Want more no. of buyers □ □ Want a more reliable buyer □ □
      Buyers stopped buying □ □ Difficulty in getting payment □ □ Other □ □

(iv) Do you ever experience delays in getting paid for crop sold (on agreed term)? Yes □ □ No □ □

   If yes, on average, how many days it takes to get paid after the committed time? ____________

(v) How many times in the last season have crop buyers not paid at all? (no. of times) ____________

   If paid, what action taken against him
      None □ □ Stop giving crop □ □ Legal action □ □ Attachment of buyer's property □ □ Community action □ □
      Other (specify) ____________
7. MEASURES FOR IMPROVING COMPETITIVENESS MARKETS

(i) Whether crop production increased in the last 5 year? Yes ☐ No ☐

If yes, how?
- New orchard ☐ Better Orchard maintenance ☐ Integration with trader (exporter) ☐ Application of better technical know-how ☐
- Don’t know ☐ Others, specify ________

If yes, why?
- Assured market ☐ Better price ☐ Provisions of better inputs & services ☐ Don’t know ☐
- Others, specify ________

If no, why?
- Lack of capital ☐ Scarcity of labour ☐ Lower prices of litchi ☐ Lack of assured market ☐ Higher price of input ☐
- Decreasing Orchard land ☐ Others, specify ________

(ii) Do you plan to expand scale of crop production? Yes ☐ No ☐

If yes, how do you plan to do it?
- Develop New orchard ☐ Better Orchard maintenance ☐ Integration with trader (exporter) ☐
- Application of better technical know-how ☐ Don’t know ☐ Others, specify ________

If no, why?
- Lack of capital ☐ Scarcity of labour ☐ Lower prices of crop ☐ Lack of assured market ☐ Higher price of input ☐
- Decreasing Orchard land ☐ Others, specify ________

8. OPINION OF FARMERS

(i) What is your opinion about current year production?

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Area</th>
<th>Technology change</th>
<th>Weather condition</th>
<th>Fund availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Increase</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b) Decrease</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c) Remain unchanged</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

(ii) What is your opinion about current year price?

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Demand</th>
<th>Market</th>
<th>Production</th>
<th>Weather condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Increase</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b) Decrease</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c) Remain unchanged</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

(iii) Basis for price determination (Please rank)

<table>
<thead>
<tr>
<th>Variety (Seed/Seedless)</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Size</td>
</tr>
<tr>
<td>Pulp content</td>
<td>Thickness of outer coat/skin</td>
</tr>
<tr>
<td>Ripeness</td>
<td>Any other, specify</td>
</tr>
</tbody>
</table>

**1-10 (Points to be given)**

(iv) Post harvest losses

<table>
<thead>
<tr>
<th>Reasons for losses</th>
<th>Loss in percentage (Mention only if loss is more than 3%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting injury</td>
<td></td>
</tr>
<tr>
<td>De-topping</td>
<td></td>
</tr>
<tr>
<td>Packing loss</td>
<td></td>
</tr>
<tr>
<td>Storage loss</td>
<td></td>
</tr>
<tr>
<td>Transportation loss</td>
<td></td>
</tr>
<tr>
<td>Drying</td>
<td></td>
</tr>
<tr>
<td>Handling loss</td>
<td></td>
</tr>
</tbody>
</table>
(v) Are you aware of World Trading Organization? Yes □ No □
   a. If yes, How it is effecting your farm practices

(vi) Are you aware about food safety measurement? Yes □ No □
   a. If yes, what measure are being taken by you to improve the quality

9. MEASURE TO IMPROVE QUALITY AND SAFETY OF CROP
   a) Buying input from a reliable source  Yes □ No □
   b) Using more organic manure or bio-pesticides  Yes □ No □
   c) Replacing chemical pesticides  Yes □ No □
   d) Use of recommended ripening material  Yes □ No □
   e) Maintaining hygiene conditions of the worker  Yes □ No □
   f) Using good packing material  Yes □ No □
   g) Keep produce away from infected material  Yes □ No □
   h) Sorting produce frequently  Yes □ No □
   i) Staggered harvesting  Yes □ No □
   j) Others, specify ____________________________

10 (i) INDICATE FIVE MAJOR PRODUCTION CONSTRAINTS.
   1. [ ]
   2. [ ]
   3. [ ]
   4. [ ]
   5. [ ]

10 (ii) INDICATE FIVE MAJOR MARKETING CONSTRAINTS.
   1. [ ]
   2. [ ]
   3. [ ]
   4. [ ]
   5. [ ]

11. INCOME PROFILE

<table>
<thead>
<tr>
<th>Activities</th>
<th>For how long (years)</th>
<th>Annual household income in 2015-16 (Rs.)</th>
<th>Annual household income in 2016-17 (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Production of surveyed crop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Dairying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Cultivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Casual Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Regular Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) Business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g) Others</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I hereby declare that the above information is provided by me as best of my knowledge.

Signature: ____________________________
(Thumb Impression)
## Annexure 2: List of Figures and Tables

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<th>Description</th>
</tr>
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<td>Average production of farmers in current season</td>
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| Table 4  | Age group – Education profile of the farmers |