

**Improved livelihoods through the development of small-scale
fruit processing enterprises in Asia**

DFID Forestry Research Programme

Project number: R7187B

Training workshop in India, August 2004

Visit Report

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SUMMARY

The training course on post harvest handling, processing and marketing of under-utilised fruit species was held in India from the 3rd to the 6th August 2004. The workshop was hosted by the Indian Institute of Horticultural Research (IIHR) in Bangalore.

The training sessions were delivered by Elke Peiler (ICUC) and Susan Azam-Ali (Independent consultant). Staff from the Indian Institute of Horticultural Research (IIHR) led the practical demonstrations and presented two of the theoretical sessions (post harvest handling and storage, food safety and legal aspects).

Sixteen participants (11 male and 5 female) from the partner organisation (Bharatiya Agro-industrial Foundation - BAIF) and from IIHR took part in the training. The BAIF trainees represented four Indian states – Gujarat, Karnataka, Maharashtra and Madhya Pradesh – where BAIF has project centres. The project resource centres will be located at the BAIF centres in Maharashtra, Karnataka and Gujarat where these trainees will be the master trainers.

The course concentrated on five under-utilised fruit species:

- Jack fruit (*Artocarpus heterophyllus*)
- Amla (*Emblica officinalis*)
- Tamarind (*Tamarindus indica*)
- Bael (*Aegle marmelos*)
- Custard apple (*Annona reticulata*)

The training course was a mixture of practical and theoretical sessions on post-harvest handling, processing and marketing. Many of the sessions were interactive. Topics covered included quality assurance issues, hygiene and sanitation, principles of processing, packaging and labelling, feasibility studies (market, technical and financial), market and consumer surveys, business planning, design of processing facilities.

Three practical processing sessions were held. The products made during these sessions were:

Tamarind concentrate, tamarind chutney, mixed fruit jam (jackfruit and custard apple), preserved jackfruit in syrup, amla candy/preserve and amla chutney.

There were three practical marketing exercises:

Design of a label
Preparation and presentation of a business plan
Preparation and carrying out of a market/consumer survey.

Trainees evaluated the course on a daily basis and also provided an overall evaluation at the end of the course. They gave a daily feedback on the key learning points of the previous day.

1. INTRODUCTION

A training course on post harvest handling, processing and marketing of under-utilised fruit species is one of the activities of the DFID-funded research programme (R7187) that is managed and coordinated by ICUC. Five countries are involved in the project – Bangladesh, India, Nepal, Sri Lanka and Vietnam. The third training course was held in India from the 3rd to 6th August 2004. The course was held at the Indian Institute of Horticultural Research (IIHR) in Bangalore.

Resource persons

The following personnel were involved in delivering the training and demonstrating the preparation of fruit products.

Ms Elke Peiler (ICUC).	Marketing and business planning
Dr Susan Azam-Ali	Post harvest handling and processing
IIHR staff:	
Dr I N Doreyappa Gowda	Preparation of fruit products
Ms Sarajini Jalali	Assistance with preparation of fruit products
Mr Redappa	Assistance with preparation of fruit products
Dr Gajanana	Food safety and legal aspects of processing
Dr D V Sudhakar Rao	Post harvest handling and storage

Course participants

Sixteen participants (5 women and 11 men) from BAIF (Bharatiya Agro Industries Foundation) and IIHR took part in the training programme (see Appendix 1 for a list of participants). The BAIF participants came from four States – Gujarat, Karnataka, Maharashtra and Madhya Pradesh. BAIF will establish resource centres in three of the States (Gujarat, Karnataka and Maharashtra) where the trainees will become master trainers, responsible for passing on the training to at least 25 beneficiaries per person to fulfil the requirements of the project.

The majority of the participants are involved in fruit processing activities with BAIF. All participants had a good command of English, therefore it was not necessary to translate the workshop sessions or the manual for the training.

Course outline

The material covered in the training course was based on the information contained within the training manuals that were prepared by ICUC. All participants received a photocopied version of the manual. The process flow sheets had been translated into Kannda and Marati. They will subsequently be translated in to Gujarati as well for the trainers to use in the field.

A detailed copy of the training programme is included in Appendix 2.

