

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

DFID Forestry Research Programme

Project number: R7187B

Training workshop in Vietnam, September 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 Vietnam from the 20th to the 23rd September 2004. The workshop was hosted by the Research Institute of Fruits and Vegetables (RIFAV) in Hanoi.

The training sessions were delivered by Elke Peiler (ICUC) and Susan Azam-Ali (Independent consultant). Staff from RIFAV assisted with the translation of sessions and with the preparation of products during the practical sessions.

Fifteen participants (10 male and 5 female) from the partner organisations took part in the training. The participants represented three provinces, where the Resource centres will be located.

The course concentrated on three under-utilised fruit species:

- Jack fruit (*Artocarpus heterophyllus*)
- Sugar apple (*Annona squamosa*)
- Persimmon (*Diospyros kaki* L.)

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:

Jackfruit in syrup, mixed jackfruit jam (jackfruit plus sugar apple), sugar apple beverage, jackfruit leather, mixed jackfruit and pineapple leather, persimmon jelly and persimmon jam.

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 final training course was held in Vietnam from the 20th to 23rd September 2004. The course was held at the Research Institute for Fruit and Vegetables in Hanoi.

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
RIFAV staff:	
Dr Chu Doan Thanh	Translation of sessions
Luong Thi Song Van	Assistance with preparation of fruit products
Le Thi Bich Thu	Assistance with preparation of fruit products
Nguyen Thi Dieu Thuy	Assistance with preparation of fruit products

Course participants

Fifteen participants (5 women and 10 men) took part in the training programme (see Appendix 1 for a list of participants). Participants came from three provinces (Hoabinh, Phutho and Thua Thien Hue), where the resource centres will be located. The trainees will become master trainers in these resource centres, 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 production and some processing activities at the village and commune level. There is very little processing of the three fruits covered in the course. English was not widely spoken, therefore translation of all the sessions was necessary.

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 translated copy of the manual and the process flow sheets.

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 Vietnam are:

Jackfruit (*Artocarpus heterophyllus*)

Sugar apple (*Annona squamosa*)

Persimmon (*Diospyros kaki* L.)

At the time of training, all these fruits were available in Vietnam.

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

Welcome address Professor Vu Manh Hai, Director RIFAV

Welcome on behalf of ICUC Elke Peiler

Aims of the Course Susan Azam-Ali

After the formal welcome, there was an introductory 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.

Experience of participants

An introductory, session where participants formed pairs and found out about each other. Each person gave feedback to the group about their partner.

	Position	Experience
1	Extension worker	Processing dried banana and longan and producing fresh annona. Needs information on processing and marketing.
2	Chairman of Horticultural Association	Works at the commune level. Works with lots of fruits. Needs information on annona.
3	Staff of provincial Horticultural Association	Produces jam, dry banana, dry longan and pre-processing of annona and persimmon.
4	Chairman of Horticultural Association	Works at the commune level. Dry longan, lychee, banana and jackfruit chips. Needs information on storage after processing.
5	Extension worker	Works at the commune level. Longan, annona, jackfruit, lychee and persimmon grow here. Don't know how to process them, only how to dry longan..
6	Chairman of women	Works at the commune level. Grows jackfruit, persimmon, lychee, longan. Dries banana, longan and lychee. Don't know how to process or store.
7	Farmer	Grows pommelo, jackfruit and mangosteen. No processing as don't know how.
8	Scientist. Deputy Director of export food crops	Grow persimmon, annona, pineapple, banana, mangosteen mainly for fresh consumption.
9	Extension worker	Works at the commune level. Grows mangosteen, pommelo and mandarin. Don't know how to processor or store.
10	Project staff member	Works at the commune level. Pineapple, banana and jackfruit are available. Made dried persimmon but it was not popular.
11	Member of poverty alleviation group in commune	Grow banana, pineapple, longan, orange. No processing or storage, but need to learn it.
12	Manager of development project at fruit research centre	Works at the commune level with ethnic people. Fresh persimmon, banana, jackfruit, sugar apple, pommelo and mangosteen. No processing as lack of knowledge.
13	Chairman of Commune Farmers Association	Persimmon and annona grown but not processed. Could grow more, but don't.
14	Staff of Agricultural Station	Fresh lychee, longan, pineapple, orange grown. No processing.
15	Chairman women Union in commune	Longan, lychee and pineapple grown. No processing as not market for products.

