

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

**DFID Forestry Research Programme**

**Project number: R7187B**

**Training workshop in Sri Lanka, 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 Sri Lanka from the 9<sup>th</sup> to the 12<sup>th</sup> August 2004. The workshop was hosted by the Horticultural Research and Development Institute (HORDI) of the Agricultural University at Gannaruwa, Kandy.

The training sessions were organised and delivered by Elke Peiler (ICUC) and Susan Azam-Ali (Independent consultant). Staff from the Industrial Technology Institute (ITI) and HORDI also presented some of the theoretical sessions and led the practical demonstrations. Due to the timings of the Course, Dr Azam-Ali was only present for the first day. Subsequent sessions on processing were delivered by staff from ITI. This report only covers the first day of the Course.

Twenty six participants took part in the training. They were a mixture of private entrepreneurs (11), NGO staff (mainly Sarvodya) (6), and Government employees (9).

The course concentrated on three under-utilised fruit species:

- Jack fruit (*Artocarpus heterophyllus*)
- Bael (belli) (*Aegle marmelos*)
- Sugar apple (*Annona squamosa*)

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.

On the first day, two practical processing sessions were held. The products made during these sessions were:

Bael jam and bael leather.

Trainees evaluated the course at the end of each day and did 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 fourth training course was held in Sri Lanka from the 9<sup>th</sup> to 12<sup>th</sup> August 2004. The course was held at the Horticultural Research and Development Institute (HORDI) at Gannaruwa, Kandy.

### 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 (only present on the first day)
ITI staff:	
Dr Shanti Wilson	Post harvest storage and handling
Dr Agnes Fernando	Processing technology
Dr Malinee Abesekara	Processing technology
Dr Dhamitri Rajapakse	Processing technology
Ilmi Hewajulige	Post harvest storage and handling
ACUC:	
Mr Asanka	Translation

### Course participants

Twenty six participants took part in the training programme (see Appendix 1 for a list of participants). Out of the twenty six, 11 trainees were from private companies, 6 were from the NGO Sarvodya and 9 were from Government Institutions and worked as extension officers (4), in the food processing unit (1) as an agriculture instructor (2) and two research students.

Most participants could communicate in English, although the majority of training sessions were translated into Sinhala.

### 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 and Sinhalese versions of 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 Sri Lanka are:

Jackfruit (*Artocarpus heterophyllus*)

Bael fruit (*Aegle marmelos*)

Sugar apple (*Annona squamous*)

At the time of training, all three fruits were available for processing.

## 2. REPORT ON TRAINING SESSIONS

This section gives an overview of the topics and material covered during the first day of training.

### DAY 1

#### Session 1. Welcome address and finding out about each other

A formal welcome address was organised by HORDI;

Welcome Address                      Dr Siriwardena (Head of Food Research Unit), Dr  
Weeraseena (DG Agriculture), Professor Gunasena  
(University of Agriculture, UTFANET Coordinator), Dr  
Kudagamage (Director, HORDI)

Welcome on behalf of ICUC      Elke Peiler

Introduction of Participants

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

#### Experience and products being made by trainees

Pulp processing
Wood apple ready to serve beverage
Canned jackfruit
Tamarind paste
Coconut oil
Sarvodya- national jackfruit processing centre
Fresh cut vegetables (Sarvodya)
Supplying packaging
Exporting fruit and vegetables
Mushrooms
Organic farming
Bottled sauces
Bottling of fruits and vegetables

#### 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	Number of participants
Improved technology for processing jam/jelly for export market	1
Quality assurance aspects for international market	3
Technology on drying	3
Technology on packaging	4
Improved technology on preservation and processing in general	9
Technology for post-harvest and storage	1
How to find marketable products from underutilised fruits	8
Find out problems and shortcomings of existing products	1

How to distribute knowledge to rural communities	4
Information on products that can be made from under-utilised fruits	1
Information on nutritional value of under-utilised fruits	3
How to market products from under-utilised fruits	2
How to establish a fruit processing business	2
Aspects of presentation and appearance of products	1
How to fix the price for products	1
Legal aspects	1