Fruits selected for inclusion in the course

Partner organisations selected three or four fruits that are of importance in their country. The fruits selected in India are:

- Jack fruit (*Artocarpus heterophyllus*)
- Bael fruit (*Aegle marmelos*)
- Tamarind (*Tamarindus indica*)
- Amla (*Emblica officinalis*)

At the time of training, the only fresh fruits available were jackfruit and amla. The jackfruit season was nearing the end. Tamarind pods had been purchased earlier and dried at the Institute. Fresh (or dried) bael fruits were not available, therefore we were unable to make bael products. Participants brought custard apple (*Annona reticulata*) to the course and this fruit was also included in the sessions.

2. REPORT ON TRAINING SESSIONS

This section gives an overview of the topics and material covered in each training session.

DAY 1

Session 1. Welcome address and finding out about each other

A formal welcome address was organised by IIHR;

Welcome Address	Dr Reddy, Project Coordinator on Tropical fruits
Introduction of participants	
Aims of the Course	Susan Azam-Ali
Presidential Address	Dr S D Shikhamany, Director IIHR
Vote of thanks	Dr Gajanana, Senior Scientist, IIHR

After the formal welcome, there was a short session to find out more about the participants' backgrounds, their involvement with fruit processing, specific problems related to processing and marketing and their expectations of the course.

Problems experienced by participants

Participants were asked to write down a maximum of three problems he/she is facing when processing fruits.

Problem
Proper storage of fruits and of products
Short shelf-life of products
Marketing of products
Advertising products
Mould growth in products
Competition from other products

Products being made or available in India

Fruit	Products
Jackfruit	Juice, pickle, jam, blended products, fruit leather, chips, papads, halva
Amla	Candy, syrup, dehydrated pieces and powder, pickles, choora
Custard apple	Arka sapona (blended beverage – sometimes with passion fruit)
Tamarind	Candy, pickles, juice concentrate, sauce, powder, jam
Bael	Candy, squash, ready to serve beverage, jam
Ber	Candy, dehydrated fruits, powder, squash, pickle

Processing experience of the participants

Pickles – lemon, mango
Sauces
Ayurvedic products – hair oil, face and body packs, lip cream
Amla supari, Amla candy, amla powder, amla jam
Mango pickle, pulp, chutney, jam, osmotically dried mango
Cashew nuts
Mushrooms
Papads – from pulses and from rice and pulses
Ragi malt
Potato chips, jackfruit chips, banana chips

Expectations from the course

Participants were asked to write down a maximum of three subjects he/she would like to cover during the training workshop.

Summary of results:

Subjects participants would like to learn during training course	No. of participants
Maintenance of hygienic processing conditions during processing	3
Information about marketing including how to orient products for the market, market outlets for processed fruits and market linkages	12
How to do a market survey for fruits	1
Post harvest handling and storage of fruits	4
Storage of products	1
Mango processing	1
Tamarind processing	2
Standardisation of products as per the FPO norms	6
Popularisation of products	1
Production of sweets	1
Production of pickles	1
Production of leathers	1
How to use natural preservatives	1
Utilisation of local fruits for processing	3
To achieve a good rate for the processing technique	1
The use of flavours in processing	1
Preservation	1
Quality assurance and quality control of products	6
Processing of ber, cashew apple and karonda	1
Packaging including low cost packaging	2
Brand development	1
Low cost production methods	1
Machinery and equipment for processing	3
Organic preservation	1

Total number participants present day 1: 16

The information presented during these sessions was used to amend the original training programme. The participants indicated that they wanted to make as many new products as possible.

Session 2. Overview of quality assurance and hygiene

A theoretical session on quality assurance and hygiene that covered the following topics:

- The importance of quality assurance throughout the processing food chain, from the selection of raw materials through to the packaging and storage of final products.
- The importance of good hygienic practice in the prevention of food poisoning and the production of high quality products.
- The use of clean, potable water for cleaning fruits and equipment and for use during processing. How to prepare chlorinated water for washing fruits using sodium hypochlorite and/or bleach. A practical session was planned for the preparation of chlorinated water. However, this was not carried out due to lack of demand.

Session 3. Principles of processing pickles, chutneys and sauces

The basic principles and outlines of processing these products was presented in a theoretical session.

Session 4. Preparation of tamarind chutney and tamarind concentrate

A practical session in which Dr Gowda demonstrated how to prepare tamarind chutney and tamarind concentrate. The group split into two, so that each group made one product. The practical session was preceded by a theoretical session on the principles of the processes and details of the recipes and methods used (see Appendix 3 for the recipes and process used).

Session 5. Day 1 evaluation and feedback

Participants were asked to complete an evaluation form at the end of each day. The scores are included in Appendix 4.

