

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

DFID Forestry Research Programme

Project number: R7187B

Training workshop in Bangladesh, June 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 Bangladesh from the 20th to the 23rd June 2004. The Centre for Mass Education in the Sciences (CMES), one of the project partners, hosted the workshop at their headquarters in Dhaka.

Staff from the Horticultural Research Centre (HRC) of the Bangladesh Agricultural Research Institute (BARI) provided assistance with translation and post-harvest and processing issues.

Twenty-two participants (7 male and 15 female) from four partner organisations (CMES, CISD, GUK and Chetona) took part in the training. These trainees will be the master trainers for their respective organisations.

The course concentrated on three under-utilised fruit species:

- Jack fruit (Khatal) (*Artocarpus heterophyllus*)
- Ber (boroi) (*Ziziphus mauritania*)
- Tamarind (tatul) (*Tamarindus indica*)

The training course was a mixture of practical and theoretical sessions on post-harvest, 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.

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

Jack fruit pickle, jackfruit in brine, jackfruit in syrup, mixed jackfruit and mango jam, Tamarind chutney, ber chutney

There were two practical marketing exercises:

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 first training course was held in Bangladesh from the 20th to the 23rd June 2004.

Resource persons

The following personnel were involved in delivering the training, translating between English and Bangla and demonstrating the preparation of fruit products.

Ms Elke Peiler (ICUC).	Marketing and business planning
Dr Susan Azam-Ali	Post harvest handling and processing
Dr Kabir (HRC)	Post harvest specialist – translation
Dr Azad (HRC)	Production specialist – translation and welcome
Mr Alamgir (HRC)	Post harvest specialist - translation
Mr Mohammad Ali (CISD)	Demonstration of the preparation of fruit products.

Course participants

Twenty-two participants (15 women and 7 men) from four partner organisations (CMES, Chetona, CISD and GUK¹) took part in the training programme (see Appendix 1 for a list of participants). The participants were selected by their respective organisations. They will become master trainers within the organisation, 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 for income generation with the beneficiaries of their organisation. Approximately three quarters of participants had a basic understanding of English. About one quarter of participants did not speak English.

Course outline

The material covered in the training course was based on the information contained within the training manuals that were prepared by ICUC. Unfortunately the Bangla versions of the manual were not available in time for the workshop. Five English copies of the manual were available (one per partner organisation). In addition, the technical flow sheets had been translated into Bangla by CMES and were available for reference.

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

Fruits selected for inclusion in the course

Partner organisations selected three fruits that are of importance in their country. The fruits selected in Bangladesh are:

- Jack fruit (Khatal) (*Artocarpus heterophyllus*)
- Ber (boroi) (*Ziziphus mauritania*)
- Tamarind (tatul) (*Tamarindus indica*)

¹ CMES – Centre for Mass Education in the Sciences
CISD – Centre for Integrated Social Development
GUK – Gono Unnayan Kendra

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

After the welcome speeches by Dr Ibrahim, the Director of CMES, Dr Azad of HRC and Elke Peiler of ICUC, there was a short session to find out about the participants' backgrounds, their involvement with processing the three fruit species, 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.

Summary of results:

Problems participants are facing when processing fruits	No. of participants
Marketing of products	15
Preservation of products/fungus problems/odour storage	16
Packaging	5
Supply of ingredients for processing	3
Use of preservatives	3
Right formula and technology for processing	3
Finance/how to make processed fruits profitable	4
Quality control	1
Communication	1

Expectations from the course

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

Summary of results:

Subjects participants would like to learn during training course	No. of participants
Strategies of marketing	2
Various formula for processing fruits	3
How to use preservatives in a correct way	2
Temperatures during food processing	1
International standards for pickles and jam	1
Processing technology for jackfruit	1
Preparation of jackfruit pickle	11
Preparation of jackfruit jam	1
Preparation of tamarind pickle/chutney	5
Preparation of mango pickle	1
Preparation of olive pickle	2
Preparation of mango juice	1
Preparation of jams/jellies and juices from various fruits	6
Preparation of papaya jelly	1
Preparation of banana chips	2
Preparation of candies	3
Preparation of channa chur	3

Preservation of fruits general	5
Preservation of jackfruit	4
Preservation of guava	1
Preservation of banana	1
Preservation of lychee	2
Preservation of mango	1
Preservation of lotcon	1
How to make processed fruits profitable	2
Packaging technology	5
How to establish processing facilities	1

The information presented during these sessions was used to amend the original training programme. It was apparent from the participants' problems and expectations that marketing and correct preservation (shelf life stability) were two of the major problems. It was also apparent that they wished to learn how to process a range of fruits and products. As a result of the initial session, the programme was adapted to include two extra 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. 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. Post harvest handling and storage

A theoretical session that covered the basic points of post harvest handling and storage. Trainees took part in an exercise to highlight the importance of good quality assurance throughout the post harvest chain, from the collection to the storage and/or processing of raw materials.