## **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. (SAA)
- Record keeping during processing as a form of quality assurance and control. (SAA)
- The importance of good hygienic practice in the prevention of food poisoning and the production of high quality products. (SAA)
- 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. (SAA)
- Critical points of quality assurance (ITI)
- Basics of hygiene (ITI)

## **Session 3. Post harvest handling and storage**

- General information on post harvest principles (ITI)
- Specific information on bael, jackfruit and soursop (ITI)

## **Session 4. Principles of processing fruit pulp, jam, jelly and leather**

- The basic principles of processing fruit pulp for long term storage, jam and leather. (SAA)
- Record keeping (ITI)
- Batch calculation (ITI)

## **Session 5. Preparation of bael jam and bael leather**

A practical session in which Dr Rajapakse and Dr Fernando demonstrated how to prepare bael jam and bael leather. The trainees split into five groups, all making the products at the same time. (See Appendix 3 for the recipes and process used).

## **Session 6. 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 HORDI were excellent. The staff had put a lot of effort into the planning and organisation of the workshop, which paid off in terms of the smooth running of the practical sessions. The room had five separate work stations that were all equipped with basic processing equipment. This meant that the trainees were able to split into five smaller groups for the practical sessions, which allowed them all to participate in the preparation of the products. At the end of the sessions, we were able to compare the products made by each group and to discuss the technical reasons behind any differences in texture, colour and appearance of the product.

## **3. LESSONS LEARNED**

### **Course content**

The first day of the training course was well received by the participants. Most of the sessions were of relevance to the majority of the trainees.

### **Practical sessions**

Participants were keen to learn how to make as many products as possible. The sessions were well organised, with plenty of space and adequate facilities for five groups of people to process at the same time. Processing experts from ITI and HORDI led the practical demonstrations and were assisted by staff from HORDI.

### **Course venue and facilities**

Many thanks to Dr Siriwardena and Dr Kudagamage and colleagues at HORDI for hosting the training in Gannaruwa and for making sure that everyone's needs were accommodated. The training room was well equipped, all materials were available and photocopying facilities were readily available. The processing room was an ideal training venue.

The accommodation was very comfortable and within walking distance of the training centre.

### **Length of the course**

I would have liked to participate in more than just the first day of the training, but other commitments prevented this.

### **Resource staff**

The resource staff at HORDI and ITI 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, processing and legal aspects of food processing.

### **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

Although I was only at the training workshop for one day, my feelings from this day were positive. The trainees seemed to enjoy the course and the practical sessions. The information appeared to be pitched at the correct level for the majority of participants. The whole course was very well organised, with input from a range of people and organisations, thus ensuring that the participants were presented with a broad range of information.

## 4. RECOMMENDATIONS

1. The training facilities were very good and the practical sessions well organised, which meant that all trainees could participate in each session.
2. There is some concern among partners about who will be responsible for ensuring that the next phase of the project goes ahead (ie the training of beneficiaries and development of Resource Centres). It may be advisable to offer support to the partners and Resource Centres and to monitor progress before it gets too late.
3. Contact RIFAV in Vietnam before the next course begins to discuss the availability of resource staff and plan for their input into the course.

## 5. ITINERARY

7<sup>th</sup> August      Bangalore to Colombo  
8<sup>th</sup> August      Colombo to Kandy  
9<sup>th</sup> August      Day 1 of training course (Course ran from the 9<sup>th</sup> to 12<sup>th</sup> of August)  
10<sup>th</sup> August     Colombo to London

## 6. CONTACTS

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Dr Weeraseema  
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HORDI  
Gannaruwa