Trainers opinions

The processing facilities at IIHR include a dedicated processing room that is equipped with a range of food processing equipment – including double jacketed pans, pulpers, dryers, blenders, pasteurisers. Most of the equipment is not appropriate for the small-scale processor and therefore was not used during the training. The processing room was large enough to allow the trainees to split into two groups for the practical sessions. The two groups made two different products simultaneously which made good use of the time available. The main disadvantage of this approach is that not everybody was able to get hands-on experience of each product.

The first day seemed to get off to a slow start.

DAY 2

Session 1. Aims of the day

The aims and objectives of the day were presented to the participants for their approval.

Session 2. Post harvest handling and storage

Dr Sudhakar Rao presented a theoretical session that covered the basic points of post harvest handling and storage of the selected fruit species.

- Sorting and grading fruits – this exercise was not completed due to non-availability of suitable fresh fruits. The only fresh fruit available was jackfruit, which is too large for grading.

Session 3. Principles of jam making

A theoretical session that explained the basic principles of jam and jelly preparation.

The session included the following;

- Basic principles of jam making
- Quality assurance, including determination of end point, cleaning jars, filling
- Calculation of different formulae according to the fruit:sugar ratio
- Calculation of total yield

Session 4. Preparation of mixed fruit jam and preserved jackfruit bulbs in syrup

Jam was prepared from a mixture of jackfruit and custard apple.

Preserved jackfruits in a 70% sugar solution.

See Appendix 3 for the recipes and methods used.

Session 5. Why products fail

A theoretical session that looked at the various factors that play a role in the promotion and sale of a product and why this is sometimes unsuccessful. This included:

- Presentation of products
- Packaging
- Labelling.

This was an interactive session, with participants contributing their ideas about what is important in terms of presentation, packaging and labelling.

Session 6. Label design

Participants were shown examples of labels and asked to design a label for any of the products that had been made. They completed this exercise in the evening.

Session 7. Day 2 Evaluation and feedback

Participants worked in groups to discuss and present the key learning points of the day. At the beginning of the following days session, one member of each group gave the feedback of the key points to the whole group.

All participants filled out an evaluation form. The comments are included in Appendix 4.

Trainers opinions

Overall, the day seemed to flow more smoothly than the previous day. It was better to hold the practical sessions during the morning as more time was available (in the afternoons, we had to finish by 4.30pm as the Institute closes at this time).

DAY 3

Session 1. Group feedback and aims of the day

One member from each group gave a short presentation of the key points from the previous day. This was a useful exercise as it made the participants reflect on what had been presented and helped the trainers assess how well the information had been understood.

The aims of the day were presented to the participants for their approval.

Session 2. The importance of doing a feasibility study part I: Market feasibility

A theoretical session that discussed the importance and role of the feasibility study in the establishment of a new business. Trainees were taken through the various steps that must be covered when carrying out a feasibility study

Session 3. How to carry out a market survey

A theoretical session that discussed the basic principles of carrying out a market survey. After this, trainees split into groups and designed their own consumer survey, which they tested on another group.

Session 4. The importance of doing a feasibility study part II – Technical feasibility

A theoretical session that covered the factors that should be taken into consideration when determining whether a business idea is technically feasible.

Session 5. The importance of doing a feasibility study part III – Financial feasibility

A theoretical session that covered all aspects of finance and financial feasibility and details of how to prepare a business plan.

Session 6. Marketing issues

A theoretical session that covered issues that can affect marketing and sale of products. Trainees participated in a brainstorming session to think about the most important issues

Session 7. Preparation of amla pickle and amla preserve/candy

Amla pickle

Amla preserved in 40% sugar solution

See Appendix 3 for the recipes and methods used.

Session 8. Preparation of a business plan.

Participants split into two groups and worked in the evening to prepare a business plan.

Session 9. Evaluation and feedback.

Participants worked in groups to discuss and present the key learning points of the day. At the beginning of the following days session, one member of each group gave the feedback of the key points to the whole group.

Trainers opinions

A very intensive day with a lot of theory. The participants coped well though.

DAY 4

Session 1. Group feedback and aims of the day

One member from each group gave a short presentation of the key points from the previous day. This was a useful exercise as it made the participants reflect on what had been presented and helped the trainers assess how well the information had been understood.

The aims of the day were presented to the participants for their approval.

Session 2. Presentation of business plans

A feedback session during which one member from each group presented their business plan to the whole group.

Session 3. Food safety and legal aspects

A session presented by Dr Gajanana of IIHR. This covered aspects of food safety (FPO – Food Protection Order and Codex Standards) and legal aspects of establishing a food processing business.

