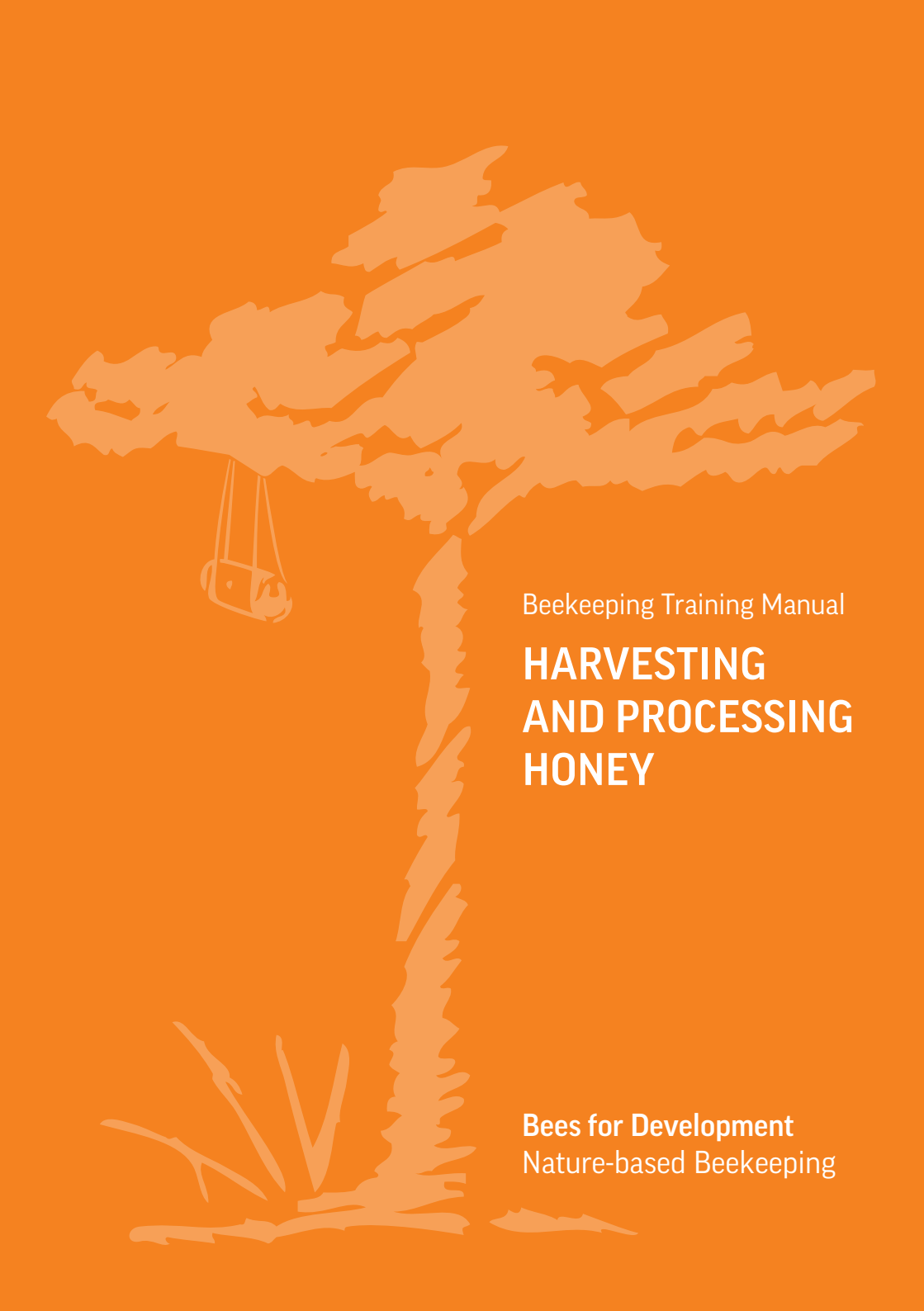




Beekeeping Training Manual

HARVESTING AND PROCESSING HONEY

Bees for Development
Nature-based Beekeeping

Using this Training Manual

This resource is intended for use by beekeeper trainers in tropical Africa and the material can be used as part of a training course. It is always useful to assess the needs of the trainees before delivering the training, to make sure that the topics covered meet their needs. We encourage you to combine theory training with practical sessions. Practical training requires more preparation, for example, you need to identify a suitable venue and assemble the necessary equipment: this is the most effective way for people to learn. Ideas for group reviews, example test questions and tips for trainers are also provided. Words appearing in **bold** are defined in the glossary on page 23.