Dr Kudagama  
Director  
HORDI

Dr Siriwardena  
Head, food Research Unit  
HORDI

**APPENDIX 1 - LIST OF PARTICIPANTS**

**Sri Lanka – 9<sup>th</sup> - 12<sup>th</sup> August 2004**

Name	Resource Centre	Office Add.	Private Add.	Contact Details		
				Tel; office	Tel; Private	E-mail
1. VV Ajantha Shantha Kumara	SEEDS	Manager, Food Technology Centre, SEEDS (Gte.) Ltd., No.45 Rawatawatte Road, Moratuwa.	Maddumagewaththa, Uluwetike, Galle.	011-5558081-5	0914-381614	reds@slt.lk
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4. JS.Pathirana	SEEDS	Enterprise Promotion Officer/Matara, SEEDS (Gte.) Ltd., No.12/63, Sri Dharmarama Mawatha, Fort, Matara.	Enterprise Promotion Officer/Matara, SEEDS (Gte.) Ltd., No.12/63, Sri Dharmarama Mawatha, Fort, Matara.	041-22223907	0722-858290	
5. Ananda Jayaweera	SEEDS	SEEDS (Gte.) Ltd., 1/292, Wakkwella Road, Galle.	Allathanabaddegama, Elpitiya	091-2242185	-	-
6. GGD.Lalani	HORDI	Inservice Training Centre, Angunakolapellessa.	No.87, Muruthawala, Pasyala	047-2228266	033-2286794	-
7. Dhammika Sarathchandra Premasiri	HORDI	Horticultural Crop Research and Development Institute, P.O.Box 11, Gannoruwa, Peredeniya.	B-2 Niwasa, Kolongalla, Hiriwadunna, Kagalle.	081-2388011-3	-	-
8. D Upali E A Senanayake	HORDI	Sumiri Products, Marandaghawala Watta Nagoda Road, Kananvila, Kaluthara	Sumiri Products, Marandaghawala Watta, District Agriculture Training Centre, Nagoda Road, Kananvila, Kaluthara	034-2224594	-	-
9. DHN.Roshantha	IPHT	-	99, Sembukattiya, Madampe(NWP)		047-2288131	
10. UG Sisira Vimalgunarathna	HORDI	Swashakthi Kala Medura, Ralaganvila, Gallalla, Rathnapura	-	045-2248118	-	-
11. Mr. BMKR Banneheka	HORDI	TIDY LANKA MARKETING, Jayaranjana Enterprises, Madampe Road, Kurudalpotha, Matale	-	-	0777-608354	-
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		Gannoruwa, Peredeniya.				
14.LGA Diwulla	HORDI		No. 10, Bogahalanda Estate, Kaineka, Kaikawala, Matale	-	0722-573827	-
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16. Niroshini Gunawardhana	HORDI	"Weerya Seva Sandaya" No. 01, Thibbotuwawa, Jak Resources Centre Ambul Ambe Road, Werellapana, Rambukkana	Godagardeniya, Rambukkana	035-2266461	-	-
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21.NG Ramyalatha	HORDI	District Agriculture Training Centre, Kananvila, Horana	District Agriculture Training Centre, Kananvila, Horana	034-2261107	-	-
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25. WH Thilak P Nawaratna	Agriculture School Student/ HORDI	-	No-24, Waldeniya Road, Kegalle	-	.35-2230944	-
26.) S.Kumudini	University Research Student/ HORDI	FRIS, Gannoruwa, Peradeniya.	St. Jude Street, Pesalai, Manner	-	0776577643	

## **APPENDIX 2 – OUTLINE OF TRAINING COURSE**

**Programme, Sri Lanka: 9<sup>th</sup> to 12<sup>th</sup> August 2004**

**Day 1: start 9:00 h**

**Session 1: Group session**

- Welcome HORDI and ITI
- 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
  - Share experiences
  - What products they would like to make etc

**Tea break: 15 minutes**

**Session 2:**

- Overview of quality assurance and hygiene (Susan Azam-Ali)
  - Critical points of QA (ITI)
  - Basics of hygiene (ITI)

**Session 3:**

- Post-harvest handling and storage
  - Introduction (Susan Azam-Ali)
  - Post-harvest handling of jack, beli and soursop - ITI

**Lunch: 12:30 – 13:30 h**

**Session 4:**

- Presentation of products: Fruit pulp, jam and jelly
  - Introduction (Susan Azam-Ali)
  - Record keeping (ITI)
  - Batch calculation (ITI)
  - Emphasis on quality assurance throughout (ITI)

**Session 5:**

- Preparation of products: bael jam and bael leather (ITI)

**Session 6:**

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

**Day 2: start 9:00 h**

**Session 1: Group session**

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

**Session 2:**

- Theory on minimal processing of jackfruit (ITI)

**Tea break: 15 minutes**

**Session 3:**

- Legal regulations: labelling (ITI)