Session 4. Establishing processing facilities

A theoretical session that covered the basics of establishing food processing facilities.

Session 5. Management and record keeping

A theoretical session covering the basic records that should be kept by entrepreneurs.

Session 6. Feedback, questions, evaluation of products and the course

A feedback session where participants could ask questions, discuss the issues covered and comment on the course.

The products made during the previous three days were evaluated – by taste and appearance.

All participants were asked to complete an evaluation of the day and an overall evaluation of the course. The results from the evaluation can be found in Appendix 4.

Session 7. Valedictory function

IIHR organised a formal closing ceremony during which the participants were presented with certificates and a photograph, participants and trainers were asked to give their comments and opinions on the course and the Director of IIHR gave a closing speech:

Welcome	Dr Reddy, IIHR
Training report	Dr Doreyappa Gowda
Trainees views	Trainees
Trainers views	Elke Peiler, Susan Azam-Ali
Distribution of certificates	Dr Shikhamany
Chairmans remarks	Dr Shikhamany
Vote of thanks	Dr Gopalakrishna Rao

Trainers opinions

A lot of information was covered on the last day. The feedback session was useful, but could have been better –especially the review of the products. However, there was

pressure to close in time for the closing ceremony, which reduced the length of time available for discussion.

3. LESSONS LEARNED

Course content

On balance, the training programme was well received by the participants. Most of the sessions were of relevance to the majority of the trainees. The programme was adjusted on a day to day basis to accommodate the needs of the trainees and to ensure that the most relevant information was presented.

Practical sessions

Participants were keen to learn how to make as many products as possible, in particular the exact recipes and formulations for products. IIHR has a long experience of research into the production of a variety of fruit-based products. The products were selected after consultation with Dr Gowda and with the trainees and based on what would be popular in India. The products made included tamarind chutney and concentrate, amla preserve and amla pickle, jack fruit in syrup and mixed jackfruit and custard apple jam. However, the practical sessions could have been significantly improved if we had prior knowledge of the facilities and capacity available at IIHR.

Course venue and facilities

Many thanks to Dr Shikhamany, Dr Reddy and colleagues at IIHR for hosting the training in Bangalore and for making sure that everyone's needs were accommodated. The only criticism of the facilities is that the opening hours of the Institute (9.30am to 4.30pm) quite severely constrained the training sessions. The day did not really start until about 10.00am and had to be finished by 4.30pm, with 1 hour out for lunch. The course was tailored to fit the time available and the participants carried out several exercises in the evening to make up for the shortage of time.

While the processing facilities were good, the processing room was not an ideal training room. It was difficult for all participants to see what was happening and to participate in the product making. Everyone worked well to make the most of the situation and to get the most out of the course.

Length of the course

Due to the daily time constraints of the Institute, it was difficult to fit all the information into the four days available and as a consequence, some of the sessions were reduced in length. The participants were cooperative and carried out a few exercises in the evenings which helped to relieve some of the pressure on time. In this particular circumstance, five days would have been better as it would have allowed for the preparation of more products.

Resource staff

The resource staff at the Institute have considerable experience of the post harvest storage, handling and processing of fruits and played a valuable role during the training course. In addition to demonstrating the products during the practical sessions and giving technical advice, they gave sessions on post harvest handling and storage and legal aspects of food processing. However, their skills and experience could have been more effectively used if we had been aware of this while planning

the workshop. For example, communication with Dr Gowda and his staff would have been useful in planning the practical sessions and deciding on the products to be made and resources needed.

Evaluation

The daily exercise of evaluating the course sessions and presenting the key learning points was a valuable exercise. The information was collated each evening and the following days programme drawn up to address any problems and issues that had arisen. Some of the sessions were less popular than the others. Based on the feedback from trainees, the trainers can adapt the training material for future courses.

General

All participants were educated to a similar level. Fortunately they all had a good command of English, so translation was unnecessary, which saved a lot of time. The majority of the trainees are already involved in food processing and so have a good knowledge of the principles of processing and of establishing small businesses. If we had been aware of this prior to the course, the training could have been tailored so that it was of more use to them. The course has been designed as a general training course for all five countries, based on the material that is in the manual. My overall feeling is that we did not give the trainees as much valuable information as we could have done. The course was valuable in that it served as a refresher course for much of the material while at the same time presenting some new information. It also gave the participants ideas about how to pass on the information during their own training sessions.