Processing experience of the participants

The participants are involved in the production and marketing of several fresh fruits. There is some processing, mainly of dried banana, jackfruit chips, dried pineapple and dried longan.

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
Processing technology for any of the following fruits: lychee, longan, persimmon, banana, pommelo, orange, mandarin, mango, pineapple, tomato, jackfruit, sugar apple	13
Post harvest handling technology for grapefruit, tomato, mango, jackfruit, sugar apple, persimmon, banana, longan, lychee, pineapple, plums, citrus, water melon	18
Market access	3
Household scale fruit processing	2
Ripening and removal of astringency from local persimmon variety	2
Building processing factories at fruit production site	1
Buying raw materials	1
Markets for processed products	2
Storage of processed products	1
Recipes for popular home made products	1
Information about preservatives available and their use	1
Equipment for household scale processing	1
How to stabilise the colour of guava juice	1
How to stabilise the colour of banana puree	1

Total number participants present day 1: 15

The participants were asked to name three products they would like to make during the course.

Products	Number
Storage of ripe sugar apple	1
Storage of ripe jackfruit	1
Post harvest handling and processing of sugar apple	3
Post-harvest handling and processing of persimmon	3
Jackfruit candy	1
Jackfruit jam	5
Jackfruit beverage	4
Jackfruit pickle	3
Dried jackfruit	2
Persimmon beverage	3
Persimmon – dried	4
Persimmon jam	3
Persimmon candy	2
Sugar apple beverage	8
Sugar apple jam	2
Canned sugar apple	2
Sugar apple candy	1
Sugar apple ice cream	2
Canned and bottled products	1

Beverages	1
Drying	1

The information presented during these sessions was used to amend the training programme and to select the products for the practical sessions.

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.

Session 3. Post harvest handling and storage

A general overview of post-harvest handling and storage plus specific details on the storage of jackfruit, persimmon and sugar apple.

Session 4. Introduction of the products that can be made from the fruits

A brief introduction to the various products that can be made from sugar apple, persimmon and jackfruit.

Session 5. Why products fail and how they can be improved

A theoretical session that studied 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. Theory of semi-processed fruits and preparation of jackfruit in syrup.

The theory of how to preserve fruit for use later in the season;

- Fruit puree
- Fruit in brine
- Dried fruit

The theory of how to preserve jackfruit in syrup (and preserved jackfruit).

Session 7. Practical session. Preparation of jackfruit in syrup.

Preserved jackfruits in a 70% sugar solution.

See Appendix 3 for the recipes and methods used.

Session 8. Evaluation

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

Trainers opinions

The first day went very well. Although the participants did not speak English, the translation of information both ways worked well. The processing room was big enough to accommodate three groups, which made the practical sessions run smoothly.

DAY 2

Session 1. Aims of the day and feedback of key learning points

Participants gave their group feedback with the key learning points from the previous day.

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. Principles of jam making and leather preparation

A theoretical session that explained the basic principles of jam, jelly and leather 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
- Basic principles of leather making

Session 5. Preparation of mixed fruit jam. Adjustment of sugar syrup to 70°Brix

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

The participants split into 3 groups, each one made jam according to a slightly different recipe. This enabled us to demonstrate the effects of adding different amounts of ingredients and to compare the products at the end of the course.

The sugar syrup prepared the previous day was brought back to 70°Brix by dissolving more sugar in the syrup.

See Appendix 3 for the recipes and method followed.

Session 6. Label design

Participants were show 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. Group review session

A general question and answer session.

Evaluation forms were completed (the results are summarised in Appendix 4).

Trainees worked in groups to discuss and present the key learning points of the day.

Trainers opinions

The sessions seemed to be well received by the participants. During the practical session the three groups all varied the basic jam recipe slightly (by modifying the amount of pectin added). This demonstrated the effects of this ingredient on the final product and also enabled us to compare the different products and formulae at the end of the course. Pectin is a fairly expensive ingredient and in some instances may be difficult to obtain. The pectin used on the course was very brown, which dulls the colour of pale fruit jams and jellies. If the jam or jelly can be made without adding pectin, it reduces the cost and (in the case of brown pectin) improves the colour.

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.

Session 2. 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 3. 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 4. 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 5. Principles of preparation of juices and beverages and how to prepare sugar apple beverage

A theory session on the basic principles of juice and beverage production.