- 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. The ideal fruit for the sorting and grading exercise was ber, but the fresh fruit season had passed and the only fruits available were dried ones.

Session 4. 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 5. Preparation of tamarind chutney

A practical session in which Mohammed Ali demonstrated how to prepare tamarind chutney to the whole group.

The recipe in the manual was adapted to suit local tastes (see Appendix 3 for the recipe 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 room was rather small to accommodate 22 trainees. Consequently the practical session was rather chaotic and disorganised. Instead of all four groups of trainees making the product at the same time as the demonstrator, a few participants were involved in the process while the rest watched. A few participants scored this session as average in the evaluation. It is possible that the overcrowding was a factor. For the practical session on day 2 the group was halved and two identical sessions were held. One group carried out a consumer survey exercise while the other group prepared the jackfruit in brine. They swapped over so both groups did both exercises.

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. 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 carried out on another group.

Session 4. Preparation of jackfruit in brine

A practical session in which Mohammad Ali demonstrated how to prepare jackfruit in brine for long term (up to 3 months) preservation. The brined jackfruit was also used for the preparation of jackfruit pickle on the following day (see Appendix 3).

Session 5. Preparation of jackfruit in syrup

A practical session in which Mohammad Ali demonstrated how to prepare jackfruit bulbs in syrup – a method of preserving ripe jackfruit for consumption as a fruit later in the season (see Appendix 3).

Preparation of mixed jackfruit jam

Mohammad Ali demonstrated how to prepare mixed jackfruit jam (using a mixture of jackfruit and mango) (see Appendix 3).

Session 6. 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.

The original plan was to do this type of group feedback at the end of each day session. However, the day sessions were very long, so a decision was made to hold the feedback session at the start of the following day.

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

Trainers opinions

Overall, the day seemed to be more organised than the previous day.

Splitting the group into two halves for the first practical session was useful as it gave everyone the opportunity to be involved.

Ideally, the same process would have been repeated for the other two practical sessions, but time did not permit this arrangement. The trainees preferred to see how to make two different products rather than repeat the sessions.

To facilitate the practical session, one trainee from each of the four NGO's was selected to do the practical. The remaining trainees all stood around the edge of the processing room where they could observe and ask questions.

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. Principles of jam making

A theoretical session that explained the basic principles of jam and jelly preparation. During the practical session on the previous day there was a lot of discussion about the formulation of jam recipes, so it was felt necessary to hold a session that clarified some of the issues. 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 3. 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 4. 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 5. Preparation of jackfruit pickle

A practical session in which Mohammad Ali demonstrated how to prepare jackfruit pickle using the green jackfruit soaked in brine the previous day. The recipe in the manual was adapted to suit local tastes (see Appendix 3).

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 a business plan.

A practical session during which participants split into groups to prepare their own business plan, based on the information they had received in the preceding sessions.

Session 8. Preparation of ber chutney I: washing and soaking fruits

A practical session during which the dried ber were sorted, washed and soaked in water overnight for the preparation of chutney the following day.

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

The day went well. The practical sessions ran smoothly with all participants in one place. The main criticism would be that there was not enough time to cover all the topics in sufficient depth.

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. Legal aspects

A theoretical session that gave an overview of legal aspects that should be taken into consideration when running a business. This was followed by a 'real-life' example from Dr Yasmin Sultana (CISD) who shared her experiences of establishing a small food processing business at CISD. This was very useful as it gave participants an insight into the various hurdles that need to be crossed when establishing and registering a business in Bangladesh.

Session 4. Preparation of ber chutney II. Preparation of the chutney

A practical session in which Mohammad Ali demonstrated how to prepare ber chutney.

Session 5. Example of a gross-profit calculation of a small-scale fruit processing enterprise. Establishing processing facilities.

A theoretical session in which Mohammad Ali presented an example of the calculation of profit for a small-scale fruit processing enterprise.

A theoretical session on the basics of establishing processing facilities.

Session 6. Feedback, questions, evaluation, certificates, close

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.

Dr Ibrahim (CMES) gave a closing speech and presented all participants with a certificate of achievement.