After learning the topics in this manual, participants will:

- Appreciate the value and different uses of honey
- Have an understanding of issues regarding honey quality
- Be able to identify ripe honey
- Be able to harvest and process honey
- Know how to store honey and package it for sale

Manuals in this series



Bees for Development thanks our generous supporters who make our work possible.

Other resources

A variety of other resources are available from **resources. beesfordevelopment.org**

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This manual was purchased by TUNADO as part of the Beeswax Skills Training Project funded by PSU in 2019. Bees for Development acknowledges all our generous supporters who make our work possible. We particularly acknowledge the Allan and Nesta Ferguson Charitable Settlement for supporting this Information Service.

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Bees capping their honey: as the water content of the honey is reduced, the bees seal the ripe honey with beeswax to preserve it.

HONEY – VALUE, USES AND QUALITY

Bees collect **nectar** from flowers and use it to create honey; during this process enzymes are added and the water content is reduced to around 20%. They store the honey in cells of **honeycomb** and seal these cells when the honey is **ripe**.

Most societies regard honey as a valuable commodity. Honey is widely used as a medicine; its ability to inhibit bacterial growth and absorb water makes it well suited as a wound dressing. It is also used to treat sore throats, coughs, conjunctivitis and gastric problems.

Honey contains minerals, vitamins and other trace elements which are of nutritional value to humans. It is a mixture of sugars which can be digested, easily providing a quick energy source. It is a natural sweetener which can be used as a replacement for sugar in drinks and cooking, used to make alcoholic beverages or simply eaten as it is.

DOES THE TYPE OF HIVE AFFECT THE QUALITY OF MY HONEY?

No. Different bee hives do not produce different qualities of honey. Bees do not differentiate between a fixed comb hive or a movable comb hive. If the bee hives are in the same apiary, with access to the same forage, then the quality and type of honey will be the same.

Ripe honey that has been capped by the bees is clean, pure, perfect quality and ready to harvest. It is impossible to improve the quality of honey through processing. It is the responsibility of the beekeeper to maintain the quality of the honey from harvest through to transport, storage and sale. The low water content of ripe honey enables it to be stored for long periods of time. If the water content is too high it will **ferment**.

The colour and taste of the honey depend on the types of plants on which the bees have foraged. These are characteristics of honey and do not affect the quality. Honey will look and taste different from region to region, and, if marketed well, the unique characteristics of your bees' honey can be very attractive to buyers.

The diversity of bee forage from herbaceous flora, crops and trees produces many different colours and tastes of honey.

GOOD QUALITY HONEY IS:

RIPE

Only harvest honey from combs that the bees have capped.

UNHEATED

Do not expose honey to high levels of heat. This will damage the honey.

CLEAN

Maintain good personal hygiene and use clean equipment.

PURE

The best honey comes from bees not treated with chemicals.

HARVESTING HONEY

EQUIPMENT

- Means of making smoke (e.g. a bundle of sticks or grass or smoker)
- Rope – if your hive is high in a tree you may need a rope to raise your honey bucket or lower the hive
- Protective equipment (especially a veil)
- Hive tool and/or knife
- Container with close-fitting lid

TOP TIPS TO HANDLE BEES SAFELY

Use cool, gentle smoke

To keep the bees calm and encourage them to move to another area

Be gentle

Avoid killing bees and making sudden movements

Work with a partner

To aid and assist one another

A simple veil and smoke are normally enough protection to work safely with bees. The veil can be made locally using a polypropylene sack and some mosquito netting. If you feel safe when harvesting, you will have the confidence to work slowly. This will reduce the temptation to use too much smoke when harvesting. Doing this can destroy large portions of the colony and reduce the quality of the honey. The aim should be always to preserve the colony; never disturb the **brood nest**. Always close the hive properly when finished. Failure to do so will encourage pests.



Gentle use of smoke can calm the bees and encourage them to move.

HARVESTING HONEY FROM FIXED COMB HIVES

Most fixed comb hives in tropical Africa are cylindrical. The bees' entrance (hole) is at one end of the hive. Bees tend to keep their honey away from their entrance, allowing the beekeeper to harvest from the other end of the hive without disturbing the whole colony. This is better for the bees and better for the beekeeper.

STEP 1

Before you visit your hives, make sure your equipment is clean and in good working order and that you have your protective gear.