Session 6. Practical session – preparation of sugar apple beverage

Sugar apple beverage was prepared according to the recipe in the manual. See Appendix 3 for more details.

Session 7. Practical session - preparation of fruit leather

Jackfruit and mixed jackfruit and pineapple leathers were made. The recipes were varied by adding or omitting citric acid to demonstrate the effects of the ingredient on the taste of the product.

See Appendix 3 for more details of the recipe and method.

Session 8. Preparation of a business plan.

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

Session 9. Group review session.

A general question and answer session.

Evaluation forms were completed (the results are summarised in Appendix 4).

Trainees worked in groups to discuss and present the key learning points of the day.

Trainers opinions

An intensive day with a lot of theory and a double practical session. While the trainees were involved in the theory sessions, we took the opportunity to experiment with the production of jam, jelly and leather from persimmon. Both jam and jelly were made without pectin so that the brown pectin did not dull the colour of the product. Both set adequately. The jelly was the best product, although extracting the juice was quite difficult and rather inefficient (350g juice from 1.5kg fruit). The jam had quite an astringent taste. The leather was not successful – it was impossible to make a good smooth puree from the fruit.

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.

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. Establishing processing facilities

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

Session 4. Legal aspects

A theoretical session on the legal aspects that should be considered when establishing a food processing business.

Session 5. Finish off products, evaluation of the products prepared during the course

Finishing off the fruit leathers. Tasting and comparison of different products.

Session 6. Group review session

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

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. Certificates were presented to all participants.

Close of the course.

Trainers opinions

The course went well. The product evaluation and tasting session was popular. Participants were keen to take samples back home with them.

Out of the three jams, the one made from whole jackfruit puree (rather than extracted juice) was the best product. It had the best taste, colour and texture.

The persimmon jelly was preferred over the jam.

People liked both types of leather – jackfruit and mixed jackfruit. Opinion was divided over whether citric acid should be added or not. All four products tasted good. The jackfruit plus pineapple leather had a better colour, but the texture was softer than the jackfruit leather.

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. There is very little experience of processing these 3 fruits at RIFAV, therefore there were no locally tested recipes and methods. The products were selected based on the requests of trainees and what would be popular in Vietnam.

Course venue and facilities

Many thanks to Dr Hai and Miss Ha for organising and hosting the training in RIFAV and for making sure that everyone's needs were accommodated. The provision of beds for a short siesta after lunch (as is the Vietnamese tradition) was much appreciated by all. 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.

The processing facilities were good. Three groups could process at the same time. However, the sessions would have been improved if there had been one or two more electric hotplates available. There was quite a lot of waiting around to use the hotplates, especially when more than one product was being made.

Length of the course

All the information was fitted into the four days. Participants did several exercises to maximise the time available. Five days would have enabled more products to be made and maybe a field visit to see one of the processing sites.

Resource staff

The resource staff at the Institute assisted with demonstration of the products during the practical classes. They do not have experience of processing these three fruits into products, but have experience of processing other fruits. Miss Ha and Dr Thanh worked with us throughout, ensuring that all material was available and providing a translation service.

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. Trainees found most of the sessions very useful.

4. RECOMMENDATIONS

1. It would be useful if RIFAV carried out some research into the basic post-harvest handling and processing of the three fruits used on the course. There is very little information on the processing, especially on the removal of astringency, of persimmon.
2. It would have been useful to spend one or two days longer in Vietnam. To travel to the project resource centre sites and to look round the markets at the range of processed products available. Passing through Bangkok airport en route to Hanoi, it was interesting to see the range of processed and fresh under-utilised fruits on offer for sale. There is obviously a large processing industry of indigenous fruits in Thailand. It would be useful if a resource person from ICUC Thailand visited Hanoi to give practical demonstrations of some of the products.
3. The trainees will probably need technical support once they start processing in the field. It would be useful if RIFAV staff could support them if they have any technical problems

5. ITINERARY

18 th September	London to Hanoi
20 th - 23 rd September	Training course at RIFAV, Hanoi
23 rd September	Hanoi to London (arrive 24 th)

6. CONTACTS

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APPENDIX 1 - LIST OF PARTICIPANTS