Trainers opinions

The day went well. It was very useful to have practical examples based on real life experience. Again, the main criticism would be that there was not enough time to cover all the topics in sufficient depth.

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. The original plan had been to make a wide range of different products and to include a juice or fruit drink in the product range. However, after consultation with the trainees and the resource people, it was decided that juices from these three fruits were not appropriate as they would not be popular products in Bangladesh. Hence, three different types of pickle and chutney were prepared, together with a jam and fruit preserved in syrup and brine.

The recipe and process for making fruit leather were described, but this could not be demonstrated as there was no dryer available.

Course venue and facilities

Many thanks to Dr Ibrahim and his colleagues at CMES for hosting the training in Dhaka at short notice and for making sure that everyone's needs were accommodated. The only minor criticism is that the processing room was rather small to comfortably fit twenty plus trainees. However, this did not prevent the trainees from taking part in all the practical sessions and making a wide range of products. Everyone worked well to make the most of the situation and to get the most out of the course.

Length of the course

The four days of training were very intensive, but made very good use of the participants and the trainers' time. The days were long and everyone was very tired at the end of each day. Unfortunately some of the planned sessions were dropped due to a lack of time. It might have been better to run the course over 5 days, but this would have incurred extra costs (financial and time-wise) to all involved.

Resource staff

We were fortunate to have the assistance of Mohammad Ali to demonstrate the products. He has hands-on experience of processing these fruits and is able to explain the process well.

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 in the remaining four countries

General

The education level of the participants was quite varied. The course aimed to please everybody so might not have been as effective as it could have been if everyone was at a similar level. For example, some of the trainees were very interested in the business plan while others seemed to have no interest (or did not understand the subject).

4. RECOMMENDATIONS

1. The training course would have been improved if the participants each had a copy of the manual, preferably translated into Bangla. Several trainees mentioned this in the end of course evaluation. Although many of them have a basic understanding of English, the manuals will be of more use to them and their organisations if they are completely translated into Bangla.
2. Marketing of the products is an issue that most of the trainees have problems with, therefore it is important that the information on marketing is also translated into Bangla. For future training courses in Sri Lanka, India, Nepal and Vietnam, it will be beneficial if the partners can at least copy the manuals so that each trainee has a copy for reference.

3. Technical support. It is likely that the trainees will require further technical support when they begin to demonstrate the products to their beneficiaries. In this respect, it would be useful for the trainers to have access to a central resource person (such as Mohammad Ali) who can re-demonstrate the preparation of the products if required. Maybe the project can make allowances for this type of back-up support.
4. Development of training material. Some of the training material used in Bangladesh should be modified before the courses are held in India, Nepal, Sri Lanka and Vietnam. The following post harvest and processing sessions will be improved:
 - a. Post harvest handling – the material will be more fruit specific rather than general information.
 - b. Grading exercise. This will depend on the availability of suitable fruits.
 - c. Preparation of chlorinated water – the need for this type of information will be ascertained before holding the session.
 - d. Presentation of the basic technical details for all products. Regardless of whether products are demonstrated, participants will be given the recipe, flow sheet and processing details for all potential products that can be made from the fruits.

5. VISIT TO SREEPUR

A visit to the CISD resource centre at Sreepur was organised for the first day. This was a very interesting visit as it gave an opportunity to see the processing site, resources available and the type of products being made.

6. ITINERARY

18 th June	London to Dhaka
19 th June	Arrival in Dhaka. Visit to HRC and the resource centre of CISD in Sreepur
20-23 rd June	Training course at CMES, Dhaka
24 th June	Dhaka to London

7. CONTACTS

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APPENDIX 1 - LIST OF PARTICIPANTS

No.	Name	Designation	Organisation
1	Ishrat Jahan	Programme Organiser	CMES
2	Md. Mozammel Haque	Programme Organiser	CMES
3	Md. Moslem Ali	Programme Organiser	CMES
4	Monira Akter	Monitor Supervisor	CMES
5	Md. Monir Hossain	Unit Organiser	CMES
6	Md. Jahangir Hossain	Senior Teacher	CMES
7	Miss Jushna	Field worker	CISD
8	Miss Firoza Begum	Field worker	CISD
9	Miss Talisma	Field worker	CISD
10	Ms. Sonia	Field worker	CISD
11	Ms. Masuda Akter	Field worker	CISD
12	Ms. Ambia Khatun	Director	CHETONA
13	Ms. Jesmin Begum	Project Officer	CHETONA
14	Sufia Khattun	Nutritionist & Programme Coordinator	CHETONA
15	Nasiruddin	Field Supervisor	CHETONA
16	Md. Anwar Hossen	Field Supervisor	CHETONA
17	Samchul Haque	Programme Associate	GUK
18	Mrs. Shamciara Happy	Programme Associate	GUK
19	Md. Golam Mehedi	Programme Associate	GUK
20	Md. Anowarul Haque	Programme Associate	GUK
21	Miss Anita Rani	Development Associate	GUK
22	Mohammad Ali	Technician	HRC/CISD