STEP 2

Careful use of smoke is essential. Make sure your fuel is burning well: you need cool, sweet smoke. Open the bee hive and gently blow smoke inside. This will calm the bees and encourage them to move to the other end. If you discover the brood nest at the opened end, close it and (if your hive allows) open the other end instead.

STEP 3

If sealed honey is found, carefully use a knife to cut the honeycombs from the bee hive. Place each honeycomb into your container and replace the lid immediately. This will protect the honey and keep bees away. Stop harvesting when you reach the brood nest.



Make sure your source of smoke is burning well before visiting the bees.



Blow the smoke gently into the hive to encourage the bees to move.



Using a sharp knife, remove honeycomb from the bee hive.

HARVESTING HONEY FROM TOP-BAR HIVES

Top-bar hives enable the beekeeper to inspect each comb before deciding whether or not to remove it from the hive. Only combs full of ripe, capped honey should be removed. Brood combs or partially filled honeycombs should be left in the hive.

STEP 1

After preparing your equipment, approach the bee hive from behind and smoke. Remove the lid of the hive and smoke across the top-bars. Gently tap on the bars to determine where the combs have been built. The honey area is likely to be furthest from the entrance. Remove two or three empty top-bars from beyond the nest area to create a working space.

STEP 2

Starting at the end furthest from the entrance, inspect each top-bar, examining the comb carefully. As each top-bar is removed, gently smoke inside the hive. Lift out sealed honeycombs and remove the bees using either a brush, feather or bunch of leaves. Use your knife to carefully cut the honeycomb so it falls directly into the bucket. Leave 10mm of wax on the top-bar to act as a starter strip for the bees to rebuild their combs. Put the lid on your container immediately to protect the honey and keep bees away.



Identify the top-bars which contain ripe honey



Carefully cut the honeycomb from the top-bar into a bucket.



Put the lid on your bucket of honey when finished.

MEASURING WATER CONTENT

Honey is **hygroscopic** and readily absorbs water. If the water content of honey is too high it will ferment, which will reduce the quality of the honey.

Beekeepers can ensure that their honey has the correct water content by only harvesting ripe, sealed honeycombs.

You can also test honey with these simple activities:

1. Dip a spoon in honey

Dip a spoon into the honey. Lift the spoon out and observe whether the substance drops immediately. If so, the water content is too high.

2. Drop honey into water

Drop honey into a glass of water and observe. If it sinks without mixing with the water it is likely to be pure, ripe honey. Otherwise it may be **unripe**.

Large-scale honey buyers purchase honey in bulk. It is likely that they will want to store your honey before it is bottled. They may use a device called a **refractometer** to test the water content of your honey. They need to ensure that it is low enough so that the stored honey will not ferment. They will smear a small drop of honey on the prism and look through the eyepiece towards the light. It is possible to read off the figure against the scale where the light meets the dark. This is the percentage of water present in the honey.



A honey refractometer.

POST HARVEST HANDLING – MAINTAINING QUALITY

Maintaining the quality of the honey means doing as little to it as possible. You cannot improve the quality of the honey through processing.

Bits of wax, **propolis**, brood, dead bees and dirt **contaminate** honey. After harvesting your honey correctly, it is important to ensure that the quality of honey is maintained until it is with the consumer.

Honey is a food and as such it must be handled hygienically. The equipment and containers that you use for processing and storage must be completely clean.

Because honey is hygroscopic and readily absorbs moisture from the air, there is a danger that the water content can increase if you do not keep your honey in a container with a close-fitting lid. It is advisable to take two containers when you harvest so that you can separate your **first grade honey** from your **second grade honey** as you harvest. Any second grade honey that you harvest can be consumed at home, used in cooking or for brewing.



Ripe and sealed honeycombs, freshly harvested. Notice how few bees and other items of debris are present.



Honey should always be kept in containers with a close fitting lid.

GENERAL RULES FOR HARVESTING AND PROCESSING HONEY

HONEY IS FOOD FOR THE BEES

Only take surplus honey and leave the rest for the colony. Stop harvesting when you reach the brood.

HONEY QUALITY CANNOT BE IMPROVED

Maintain the quality of the honey by harvesting only ripe combs, apply careful use of smoke and use clean equipment. Different hives produce the same quality of honey.

HONEY IS CONSUMED BY PEOPLE

Honey must be handled hygienically. Only use clean and dry equipment and containers when harvesting, processing and storing your honey. Honey should be clean; harvest carefully to ensure it is free from bees and any contaminants.