No	Name	Commune - District - Province
(1)	(2)	(3)
1	Bui The Thao	Lien Hoa - Lacthuy - Hoabinh
2	Vu Dinh Kieu	Lien Hoa - Lacthuy - Hoabinh
3	Dinh Phuong Lan	Lien Hoa - Lacthuy - Hoabinh
4	Ngo Manh Ha	Lien Hoa - Lacthuy - Hoabinh
5	Ha Tien Truong	District Agricultural Division in Lacthuy - Hoabinh
6	Nguyen Van Sinh	Cotiet - Tamnong - Phutho
7	Vu Dinh Thuyen	Huongnoi - Tamnong - Phutho
8	Ta Thi Thanh	Huongnha - Tamnong - Phutho
9	Hoang Hai Anh	Phutho Horticultural Association
10	Kieu Quoc Phong	District Extension Station in Tam N«ng - Phó Thä
11	Truong Van Chien	Fruit Experiment and Development Centre in Thua Thien Hue province
12	Nguyen Ngoc Tan	Huongvan - Huongtra - Thuathienhue
13	Tran Nguyen Vu	ANgo - Aluoi - Thua Thien Hue
14	Tran Huu Danh	H-ng Long - Hue City - Thua Thien Hue province
15	Nguyen Van Tien Dung	Adot - Aluoi - Thua Thien Hue

APPENDIX 2 – OUTLINE OF TRAINING COURSE

Day 1: start 8:30 h

Session 1: Group session

- Welcome RIFAV
- Welcome on behalf of ICUC
- 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
 - 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

Session 3:

- Post-harvest handling and storage
 - General overview and fruit specific

Session 4:

Introduction of various products that can be made from the fruits

Lunch: 11:30 – 13:00 h

Session 5:

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

Session 6:

- Theory of puree and pulp preparation and of preparation of jackfruit in syrup
 - Record keeping
 - Batch calculation

Tea break: 15 minutes

Session 7: in groups (trainees split into 3 or 4 groups of 4-5 people):

- Preparation of jackfruit in syrup

Session 8:

- Decide what product(s) will be made tomorrow
- Problems, questions
- Evaluation of day 1

End: 17:00 h

Day 2: start 8:30 h

Session 1: Group session

- Aims of the day
- Key learning points of day 1 (presentation by trainees)

Session 2:

- The importance of doing a feasibility study – part I: Market feasibility
 - Exercise: Checklist of entrepreneurial characteristics

Tea break: 15 minutes

Session 3:

- How to carry out a market survey
 - Exercise on consumer survey

Lunch: 11:30 - 13:00 h

Session 4:

- Principles of jam making and leather preparation and theory of preparation of mixed jackfruit/sugarapple jam including
 - Record keeping
 - Batch calculation

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

- Preparation of mixed jackfruit/sugarapple jam. Emphasis on quality assurance throughout.

Session 6: Homework

- Label design: design label for first product

Session 7: Group review session

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

End: 16:30

Day 3: start 8:30 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 II: Technical Feasibility

Tea break: 15 minutes

Session 3:

- The importance of doing a feasibility study – part III: Financial Feasibility

Session 4:

- Marketing issues

Lunch: 11:30 – 13:00 h

Session 5:

- Principles of preparation of juices and beverage and how to prepare sugarapple beverage including
 - Record keeping
 - Batch calculation

Session 6: in groups (trainees split into 3 or 4 groups of 4-5 people):

- Preparation of sugarapple beverage. Emphasis on quality assurance throughout.

Tea break: 15 minutes

Session 7: in groups (trainees split into 3 or 4 groups of 4-5 people):

- Preparation of jackfruit leather. Emphasis on quality assurance throughout.

Session 8: in groups (homework)

- Preparation of a business plan

Session 9: Group review session

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

End: 16:30 h

Day 4: start at 8:30 h

Session 1: Group session

- Aims of the day and presentation of key learning points from the previous day

Session 2:

- Presentation of business plans of different working groups

Tea break: 15 minutes

Session 3:

- Establishing processing facilities
- Management
- Record keeping

Session 4:

- Legal aspects

Lunch: 11:30 – 13:00 h

Session 5: in groups

- Finish off products and tasting and discussion of products prepared during the training course

Tea break: 15 minutes

Session 6: Group review session

- Questions
- Feedback
- Evaluation
- Certificates
- Close

End: 16:00 h

APPENDIX 3 - PRODUCTS

Jackfruit bulbs in syrup of preserved jackfruit

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. The three groups all used slightly different recipes to demonstrate the effects of adding pectin to the jam. Group 1 also used the fruit pulp from jackfruit while groups 2 and 3 used extracted jackfruit juice.