APPENDIX 2 – OUTLINE OF TRAINING COURSE

Training for the trainers on fruit processing, marketing and business development. Bangladesh: 20th June to 23rd June 2004

Day 1: start 9:00 h

Session 1: Group session

- Welcome Dr. Ibrahim (CMES)
- Welcome Dr. Azad (HRC)
- Welcome Ms. Elke Peiler (ICUC)
- Aims of the course
- Finding out about each other
 - What the trainers do/share experiences
 - 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

Lunch: 13:30 – 14:30 h

Session 4:

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

Tea break: 15 minutes

Session 5:

- Preparation of tamarind chutney including
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Session 6: Group review session

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

End: 17:30 h

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:

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

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

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

Tea break: 15 minutes

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

- Preparation of jackfruit in brine including
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Lunch: 13:30 - 14:30 h

Session 5:

- Preparation of jackfruit in syrup
- Preparation of jackfruit/mango jam including
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Session 6: Group review session

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

End: 17:30

Day 3: start 9:00 h

Session 1: Group session

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

Session 2:

- Principles of jam making

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: (trainees split into groups of 4-5 people)

- Preparation of jackfruit pickle including
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Lunch: 13:30 – 14:30 h

Session 6:

- Marketing issues

Tea break: 15 minutes

Session 7: in groups

- Exercise: Preparation of a business plan

Session 8:

- Preparation of ber pickle – I: Washing and soaking fruits
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Session 9: Group review session

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

End: 17:30 h

Day 4: start at 9:00 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:

- Legal aspects

Tea break: 15 minutes

Session 4:

- Preparation of ber pickle – II
 - Record keeping
 - Batch calculation
 - Emphasis on quality assurance throughout

Lunch: 13:30 – 14:30 h

Session 5:

- Example: Gross-profit calculation of a small-scale fruit processing enterprise
- Establishing processing facilities

Session 6: Group review session

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

End: 16:30 h

APPENDIX 3 - PRODUCTS

Tamarind Chutney

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

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.

Mango and Jackfruit leather

600g mango pulp
400g jackfruit pulp
100g sugar
0.4g KMS

1. Mix all the ingredients together
2. Pour onto a tray, 1cm thickness. Dry in a solar dryer.
3. When the weight has reduced by 60%, add a second layer of pulp.
4. Dry for 2 days in a solar dryer.

Jackfruit in brine

The jackfruit season is very short (about 2-3 months). Holding in brine (8%) is one method of preserving the young bulbs (unripe bulbs that are used for pickling) to make pickle later in the season.

Preparation of brine for storage

80g salt
water to make to 1 litre
1g potassium metabisulphite
13ml acetic acid

1. Dissolve the salt in about 500ml water. Heat if necessary to dissolve the salt.
2. Add the potassium metabisulphite.
3. Add more water to make the volume up to 1 litre.
4. Add acetic acid
5. Remove the unripe bulbs from the jackfruit.
6. Immerse in brine solution. Seal in large plastic barrels or buckets.

Jackfruit bulbs in syrup

Preserved jackfruit in syrup is a way of preserving ripe jackfruit for consumption as a fruit later in the season. It is a similar product to a canned fruit, but with a shorter shelf life.

Ripe jackfruit
Sugar to make a 40% syrup solution
3g citric acid per litre of syrup solution.

1. Prepare sugar syrup. Dissolve 400g sugar in about 500ml 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.
3. Take out the ripe jackfruit bulbs.
4. Place bulbs in clean, sterile glass jars. (Fill to about 75% of the volume).
5. Add syrup to the jars. Fill to the top.
6. Place lids on top of the jars. Do not fasten down. It is important to use metal screw tops lined with lacquer so that they form a good seal with the jar on cooling.
7. Carefully place the jars in a pan of water (hot water bath). Heat the water. Hold at 80°C for twenty minutes to pasteurise.
8. Carefully remove jars from the water. Tighten the screw caps. Invert the jars and leave to cool.
9. Label.