**Session 4:**

- Practical session (ITI)
  - Demonstration of minimal processing of jackfruit
  - Preparation of jackfruit-pineapple jam
  - Preparation of dehydrated jackfruit

**Lunch: 12:30 - 13:30 h**

**Session 5:**

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

**Session 6:**

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

**Session 7: in groups**

- Label design: design label for one product

**Session 8: Group review session**

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

**End: 17:30**

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**Day 3: start 9:00 h (if possible earlier)**

**Session 1: Group session**

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

**Session 2: in groups**

- How to carry out a market survey (Elke)
  - Exercise: Consumer survey

**Tea break: 15 minutes**

**Session 3:**

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

**Session 4:**

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

**Session 5:**

- Marketing issues (Elke)

**Lunch: 13:30 – 14:30 h**

**Session 6:**

- Theory on processing of juice, beverages (HORDI)

**Session 7:** (trainees split into groups of 4-5 people) (HORDI)

- Preparation of soursop RTS beverage
  - Record keeping
  - Batch calculation
  - Emphasis on quality assurance throughout

**Session 8:** (trainees split into groups of 4-5 people) (HORDI)

- Preparation of bael cordial
  - Record keeping
  - Batch calculation
  - Emphasis on quality assurance throughout

**Session 9: in groups (homework)**

- Exercise: Preparation of a business plan

**Session 10: Group review session**

- Questions, problems
- Plan for day 4
- Distribution of evaluation forms: overall opinion
- Evaluation of day 3

**End: 17:30 h**

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**Day 4: start at 9:00 h (if possible earlier)**

**Session 1: Group session**

- Aims of the day

**Session 2: Group session**

- Presentation of business plan by working groups

**Tea break: 15 minutes**

**Session 3:**

- Establishing processing facilities (Elke)

**Session 4:**

- Management (Elke)
- Record keeping (Elke)

**Session 5:**

- Legal aspects (HORDI)

**Session 6:**

- Theory on how to prepare fruit leather (HORDI)

**Session 7:**

- Preparation of bael leather (HORDI)

**Lunch: 13:30 – 14:30 h**

**Session 8: Group review session**

- Questions
- Feedback
- Evaluation of the course
- Certificates
- Close

**End: 16:00 h**

## **APPENDIX 3 - PRODUCTS**

### **Bael jam**

Bael jam was prepared according to the recipe in the training manual.

1kg bael pulp  
1kg sugar  
10g pectin (up to 1%)  
5g citric acid

1. Remove bael pulp from the fruits. Add an equal amount of water and mix the pulp.
2. Filter the pulp, remove seeds and fibres.
3. Mix sugar with pectin and add to the pulp.
4. Heat, stirring occasionally to prevent burning. Check the sugar content periodically.
5. Continue heating until the mixture reduces by half. Dissolve the citric acid in water and add to the mix.
6. 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.
7. Cap the jars, cool and label.

### **Bael leather**

1kg Bael pulp 200g sugar (20% weight of fruit)

1. Scoop out bael flesh. Mix with water (1:1).
2. Sieve the pulp to remove fibres and seeds.
3. Add sugar.
4. Heat in a stainless steel pan until mixture is concentrated.
5. Pour onto greaseproof paper. Place in a cabinet drier at 45-50°C.
6. Dry overnight until moisture content is about 14-15%.



## 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	5	22.7
		Good	9	40.9
		Average	7	31.8
		Poor	1	4.5
		Very poor		
2	Overview quality assurance and hygiene	Very good	7	31.8
		Good	15	68.2
		Average		
		Poor		
		Very poor		
3	Post-harvest handling and storage	Very good	4	18.2
		Good	11	50.0
		Average	7	31.8
		Poor		
		Very poor		
4	Principles of the preparation of puree and jam	Very good	6	27.3
		Good	10	45.5
		Average	5	22.7
		Poor	1	4.5
		Very poor		
5	Grading and sorting of fruits	Very good	3	13.6
		Good	8	36.4
		Average	8	36.4
		Poor	3	13.6
		Very poor		
6	Preparation of bael products	Very good	9	40.9
		Good	11	50.0
		Average	2	9.1
		Poor		
		Very poor		

Total number participants present day 1: 22