



TBT PROGRAMME  
OVERCOMING TECHNICAL BARRIERS TO TRADE



# TRAINING MANUAL GOOD MANUNUFACTURING PRACTICES

HONEY



# What is honey?



- ❖ Honey is the sweet, viscous juice usually collected in the largest quantities from beehives.
- ❖ It is found in cells of the honeybee comb.
- ❖ Mature (ripe) honey is usually found in sealed combs and can be kept indefinitely; unsealed honey is not mature (unripe) and therefore ferments shortly after it is harvested.
- ❖ Honey is used as food, medicine (constipation, duodenal ulcers, liver problems, burns, etc) and as ingredients in medicine (added in cough syrups), food (confectionary industry), making beverages and cosmetic creams.



# Honey

- Honey
  - NIS 473: 20XX Standards for Honey



# Module 1 Standards

## Learning outcomes

- 1.1. Gain familiarity with NIS 473 of 20xx
- 1.2 Understand the key quality parameters of Honey
- 1.3 Understand where and how quality of Honey is assessed

## Teaching strategy:

Learning activities for the trainee must include:

- a) Discuss the content of the standards
- b) Impact of actions during harvesting and processing of Honey on the quality

**Assessment condition: Trainee must be given** access to:

- i) NIS Standards for Honey
- ii) Overview of Honey processing

## Assessment criteria:

Trainees shall be able to demonstrate an understanding of the quality parameters contained in the standard and how these can be affected during production.

**Assessment method: To demonstrate** achievement of the above criteria the trainee will be given:

- oral questions
- or written questions
- Practical demonstration

# Honey – Key issues

- Pesticides .... kill bees
- Water – fermentation and spoilage of honey
- Insect and animal damage to hives and product
  
- Proper care of swarms and hives
- Elimination of water
- Separation and preparation of products

# Honey Quality Standards

| PARAMETER  | REQUIREMENTS<br>(CAC XXX)            | TEST METHODS    |
|--|--------------------------------------|-----------------|
| Moisture content (%) (max)                               | 20.0                                 | IHC( 2009:1(10) |
| Ash content (%) (max)                                    | 0.6                                  | IHC(2009:3(19)  |
| Specific rotation[α]20D                                  | -20.4 to 4.8                         | IHC(2009:11(61) |
| Total acidity (max)                                      | 40 milli-equivalent per 1000 grammes | IHC( 2009:4(24) |
| pH   | 3.42-6.10                            | IHC( 2009:4(24) |
| Sucrose (%) (max)  | 5.0                                  | IHC( 2009:7(42) |
| Reducing sugar calculated as invert sugar (%) (max)      | 65.0                                 | IHC( 2009:7(42) |
| Fructose/dextrose ratio                                  | 106-119:900                          | IHC( 2009:1(10) |
| Water insoluble content (pressed honey) (%) (max)        | 0.5                                  | IHC( 2009:8(55) |
| Water insoluble content (unpressed honey) (%) (max)      | 0.1                                  | IHC( 2009:8(55) |
| Specific density g/litre                                 | 1352-1500                            | IHC( 2009:1(10) |
| Diastase activity (diastase number on Gothe scale) (min) | 8                                    | IHC( 2009:6(35) |
| Electrical conductivity (mS/cm) (min)                    | 0.8                                  | See Appendix F  |
| Hydroxyl methyl furfural content (mg/kg) (max)           | 40.0                                 |                 |
| Fiehes test (detection of technical sugar)               | Negative                             | See Appendix B  |
| Proline content (mg/kg) (min)                            | 10.0                                 | See Appendix A  |
| Honeys with natural low enzyme count                     | 4.0                                  |                 |
| Invertase number (Hadons unit) (min)                     | 10.0                                 | See Appendix E  |
| For Honey with naturally low enzyme count                | 4.0                                  |                 |
| Lugol's reaction (detection of technical sugar)          | Negative                             | See Appendix D  |
| Lund's reaction  | Precipitate formed (0.6-3.0          | See Appendix C  |