Despite these negative perceptions, the trainees all gave positive evaluations of the course, and indicated that it was pitched at the correct technical level. They did stress that they would have preferred more practical than theoretical classes, although the majority of them found most of the theory sessions of value.

4. RECOMMENDATIONS

1. The training course could have been improved if we had prior knowledge about the competencies and education level of the trainees. The material could then have been adapted so that it was more suited to their needs. The overall feeling is that the trainees are already familiar with most of the material that was presented to them and that this was more like a refresher course, with some new material being covered.
2. The course could also have been improved if we had prior information about the technical capabilities of resource staff. The staff at IIHR have a lot of experience and technical knowledge that could have been better utilised if we had been able to plan ahead.
3. Practical sessions. The practical sessions could have been improved if more time was available to do an initial demonstration of a product before the trainees made it themselves. The ideal situation would be to have a large training room where 4 or 5 groups of trainees could make the same product simultaneously, either after watching a demonstration, or at the same time that it is being demonstrated.

4. Technical support. It is likely that the trainees will require further technical support when they begin to demonstrate the products to their beneficiaries. IIHR can provide this type of technical support.
5. Development of training material. The training material was revised since the first course in Bangladesh. Prior to the next course in Vietnam, it should be adapted again according to the needs of the participants.

5. ITINERARY

1st August London to Colombo
2nd August Colombo to Bangalore
3rd-6th August Training course at IIHR, Bangalore
7th August Bangalore to Colombo

6. CONTACTS

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APPENDIX 1 - LIST OF PARTICIPANTS

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APPENDIX 2 – OUTLINE OF TRAINING COURSE

Programme, India: 3rd to 6th August 2004

Day 1:

9.30 Registration

9.45-10.30 Inaugural function

Session 1: Group session

- Aims of the course
- Finding out about each other
 - What the trainers do
 - What fruits they are processing and the products they make
 - The problems they have with processing
 - What they would like to get out of the course
 - Share experiences
 - What products they would like to make etc

Tea break: 15 minutes

Session 2:

- Overview of quality assurance and hygiene
 - Critical points of QA
 - Basics of hygiene

Lunch: 13:30 – 14:30 h

Session 3:

- Principles of pickles and chutney preparation
- Principles of sauce preparation

Tea break: 15 minutes

Session 4:

- Preparation of tamarind concentrate and tamarind chutney

Session 5:

- Decide what product(s) will be made tomorrow

End 16.30

Day 2: start 9:30 h

Session 1: Group session

- Aims of the day

Session 2: Post harvest handling and storage (Dr Sudhakar Rao)

Session 3: Principles of jam and jelly making and candy and preserve production

Tea break: 15 minutes

Session 4: Preparation of mixed fruit jam and jack fruit in syrup

Lunch: 13:30 - 14:30 h

Session 5:

- Talk about why products fail and how they can be improved
 - Presentation of products
 - Packaging
 - Labelling

Tea break: 15 minutes

Session 6: in groups

- Label design: design label for one product

Session 7: Group review session

- Problems, questions
- Plan for day 3
- Evaluation of day 2

End: 16:30

Day 3: start 9:30 h

Session 1: Group session

- Aims of the day
- Key learning points of day 2 (presentation by trainees)

Session 2:

- The importance of doing a feasibility study – part I: Market feasibility

Session 3: in groups (trainees split into 3 or 4 groups of 4-5 people):

- How to carry out a market survey
 - Exercise: Consumer survey

Session 3:

- The importance of doing a feasibility study – part II: Technical feasibility

Tea break: 15 minutes

Session 4:

- The importance of doing a feasibility study – part III: Financial feasibility
- How to prepare a business plan

Session 5:

Marketing issues

Lunch: 13:30 – 14:30 h

Session 6:

- Preparation of amla preserve and amla pickle

Session 7: in groups (in the evening)

- Exercise: Preparation of a business plan

End: 16:30 h

Day 4: start at 9:30 h

Session 1: Group session

- Aims of the day
- Key learning points of day 3 (presentation by trainees)

Session 2: Group session

- Presentation of business plan by working groups

Session 3:

- Food safety and legal aspects

Session 4:

- Establishing processing facilities

Tea break: 15 minutes

Session 5:

- Management
- Record keeping

Lunch: 13:30 – 14:30 h

Session 6: Group review session

- Questions
- Feedback
- Evaluation of the course

Session 7: Valedictory function

- Address
- Feedback
- Certificates
- Close

End: 16:00 h

APPENDIX 3 - PRODUCTS

Tamarind Chutney

2kg tamarind pulp	2.5g black pepper
1500ml water	1g cardamom
Sugar (1kg per kg extracted pulp)	1g cinnamon
Spices (per kg extracted pulp):	1g cloves
5g chilli powder	30g salt
3g black cumin	100ml mustard oil
1g black pepper	1.5g potassium metabisulphite
10g mustard powder	