Recipes

Ingredient	Group 1	Group 2	Group 3
Jackfruit pulp	500g liquidised pulp	Juice from 500g liquidised pulp	Juice from 500g liquidised pulp
Custard apple pulp	500g liquidised pulp	500g liquidised pulp	500g liquidised pulp
Sugar	800g	800g	800g
Pectin	5g	10g	15g
Citric acid	10g	10g	10g

1. Remove jackfruit bulbs. Heat gently until the bulbs are softened. Liquidise into a pulp. For groups 2 and 3 – squeeze out the juice through a muslin cloth or jelly bag.
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.

Persimmon jam

920g persimmon pulp (1.2kg fruit)
820g sugar
5g citric acid

1. Peel the fruit, scoop out the flesh and place in a stainless steel pan.
2. Heat gently to soften the pulp (15 minutes)
3. Add sugar (820g). Mix well and increase heat.
4. Boil, stirring occasionally to prevent burning.
5. Add citric acid. Continue heating until the final TSS is 68°.
6. Hot fill into clean, sterile jars. Cap, cool and label.

Persimmon jelly

350g extracted fruit juice (from 1.5kg fruit)
350g sugar
1g citric acid

1. Peel the fruit, scoop out the flesh and place in a stainless steel pan.
2. Heat gently to soften the pulp. Squeeze out the juice through a muslin cloth or jelly bag.
3. Add sugar. Mix well and heat.
4. Boil, stirring occasionally to prevent burning.
5. Add citric acid. Continue heating until the final TSS is 68°.
6. Hot fill into clean, sterile jars. Cap, cool and label.

Sugar apple beverage

1kg sugar apple pulp
370g sugar
1g citric acid

1. Peel the fruit and extract the pulp. Blend the pulp to form a smooth paste (Add 1% ascorbic acid to prevent browning).
2. Add 2.5l water, 370g sugar and 1g citric acid per kg pulp. Mix thoroughly. Boil for 3 minutes at 70°C.
3. Fill sterilised bottles with the hot nectar. Crown cork bottles.
4. Pasteurise sealed bottles for 10-20 minutes at 95°C.
5. Cool to room temperature by immersing in cool water.
6. Label.

Jackfruit and mixed fruit leather

Four different recipes were used to make leather. This allowed for comparison between the different types.

Ingredient	1	2	3	4
Jackfruit pulp	500g	500g	1000g	1000g
Pineapple pulp	500g	500g	none	none
Sugar	100g	100g	100g	100g
Citric acid	3g	none	3g	none

- a) Prepare fruit pulps. Blend to make a smooth pulp.
- b) Heat in a stainless steel pan
- c) Add sugar. Dissolve and continue heating until the TSS is 30°.
- d) Pour onto greaseproof or waxed paper on a drying tray.
- e) Dry overnight at 50-55°C.
- f) Remove from the paper. Sprinkle with cornflour to prevent sticking.
- g) Cut into desired shapes. Seal in moisture proof bags.

APPENDIX 4 – EVALUATION REPORTS

Day 1:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Sharing experiences and problems	Very good	7	46.7
		Good	8	53.3
		Average		
		Poor		
		Very poor		
2	Overview quality assurance and hygiene	Very good	8	53.3
		Good	6	40.0
		Average	1	6.7
		Poor		
		Very poor		
3	Post-harvest handling and storage	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		
4	Introduction of products	Very good	11	73.3
		Good	4	26.7
		Average		
		Poor		
		Very poor		
5	Why products fail	Very good	3	20.0
		Good	12	80.0
		Average		
		Poor		
		Very poor		
6	Theory of preparation of jackfruit in syrup	Very good	10	66.7
		Good	5	33.3
		Average		
		Poor		
		Very poor		
7	Preparation of jackfruit in syrup	Very good	10	66.7
		Good	5	33.3
		Average		
		Poor		
		Very poor		

Total number participants present day 1: 15

Day 2:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Presentation of key learning points of day 1	Very good	6	40.0
		Good	9	60.0
		Average		
		Poor		
		Very poor		
2	Market feasibility	Very good	9	60.0
		Good	5	33.3
		Average	1	6.7
		Poor		
		Very poor		
3	Consumer survey	Very good	5	33.3
		Good	9	60.0
		Average	1	6.7
		Poor		
		Very poor		
4	Principles of jam making and how to prepare mixed jackfruit/sugarapple jam	Very good	8	53.3
		Good	7	46.7
		Average		
		Poor		
		Very poor		
5	Preparation of sugarapple jam	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		