| ORGANISM                                       | MAXIMUM LIMITS CAC<br>(cfu/g) | TEST METHODS |
|--|-------------------------------|--------------|
| Total aerobic mesophilic bacterial plate count | 1 x 10 <sup>3</sup>           | AOAC 2012    |
| Mould/yeast                                    | 5.0 X10 <sup>1</sup>          | AOAC 2012    |
| Coliform count                                 | Nil                           | AOAC 2012    |
| E.coli   | Nil                           | AOAC 2012    |

| METAL                   | REQUIREMENTS<br>CAC XXXX | TEST METHODS |
|-------------------------|--------------------------|--------------|
| Arsenic (As)mg/kg (max) | 1.0                      | A0AC 2012    |
| Copper (Cu) mg/kg (max) | 2.0                      | A0AC 2012    |
| Lead (Pb) mg/kg (max)   | 0.5                      | A0AC 2012    |

# Good Manufacture Practices refers to

- location of bee garden,
- equipment and tools management,
- hygiene and work safety,
- apitechnical measures,
- bee feeding,
- health protection,
- premises for honey extracting,
- conditions of storing bee products.



# Special considerations for bee keeping



# Module 2 : Pre-harvest activities in Honey

## Exercise 1: **Setting up Aperies**

Suggested minimum instructional time: **40 minutes**

### **Learning outcomes**

- 1.1 Understand good hive design
- 1.2 Understand good hive location
- 1.3 Understand good site preparation and maintenance

### **Teaching strategy:**

Learning activities for the trainee must include:

- Discussions on elements of setting up and populating hives
- Maintaining and observing hives
- Identifying hive ready for harvesting

**Assessment condition: Trainee must be given** access to:

- i) information and handouts
- ii) Examples of hives
- iii) Examples of honey comb

### **Assessment criteria:**

- 1.1.1 Signs of mature hives are identified correctly
- 1.1.2 Risks associated with bee keeping practice are understood

**Assessment method: To demonstrate** achievement of the above criteria the trainee will be given:

- oral questions
- or written questions
- Practical demonstration

# Bee garden



- **Away from potential contamination**
- **mild airflow (ventilation) and terrain drainage**
- **raised**
- **slightly tilted forward in order to prevent humidity keeping in the bee hive.**

## construction of improved and modern hives



- constructed from durable well-seasoned, dry timber, which is free from knot holes and cracks.
- Timber - good smell that is not offensive to the bees.
- Provide the hygienic means for hand washing : clean water and neutral scent soap



# Equipment and tools



- ❖ Equipment for inserting honey comb bases and top bar should be made of:
- ❖ Stainless material
- ❖ Not rusty,
- ❖ Material which can be easily cleaned and disinfected.