Jackfruit pickle

Brine

50g salt

water to make to 1 litre

Green, unripe jackfruit

Other ingredients (per kg brined jackfruit)

100-150g green mango pulp

60g fresh ginger

30g garlic

20g mustard powder

10g turmeric

20g chilli powder

5g fenugreek

3g cumin

40g salt

150g sugar

15ml acetic acid

600-700ml mustard oil (600ml if only bulbs are used. 700ml if outer flesh is included)

Stage 1.

1. Dissolve the salt in about 500ml water. Heat if necessary to dissolve the salt.
2. Add water to make up to 1 litre.
3. Remove the bulbs from the jackfruit.
4. Immerse in the 5% brine. Keep the bulbs under the brine by weighting down with a heavy weight.
5. Leave to soften in the brine overnight for 24 hours.

Stage 2.

6. Blend the mango, ginger and garlic in a liquidiser. Add water to make into a paste.
7. Add turmeric and chilli powder to the paste.
8. Remove the bulbs from the brine. Wash and drain.
9. Deep fry the bulbs in mustard oil (600-700ml). Remove from the oil when softened.
10. Fry the mango, garlic, ginger paste in the oil remaining in the pan. Stir and cook for a few minutes until it is cooked.
11. Add the fried jackfruit bulbs and sugar to the cooked paste. Mix well.
12. Add cumin, fenugreek and salt. Stir well to mix.
13. Add acetic acid and mustard powder. Mix well.
14. Fill into clean, sterile jars.

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.

1kg jackfruit pulp
1kg mango pulp
1600g sugar
30g pectin
20g citric acid

1. Remove jackfruit bulbs. Liquidise into a pulp.
2. Peel mango. Liquidise into a pulp.
3. Place fruit pulps in a large boiling pan. Check the initial sugar content using a refractometer.
4. Hold back about 150g sugar (about 5 times the weight of pectin). Add the remaining sugar to the fruit. Mix well.
5. Heat, stirring continuously. Check the sugar content periodically.
6. Mix the pectin with the 150g 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.

Ber chutney

1kg dried ber	2g cinnamon
700g-1kg sugar depending upon variety and taste	1g cardamom
5g chilli powder	1g nutmeg
10g mustard powder	1g black pepper
2g cumin	5ml acetic acid
2g aniseed	30g salt
	2g potassium metabisulphite (KMS)

1. Soak ber fruit overnight (12 hours)
2. If the ber is soft after soaking, it is fine. Sometimes it remains hard and needs to be heated to soften it
3. Add sugar to the ber fruit. Heat for about 10-15 minutes until the TSS is 55°.
4. Add all the spices. Mix well and heat.
5. Add the acetic acid and salt. Mix well.
6. Continue heating until the TSS is 60°.
7. Mix the KMS with a little hot water. Add to the chutney, stir well to mix.
8. Pour into clean, sterile jars.

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	6	27.3
		Good	16	72.7
		Average		
		Poor		
		Very poor		
2	Overview quality assurance and hygiene	Very good	6	27.3
		Good	11	50.0
		Average	5	22.7
		Poor		
		Very poor		
3	Post-harvest handling and storage	Very good	4	18.2
		Good	15	68.2
		Average	2	9.1
		Poor	1	4.5
		Very poor		
4	Why products fail	Very good	7	31.8
		Good	12	54.6
		Average	3	13.6
		Poor		
		Very poor		
5	Preparation of tamarind chutney	Very good	9	41.0
		Good	11	50.0
		Average	1	4.5
		Poor	1	4.5
		Very poor		

Total number participants present day 1: 22

Day 2:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 1	Very good	7	35.0
		Good	12	60.0
		Average	1	5.0
		Poor		
		Very poor		
2	Market feasibility	Very good	8	40.0
		Good	10	50.0
		Average	2	10.0
		Poor		
		Very poor		
3	Market survey, Consumer survey	Very good	9	45.0
		Good	10	50.0
		Average	1	5.0
		Poor		
		Very poor		
4	Preparation of jackfruit in brine	Very good	8	40.0
		Good	11	55.0
		Average	1	5.0
		Poor		
		Very poor		
5	Preparation of jackfruit in syrup and jackfruit jam	Very good	7	35.0
		Good	13	65.0
		Average		
		Poor		
		Very poor		