HONEY CAN BE DAMAGED BY OVERHEATING

Do not leave your honey in the sun. Placing honey in direct sunlight reduces its quality. Do not allow your honey to crystallise in the comb. Strain or press honey as soon as possible after harvesting to reduce the need for heat during processing.

HONEY ABSORBS MOISTURE

Always store your honey in a container with a close-fitting lid. Do not harvest honey in the rain. This will put stress on the colony and could increase the water content in the honey as well.

HONEY SHOULD BE SETTLED BEFORE PACKAGING

Settling will help to produce a significantly clearer honey which can be more attractive to buyers.

THE HONEY MARKET DEPENDS ON TRUST

Satisfied customers can become regular customers.

SUGGESTED TRAINING PLAN

Title of session*	Learning objectives	Methods of teaching	Additional training resources	Page(s)
Introductions and overview of the day	Explain to participants what they will learn from this training	Participants introduce themselves and any previous beekeeping experience	Board markers, large sheets of cardboard or paper, exercise books, pens	
Honey - value, uses and quality	- Describe what honey is and how it is produced - Appreciate the value of honey and its uses - Distinguish between ripe and unripe honey - Recognise good quality honey and how to maintain it	- Lecture - Group discussion - Activity: Water content tests	- Pure honey - Glasses of water	4, 9
Harvesting honey from fixed comb hives	- Know what equipment is needed to harvest honey from fixed comb hives - Understand how to harvest safely - Recognise that only surplus honey should be removed	- Lecture - Group discussion - Role play - Practical: Harvesting from a fixed comb hive	- Lecture - Group discussion - Role play - Practical: Harvesting from a fixed comb hive	7, 11
Harvesting honey from top-bar hives	- Know what equipment is needed to harvest from top-bar hives - Understand which combs to harvest and how - Explain how to handle bees safely	- Lecture - Group discussion - Role play - Practical: Harvesting from a top-bar hive	- Harvesting equipment - Top-bar hive	8, 11

*Each classroom session is designed to last 30 minutes. Allocate extra time for practicals.

Title of session*	Learning objectives	Methods of teaching	Additional training resources	Page(s)
Review	- Allow participants to reflect on what they have learned - Encourage independent thinking and creativity - Create enthusiasm and motivate participants - Enhance group interaction and the sharing of ideas	- Games - Role plays - Discussion in small groups	Case study scenarios	20
Processing honey	- Describe how honey can be separated from comb using the drip and pressing methods - Know how to identify ripe honey - Know how to process honey hygienically	- Lecture - Group discussion	Honey press (if available)	11, 14
Storing, packaging and selling honey	- Know how honey should be stored to maintain quality - Describe different ways honey can be packaged - Identify potential markets - Recognise crystallisation and how to reverse it	- Lecture - Group discussion	Example bottles and labels	16 - 18
Assessment	- Assess the learning that has taken place - Clarify issues that have not been fully understood - Obtain feedback from participants	- Written or oral quiz - Group discussion and reflection - Questions and answers	Question sheets or plain paper, pens	21

*Each classroom session is designed to last 30 minutes. Allocate extra time for practicals.

PROCESSING HONEY – THE DRIP METHOD

It is best to process honey when it is warm and fresh from the hive. Process in the evening to avoid large numbers of bees visiting and getting into the honey.

STEP 1

If you have whole pieces of honeycomb, break the comb into small pieces, then crush to help release the honey from the cells.



Process your honey as soon as possible after harvesting

STEP 2

Use a strainer or sieve to **filter** the honey. The strainer can be made from clean cotton or cloth. Let the honey drip through the strainer into a clean, dry container.



Place small pieces of crushed honeycomb into a sieve to filter

STEP 3

Cover the honeycombs with a clean cloth to prevent any **contamination** by dust. Seal the container as soon as possible after filtering; exposure to air can increase the water content. Allow the honey to drip overnight in a warm, dark place (the actual time this takes will depend on the ambient temperature). Regularly remove the sticky wax residue and add more honeycomb. The sticky wax residue can be processed into clean **beeswax** later.



Only use clean, food grade containers and put the lid on your bucket when finished.

PROCESSING HONEY – THE PRESSING METHOD

If you have large volumes of honeycomb to process it might be worthwhile to use a honey press. A press is a container for the pieces of comb and a mechanical device to squeeze them. It is advisable to use a cloth bag that fits inside the press to aid filtering. Or, if none are available, place a sieve under the press on top of the receiving bucket. A honey press may yield higher volumes of honey in a shorter period of time compared to the drip method, but they are expensive to buy or make.