1. Mix the dried tamarind with water (about 2kg pulp to 1000ml water) and pressed through a plastic sieve to remove the stones (1st extract).
2. Wash the stones and fibres with another 500ml water and re-press through the sieve to extract the maximum pulp (2nd extract).
3. Weigh the extracted pulp (from 2kg tamarind, about 1.8kg pulp)
4. Dry fry the spices in an open pan. Grind them.
5. Gently heat the pulp.
6. Add the sugar.
7. Add the fried spices. Mix well.
8. Heat until the final total solids measure 60% (using a refractometer).
9. Hot fill the chutney into clean, sterile jars. Cap and label.

Tamarind Concentrate

Dried tamarind pulp (moisture content of about 12%)

1. Take the dried, deseeded tamarind pulp
2. Soak in water for 30 minutes to 1 hour
3. Squeeze out the clear juice
4. Check the TSS and acidity
5. Heat the juice, stirring occasionally to prevent sticking and burning
6. Heat until the TSS is 55-65%
7. KMS can be added if desired (100ppm)
8. Fill into sterilised bottles

Tamarind Sauce

Tamarind 1kg	Pepper 10g
Salt 60g	Clove 10g
Sugar 750g-1kg	Onion 100g
Sodium benzoate 600ppm	Chillies 48g
	Cumin 80g
Spices (chopped and placed in a spice bag):	Mace 10g
Cinnamon 10g	Cardamom 10g
Garlic 30g	

1. Mix the salt and sugar with the tamarind juice
2. Add the spice bag
3. Heat, stirring occasionally to prevent sticking, until the volume has reduced to 1/3rd the original
4. Pour into sterilised bottles.

Jackfruit bulbs in syrup or preserved bulbs

Ripe jackfruit

Sugar to make a 70° syrup solution (2l of syrup for each kg of bulbs)

3g citric acid per litre of syrup solution

KMS (700ppm) (optional)

1. Prepare sugar syrup. Dissolve 700g sugar in about 700ml water. Heat to dissolve the sugar. Add the citric acid. Make the volume up to 1 litre using clean water. The strength of the sugar syrup can be checked using a refractometer.
2. Strain the sugar syrup through muslin cloth to remove any impurities. Leave to cool to room temperature.
3. Take out the ripe jackfruit bulbs.
4. Place bulbs in clean, sterile container. Cover with syrup. Leave for 24 hours.
5. Remove the bulbs from the syrup. Check the TSS of the sugar syrup. Bring back to 70° by heating and dissolving more sugar. Strain again and cool to room temperature.
6. Replace the bulbs in the syrup and leave for 24 hours.
7. Repeat this process until the TSS stabilises at 70° (4-5 days). Bottle the fruit and syrup in clean, sterilised jars.
8. If desired, KMS can be added before bottling (700ppm).
9. To make jackfruit candy. Once the bulbs have been soaked in syrup for a sufficient amount of time (until the TSS of the sugar syrup stabilises at 70°), the bulbs are removed from the syrup, quickly rinsed to remove excess syrup, then placed on trays for drying. They are gently dried at 55-60° until the moisture content is about 14%.

Mixed fruit jam

There are several methods and formulae to make a jam.

Ripe jackfruit has a fairly high sugar content, therefore a mixture of 55% fruit to 45% sugar is used.

500g jackfruit pulp

500g custard apple pulp

750g sugar

10g pectin (up to 1%)

3-5g citric acid

1. Remove jackfruit bulbs. Liquidise into a pulp.
2. Scoop out custard apple pulp. Mix with 1% ascorbic acid to prevent browning.
3. Place fruit pulps in a large boiling pan. Check the initial sugar content using a refractometer.
4. Hold back about 50g sugar (about 5 times the weight of pectin). Add the remaining sugar to the fruit. Mix well.
5. Heat, stirring occasionally to prevent burning. Check the sugar content periodically.
6. Mix the pectin with the 50g sugar. When the TSS is 55°, add the pectin and sugar. Mix well.
7. Continue heating. When the TSS is 58°, add the citric acid. Mix well.
8. Continue heating until a final TSS of 65°. Remove from the heat, allow to cool to about 80-85°C, then fill into clean, sterile jars.
9. Cap the jars, cool and label.