Total number participants present day 2: 20

Day 3:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 2	Very good	14	66.7
		Good	7	33.3
		Average		
		Poor		
		Very poor		
2	Principles of jam making	Very good	9	42.9
		Good	10	47.6
		Average	2	9.5
		Poor		
		Very poor		
3	Technical Feasibility	Very good	9	42.9
		Good	8	38.1
		Average	4	19.0
		Poor		
		Very poor		
4	Financial Feasibility	Very good	8	38.1
		Good	11	52.4
		Average	2	9.5
		Poor		
		Very poor		
5	Preparation of jackfruit pickle	Very good	14	66.7
		Good	7	33.3
		Average		
		Poor		
		Very poor		
6	Marketing issues	Very good	10	47.6
		Good	11	52.4
		Average		
		Poor		
		Very poor		
7	Preparation of business plan	Very good	9	42.9
		Good	7	33.3
		Average	3	14.3
		Poor	2	9.5
		Very poor		

Total number participants present day 3: 21

Day 4:

Session	Session title	Evaluation	No. participants	% of total no. of participants
1	Key learning points of day 3	Very good	11	50.0
		Good	11	50.0
		Average		
		Poor		
		Very poor		
2	Presentation of business plans	Very good	9	40.9
		Good	11	50.0
		Average	2	9.1
		Poor		
		Very poor		
3	Establishment of processing facilities	Very good	8	36.4
		Good	14	63.6
		Average		
		Poor		
		Very poor		
4	Preparation of ber pickle	Very good	18	81.8
		Good	4	18.2
		Average		
		Poor		
		Very poor		
5	Group review session	Very good	11	50.0
		Good	10	45.5
		Average	1	4.5
		Poor		
		Very poor		

Total number participants present day 4: 22

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	8	40.0
		Good	12	60.0
		Average		
		Poor		
		Very poor		
2	Length of training course Was the length of the training course:	Too short	2	10.0
		Just right	11	55.0
		Too long	7	35.0
3	Location of training course and training facilities Were the training facilities to your satisfaction?	Very good	5	25.0
		Good	10	50.0
		Average	5	25.0
		Poor		
		Very poor		
4	Style of presentation Was the style of presentation:	Very good	5	25.0
		Good	13	65.0
		Average	2	10.0
		Poor		
		Very poor		
5	Technical content Was the technical content of the course:	Too technical	4	20.0
		Right level	16	80.0
		Not technical enough		
6	Practical sessions How useful were the practical sessions?	Very good	14	70.0
		Good	6	30.0
		Average		
		Poor		
		Very poor		
7	Theory sessions How useful were the theory sessions?	Very good	5	25.0
		Good	13	65.0
		Average	2	10.0
		Poor		
		Very poor		
8	Balance Theory - Practice How was the balance between theory and practical sessions?	Too much theory and not enough practical training	4	20.0
		Good balance of theory and practice	16	80.0
		Not enough theory		
9	Was the amount of information given each day	Too much		
		Just right	20	100.0
		Too little		

Results of open questions:

10	Which session(s) did you find most useful?	Preservation of jackfruit	6	30.0
		Preparation of jackfruit pickle	9	45.0
		All practical sessions	4	20.0
		Market feasibility	1	5.0
		How to carry out a market survey	2	10.0
		Preparation of business plan	2	10.0
		No answer	7	35.0
11	Which session(s) did you find least useful?	Theory sessions because handout was not distributed	2	10.0
		Label design	1	5.0
		Preparation of mixed jackfruit and mango jam	6	30.0
		All sessions were useful	3	15.0
		No answer	8	40.0
12	What other information (if any) would you have liked to receive?	Processing of other fruit pickles (e.g. mango)	2	10.0
		Processing of other fruit jams	1	5.0
		Processing of juices	2	10.0
		Processing of guava, lotkon and kologam	1	5.0
		Processing of banana chips	1	5.0
		More information of marketing of products in Bangladesh	1	5.0
		Other contents in general	1	5.0
No answer	13	65.0		
13	Do you have any other suggestions for improvement of the training course?	Duration of course should be longer for more practical sessions	2	10.0
		Manual/handouts should be distributed	3	15.0
		Manual/handouts should be prepared in Bengali	1	5.0
		More follow-up training courses should be organised for trainers for them to work more efficient and effective	3	15.0
		Participants of training course should have the same qualification	1	5.0
		No answer	10	50.0
14	Do you have any other comments?	Preparation of more products	2	10.0
		Duration of course should be longer	1	5.0
		Stove in processing room is very dangerous	2	10.0
		Training rooms for practical and theoretical sessions are too small	1	5.0
		No other comments	2	10.0
		No answer	12	60.0

Number of participants who handed in the overall evaluation form: 20