Pressed honey may contain a higher proportion of **pollen** which can cause it to look cloudy and become more prone to **crystallisation**. Although this does not affect the quality of the honey, it may reduce its attractiveness to potential buyers. Take care to remove areas of comb containing large amounts of pollen. Pollen can be detected by holding combs towards the sunlight and looking through. Rather than discarding these sections entirely, they can be consumed at home, as pollen is very nutritious. Or the comb can be processed into clean beeswax.

As with the drip method, break the comb into smaller pieces and place them into a cloth bag (if available). The bag is squeezed by the press manually, sometimes with the assistance of a car jack. Let the honey strain directly into a bucket and repeat.



Place the broken combs into the press.



The press works by turning a large handle to increase the pressure on the honeycombs.



As the honeycombs are squeezed, the honey strains into a clean bucket

STORING AND PACKING HONEY

After processing, **do not discard the comb**. It is valuable! Whether dripping or pressing, the leftover wax residue can be processed into clean beeswax and sold. For more information about how to process your comb into clean beeswax, see our training manual on **processing beeswax**.

Honey is a stable commodity with a long shelf life. If harvested carefully and stored in containers with close-fitting lids, it will remain wholesome for several years without the need for refrigeration.

Almost all honey crystallises when it is stored. There is no difference in the nutritional value or the quality between solid and liquid honey. The crystallisation process can be manipulated to create

soft set honey, which some customers may prefer. If soft set honey is required, it is possible to start the crystallisation process by 'seeding' it. You can bring crystallised honey back to its liquid form by standing the honey in a container of warm water (60°C) until it liquefies. Remember, heating reduces the quality of the honey so this should be done only when absolutely necessary.



Bottled honey with a label promoting its provenance (Ethiopia) to a foreign market.

Liquid honey should always be settled before it is packaged for sale. Store the honey with a close fitting lid for two or three days. During this time small bubbles, remaining wax flakes and other impurities will rise up to the surface. **Settling** is the secret to clearer honey.

Honey can also be sold in the comb. Select pieces of new white honeycomb which are sealed and undamaged. Cut them into neat portions and package them carefully for sale. Both the honey and the comb can be eaten.

Comb honey can fetch a higher price (if sold in this way) because the consumer can be sure that the honey has not been contaminated in any way, and honey that has not been exposed to the air has a finer flavour. Use a sharp knife to cut sections of uniform size.

DO NOT LEAVE HONEY IN THE SUN

Many of the substances that contribute to the flavour and special properties of the honey are **volatile compounds** which **evaporate** easily. Placing honey in direct sunlight for long periods reduces the quality.



Notice the air bubbles that are present after using the honey press. Settling will help to produce clearer honey.

SELLING HONEY

Beekeepers need to understand what market best suits their needs. Market opportunities will vary depending on the volume of the honey available. An individual beekeeper may have only small quantities of honey to sell. They can either sell this in the local market at a local price, or join with other beekeepers and bulk their honey together to access more distant markets. Remember: as a general rule of thumb, the more distant the market is, the more stringent the regulations will be to access that market.

A beekeeper in Ethiopia displaying his recent harvest: honey is most commonly sold as comb honey in local markets.



ORGANIC HONEY

African honey is some of the cleanest in the world. Beekeepers in Africa do not treat their bees with veterinary medicines and many colonies (for example in forest beekeeping systems) are kept far away from any sources of pollution or contamination. Because of this, some African honey may be eligible for organic certification. For more information on organic certification, read our *Beekeeping and Development Guide 4*.



The Soil Association Organic logo guarantees that Soil Association rules on organic production have been respected. Products that are certified can display this logo on their packaging.



Honeycomb being sold by the kilogram in Bahir Dar, Ethiopia.
© Milan Wiercx van Rhijn

IDEAS FOR REVIEW

Reviews are designed to motivate participants and reinforce the key messages. Activities should be relevant to the learning objectives of this manual. Instructions must be clear to avoid confusion. Time for group reflection will ensure the intended message has been conveyed.

Pictures

Divide the class into small groups and use the images of comb below to stimulate discussion. Identify the feature depicted in the images.

Which combs are ripe for harvesting and why?

What elements could reduce the quality of the honey?

Demonstration

Volunteers are given the task of demonstrating a technique they have just learned and describing the process to the rest of the class. Other members of the group can help the volunteers by making suggestions if they have forgotten a stage in the process.



FURTHER READING

Honey packaging and labelling for retail

Bees for Development Journal
Edition 114

Honey processing: soft set honey

Bees for Development Journal
Edition 127

How can I tell if honey has been adulterated?