Total number participants present day 2: 15

Day 3:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 2	Very good	6	42.9
		Good	8	57.1
		Average		
		Poor		
		Very poor		
2	Technical Feasibility	Very good	8	57.1
		Good	6	42.9
		Average		
		Poor		
		Very poor		
3	Financial Feasibility	Very good	6	42.9
		Good	8	57.1
		Average		
		Poor		
		Very poor		
4	Marketing issues	Very good	7	50.0
		Good	7	50.0
		Average		
		Poor		
		Very poor		
5	Theory on processing of juices and beverages and how to prepare sugarapple beverage	Very good	5	35.7
		Good	9	64.3
		Average		
		Poor		
		Very poor		
6	Preparation of sugarapple beverage	Very good	4	28.6
		Good	10	71.4
		Average		
		Poor		
		Very poor		
7	Preparation of jackfruit leather	Very good	2	14.3
		Good	12	85.7
		Average		
		Poor		
		Very poor		
8	Preparation of a business plan	Very good	2	14.3
		Good	12	85.7
		Average		
		Poor		
		Very poor		

Total number participants day 3: 14

Day 4:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Presentation of business plans	Very good	5	33.3
		Good	10	66.7
		Average		
		Poor		
		Very poor		
2	Establishing of processing facilities, management, record keeping	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		
3	Legal aspects	Very good	8	53.3
		Good	6	40.0
		Average	1	6.7
		Poor		
		Very poor		
4	Finish off products from previous days	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		
5	Group review and feedback	Very good	6	40.0
		Good	9	60.0
		Average		
		Poor		
		Very poor		

Total number participants present day 4: 15

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	11	73.3
		Good	4	26.7
		Average		
		Poor		
		Very poor		
2	Length of training course Was the length of the training course:	Too short	10	66.7
		Just right	5	33.3
		Too long		
3	Location of training course Was the location of the training course to your satisfaction?	Very good	11	73.3
		Good	4	26.7
		Average		
		Poor		
		Very poor		
4	Training facilities Were the training facilities to your satisfaction?	Very good	8	53.3
		Good	7	46.7
		Average		
		Poor		
		Very poor		
5	Style of presentation Was the style of presentation:	Very good	10	66.7
		Good	5	33.3
		Average		
		Poor		
		Very poor		
6	Technical content Was the technical content of the course:	Too technical	3	20.0
		Right level	12	80.0
		Not technical enough		
7	Practical sessions How useful were the practical sessions?	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		
8	Theory sessions How useful were the theory sessions?	Very good	9	60.0
		Good	6	40.0
		Average		
		Poor		
		Very poor		
9	Balance Theory - Practice How was the balance between theory and practical sessions?	Too much theory and not enough practical training		
		Good balance of theory and practice	15	100.0
		Not enough theory		
10	Was the amount of information	Too much	1	6.7

	given each day	Just right	12	80.0
		Too little	2	13.3

Results of open questions:

11	Which session(s) did you find most useful?	All sessions were very useful	1	6.7
		Practical sessions	8	53.3
		Marketing issues	4	26.7
		Business planning	1	6.7
		Post-harvest handling	2	13.3
12	Which session(s) did you find least useful?	No comment	13	86.7
		Material preparation and resources	1	6.7
		Practical session	1	6.7
13	What other information (if any) would you have liked to receive?	Information on international markets	1	6.7
		Information on processing other fruits	2	13.3
		More practical training	2	13.3
		More information on post-harvest handling	2	13.3
		More processing flowcharts	2	13.3
		More information on marketing	1	6.7
		Information on drying of lychee and mango	1	6.7
		More detailed information about the fruits	1	6.7
14	Do you have any other suggestions for improvement of the training course?	Training course should be longer	2	13.3
		Manual should be translated into Vietnamese	1	6.7
		Lunchbreak should be longer	1	6.7
		More time for practical training	1	6.7
		More time for discussion and exchange	1	6.7
		RIFAV should come to local areas to give instructions during fruit season	1	6.7
15	Do you have any other comments?	Thanks a lot	1	6.7
		Manual should be translated into Vietnamese	1	6.7

Number of participants who handed in the overall evaluation form: 15