Amla preserve

1kg Amla fruits

1.25kg sugar

Quick method

1. Select firm and ripe fruits, wash in clean water.
2. Blanch in water to soften. Cut into pieces and remove stone.
3. Layer the fruit with sugar. Leave overnight.
4. Drain the sugar. Raise the TSS of the syrup to 50°Brix.
5. Leave overnight.
6. Gradually raise the Brix to 70°
7. Pour into clean sterile bottles.

Longer method

1. Select large fruits. Prick with a fork.
2. Blanch in boiling water for 2-3 minutes.
3. Prepare sugar syrup (50°Brix + 0.3% citric acid.) Filter and cool.
4. Add softened fruit to the sugar syrup. Leave overnight.
5. Check the TSS (50°).
6. Keep adding more sugar to the syrup until the Brix is maintained at 50° (about 4-5 days).
7. Remove fruit from syrup. Heat syrup until final Brix is 70°. Add the fruit and leave for 4-5 days.
9. Pour into clean sterile bottles.
10. To make amla candy, drain the syrup and dry the fruits in the sun or a solar dryer.
11. Roll in powdered sugar to prevent stickiness.

Amla pickle

1kg amla fruit
150g salt
150g sugar
15g red chillies

10g turmeric
10g cumin
10g black pepper
300g mustard oil (or refined oil)

1. Heat the amla in water to soften
2. Cut into quarters and remove the seed
3. Boil the oil to remove the raw taste (Water squirted into the oil to increase the temperature and make it froth)
4. Add the spices to the oil. Cook until fragrant.
5. Add the amla, sugar and salt to the oil and spice mixture. Cook.
6. Pour into clean, sterile bottles.
7. Leave for 4-5 days to settle before consumption.

APPENDIX 4 – EVALUATION REPORTS

RESULTS OF THE EVALUATION OF THE TRAINING COURSE BY PARTICIPANTS

Day 1:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Sharing experiences and problems	Very good	13	81.3
		Good	2	12.5
		Average	1	6.3
		Poor		
		Very poor		
2	Overview quality assurance and hygiene	Very good	2	12.5
		Good	12	75.0
		Average	2	12.5
		Poor		
		Very poor		
3	Theory of grading and sorting of fruits	Very good	6	37.5
		Good	7	43.8
		Average	3	18.8
		Poor		
		Very poor		
4	Preparation of tamarind chutney and tamarind sauce	Very good	6	37.5
		Good	7	43.8
		Average	2	12.5
		Poor	1	6.3
		Very poor		

Total number participants present day 1: 16

Additional comments made by one participant:

“We need much more information on grading and sorting of fruits. Time given by teacher was very short.”

“Session on grading and sorting was only based on theory. If possible, practical session is also necessary.”

Day 2:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Post-harvest handling and storage	Very good	6	42.9
		Good	7	50.0
		Average	1	7.1
		Poor		
		Very poor		
2	Preparation of jackfruit in syrup	Very good	2	14.3
		Good	9	64.3
		Average	3	21.4
		Poor		
		Very poor		
3	Preparation of jackfruit and custard apple jam	Very good	2	14.3
		Good	9	64.3
		Average	3	21.4
		Poor		
		Very poor		
4	Why products fail	Very good	4	28.6
		Good	8	57.1
		Average	2	14.3
		Poor		
		Very poor		
5	Labelling and label design	Very good	3	21.4
		Good	9	64.3
		Average	2	14.3
		Poor		
		Very poor		

Total number participants handed in evaluation form day 2:14

Day 3:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 2	Very good	6	40.0
		Good	9	60.0
		Average		
		Poor		
		Very poor		
2	Market feasibility	Very good	7	46.7
		Good	6	40.0
		Average	1	6.7
		Poor		
		Very poor		
3	Market survey – consumer survey	Very good	2	13.3
		Good	11	73.3
		Average	2	13.3
		Poor		
		Very poor		
4	Technical Feasibility	Very good	2	13.3
		Good	11	73.3
		Average	2	13.3
		Poor		
		Very poor		
5	Financial Feasibility	Very good	6	40.0
		Good	6	40.0
		Average	3	20.0
		Poor		
		Very poor		
6	Marketing issues	Very good	4	26.7
		Good	7	46.7
		Average	4	26.7
		Poor		
		Very poor		
7	Preparation of amla preserve and amla pickle	Very good		
		Good	8	53.3
		Average	6	40.0
		Poor		
		Very poor	1	6.7
8	Preparation of business plan	Very good	4	26.7
		Good	9	60.0
		Average	2	13.3
		Poor		
		Very poor		