Bees for Development Journal
Edition 88

All of the above can be found at beesfordevelopment.org/journal

USA National Honey Board.

Honey Crystallisation

Accessed at: <http://www.beesfordevelopment.org/media/2774/crystallization.pdf>

Bogdanov, S(2009)

The book of honey

Accessed at: www.bee-hexagon.net/honey

Krell, R(1996)

Value-added products from beekeeping

Rome, Italy: FAO.

Accessed at: www.fao.org/3/w0076e/w0076e00.htm

QUESTIONS FOR ASSESSMENT

At the end of the manual it is good practice to assess whether participants have learned what they need to know. This helps them and it helps you too.

They will be confident that they have learned something, and you will know whether you have achieved the learning objectives. If participants are unable to answer questions, clarification will be required.

Example questions

1. What are the uses of honey?
2. How do you know when honey is ripe?
3. What can contaminate honey?
4. How can the quality of honey be assured?
5. What equipment is needed for harvesting?
6. What should you remove from the hive?
7. How do you handle bees safely?
8. What are the two methods of separating honey from comb?
9. What effects do temperature and moisture have on honey?
10. What is crystallisation?

TRAINING TIPS

1. Preparation is vital. Do some background reading in addition to reading this manual. Participants often ask questions you do not expect. More detailed information is available from beesfordevelopment.org
2. Organise practicals well in advance and ensure that you have all the equipment and training resources needed. Plan your procedures in case of an accident or medical emergency.
3. Learning is enhanced when training is participatory. Ask lots of questions and give participants the opportunity to discuss the subject. Involve participants in practical sessions.
4. Make lessons interesting. Seeing as well as hearing helps participants to understand and remember. Explain things by using examples people can relate to. Share experiences. Humour helps!
5. Adapt resources and teaching style to the training situation. The lesson plan on pages 12 and 13 is suggested only as a guide. Adapt the course content according to the previous experience of the participants. Find out the level of literacy and the preferred language of the group, and adjust your teaching methods to suit.
6. Photocopy sections of this manual and give them as handouts.
7. Reflect on your teaching. What worked and what did not? You could consider asking similar questions to the participants, possibly in the form of an anonymous training evaluation questionnaire.

GLOSSARY

Beeswax

Wax produced by honey bees. It is secreted by glands on the underside of the abdomen and used to build comb.

Brood nest

The combs in which the brood are reared.

Comb

The precise wax structure made of hexagonal cells in which honey bees rear young and store honey and pollen.

Comb honey

Honey in the comb.

Contamination

The process by which something becomes unfit for human consumption through the presence of residues of chemicals, medicines, bacteria, organisms, dirt or waste.

Crystallisation

Sugars in the honey come out of solution and form crystals. The speed of crystallisation is determined by the type of sugars contained in the honey, and the process will be speeded up at lower temperatures.

Evaporation

The process of a substance changing from liquid to vapour.

Fermentation

A chemical change in honey brought about by yeasts. Alcohol may be created during the fermentation process.

Filtration

The process of using a filter or mesh to separate substances. Substances which are too solid to pass through the mesh will be retained (e.g. wax), whereas liquid (e.g. honey) will pass through.

First grade honey

The best honey, suitable for export or for local sale.

Hygroscopic

The ability of a substance to absorb water from the air.

Organic honey

Honey that is free from any residues and pesticides, fertilisers, drug treatments or heavy metals. Honey that meets this criteria can benefit from organic certification.

Pollen

Pollen grains contain the male sperm cells of plants.

Propolis

Plant resins collected by honey bees and used by them to seal cracks and gaps with the hive. It is used by bees to line the nest and line the brood cells - it has anti-microbial qualities.

Ripe honey

Honey with low moisture content and capped with a wax seal in the honeycomb.

Nectar

The sweet liquid secreted by flowers. It is a watery solution of sugars.

Second grade honey

Honey which is not the best; perhaps its water content is too high or it has been spoiled in some way (but not in a way that is harmful to health).

Settling

The process of leaving honey to stand for some hours or days to allow air bubbles and any scraps of wax to float to the top of the honey stored in the tank. This process results in a cleaner and more uniform product ready for storage.

Unripe honey

Honey in cells that has not been fully processed by the bees. The water content is higher than 20% and it has not been covered with a wax capping.

Volatile compound

A substance that evaporates at a relatively low temperature.



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Championing honey bees and insect pollinators

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UK Charity 1198116
ISBN 978 1 898807 39 1

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