Total number participants present day 3: 15

Day 4:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 3	Very good	5	31.3
		Good	11	68.8
		Average		
		Poor		
		Very poor		
2	Presentation of business plan	Very good	11	68.8
		Good	5	31.3
		Average		
		Poor		
		Very poor		
3	Marketing safety and legal aspects	Very good	4	25.0
		Good	9	56.3
		Average	3	18.8
		Poor		
		Very poor		
4	Establishing food processing facilities	Very good	2	12.5
		Good	10	62.5
		Average	4	25.0
		Poor		
		Very poor		
5	Management and record keeping	Very good	3	18.8
		Good	8	50.0
		Average	5	31.3
		Poor		
		Very poor		
6	Group review and feedback	Very good	7	43.8
		Good	8	50.0
		Average	1	6.3
		Poor		
		Very poor		

Total number participants present day 4: 16

Overall opinion on training course:

No.	Question	Evaluation	No. participants	% of total no. of participants
1	How well did the training course meet your expectations?	Very good	3	18.8
		Good	10	62.5
		Average	3	18.8
		Poor		
		Very poor		
2	Length of training course Was the length of the training course:	Too short	7	43.8
		Just right	9	56.3
		Too long		
3	Location of training course Was the location of the training course to your satisfaction?	Very good	5	31.3
		Good	12	75.0
		Average		
		Poor		
		Very poor		
4	Training facilities Were the training facilities to your satisfaction?	Very good	5	31.3
		Good	8	50.0
		Average	3	18.8
		Poor		
		Very poor		
5	Style of presentation Was the style of presentation:	Very good	6	37.5
		Good	9	56.3
		Average		
		Poor		
		Very poor		
6	Technical content Was the technical content of the course:	Too technical	1	6.3
		Right level	14	87.5
		Not technical enough	1	6.3
7	Practical sessions How useful were the practical sessions?	Very good	4	25.0
		Good	6	37.5
		Average	5	31.3
		Poor	1	6.3
		Very poor		
8	Theory sessions How useful were the theory sessions?	Very good	4	25.0
		Good	11	68.8
		Average	1	6.3
		Poor		
		Very poor		
9	Balance Theory - Practice How was the balance between theory and practical sessions?	Too much theory and not enough practical training	11	68.8
		Good balance of theory and practice	4	25.0
		Not enough theory	1	6.3
10	Was the amount of information given each day	Too much		
		Just right	16	100.0
		Too little		

Results of open questions:

11	Which session(s) did you find most useful?	All sessions were very useful	1	6.3
		Preparation of business plan	5	31.3
		All theoretical sessions	1	6.3
		Handling and storage of fruits	1	6.3
		Feasibility study	3	18.8
		Legal aspects	3	18.8
		Marketing issues	3	18.8
		Preparation of tamarind pickle	1	6.3
		Preparation of consumer survey	2	12.5
		All practical sessions	2	12.5
		Why products fail	1	6.3
12	Which session(s) did you find least useful?	All sessions were useful	12	75.0
		Preparation of consumer survey	1	6.3
		Theoretical sessions in general	1	6.3
		Marketing issues	1	6.3
		Practical sessions in general	1	6.3
13	What other information (if any) would you have liked to receive?	Visit of processing facilities of a successful entrepreneur to exchange information	3	18.8
		Presentation of complete business plans for relevant products of regional importance	1	6.3
		Processing of other underutilised fruits such as bael	1	6.3
		How to start a small-scale business in village level	1	6.3
		More information on how to carry out a market survey	2	12.5
		Principles of processing the products before the practical session	1	6.3
		Information on IIHR activities regarding fruit processing	1	6.3
		Standards for underutilised fruits and fruit products	1	6.3
		Information regarding practical feasibility of underutilised fruits	1	6.3
		More information on FPO	2	12.5
		Safety measures	1	6.3
14	Do you have any other suggestions for improvement of the training course?	More time for practical sessions	7	43.8
		Better planning and coordination of practical sessions	4	25.0
		Demonstration of products before processing	3	18.8
		Time for training sessions each day should be longer	2	12.5
15	Do you have any other comments?	More products of underutilised fruits should be included in the practical sessions	1	6.3
		Principles of processing the products should be presented before the practical session	1	6.3
		No other comments	12	75.0

Number of participants who handed in the overall evaluation form: 16