# Protective clothing

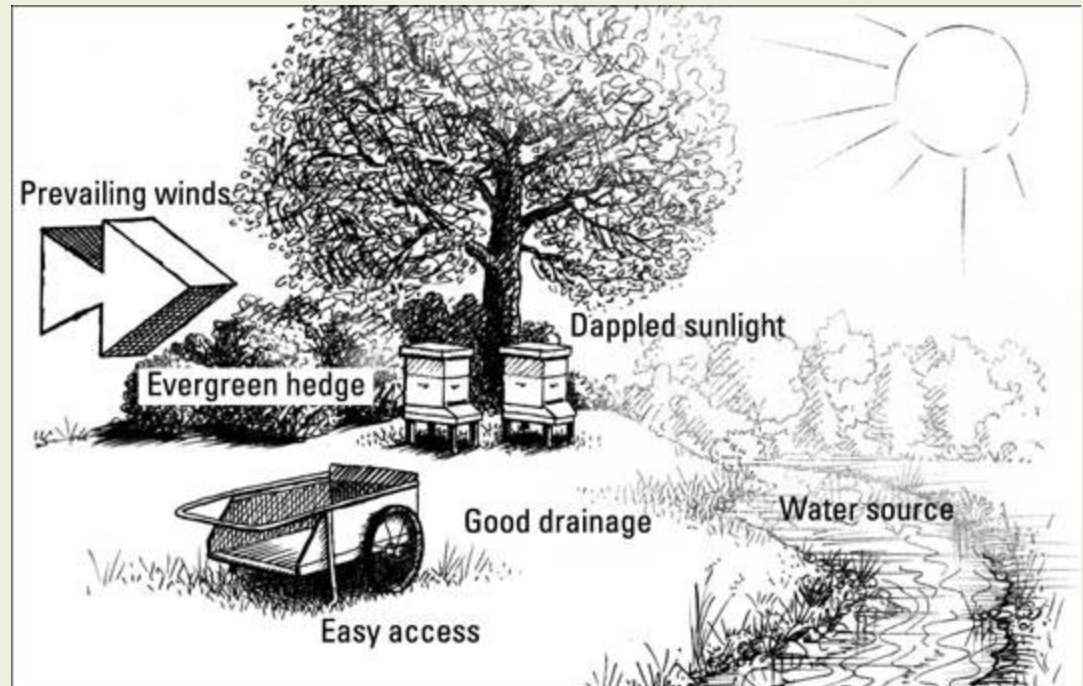


- Protective clothing includes: bee hat with net fabric and/or beekeeping suit (overalls or blouse) and protective booths (or shoes).
- If treating bees with organic acids, the protective clothing consists of gloves of impermeable and non-sorbent material as well as protective glasses



# Recommended practices during installation of hives

- a) site should be slashed, fenced off and protected from the intrusion of animals and humans.
- b) Away from the next beekeeper and appropriate distance from people, livestock, and public places.





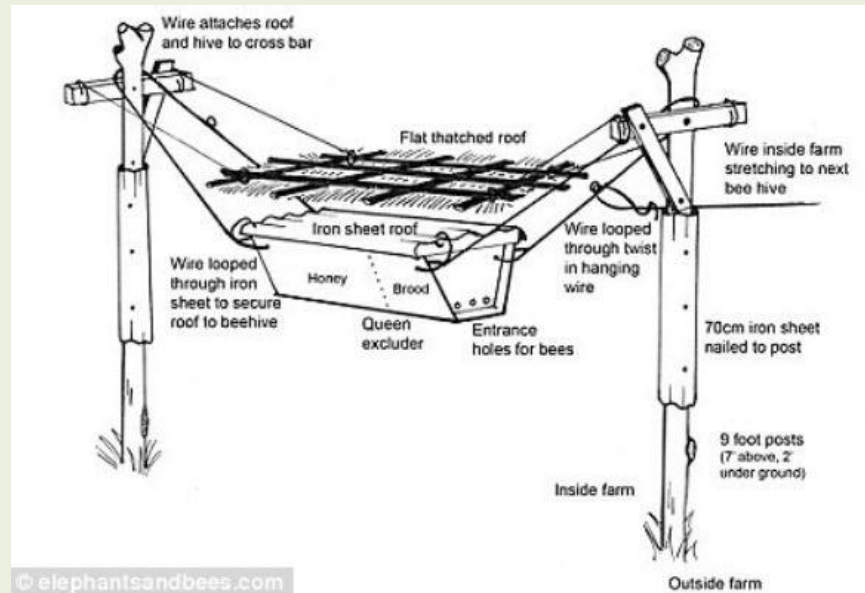
- c) Steep slopes or gradients, should be avoided.
- d) Protected from pests especially termites, black ants.
- e) On strong poles
- f) Where germinating poles are used, pruning shall be done regularly to reduce possibilities of pest infestation.





f) The wire used for hanging hives - smear with grease to prevent attack of ants that could destabilize the colonies.

g) Don't use areas subject to flooding unless sufficient safeguards are provided.



# Top-bar hive



All top bar hives should have top bars with dimension of width of 3.2 cm and a length of approximately 48cm

# Populating the hive

## ***1. Baiting a swarm***

- Use a small hive that has already been inhabited by bees and fill it with frames or top bars; two of the frames should contain combs and the others should have foundation sheets or strips of old comb.
- Place the hive in a tree or on a roof in such a way that there is some protection from the wind.
- Place the hive in its desired place the very day that the swarm has taken occupation of it.
- Baiting is useful only in the swarming season, usually at the beginning of the dry season and end of a cold season.

## ***2. Capturing a swarm***

You may capture a newly settled swarm around a branch of a tree, but make sure you wear protective clothing.

- First sprinkle cold water over the bees with a brush or spray bottle to stop them from moving away.
- Hold a small hive without frames, a basket or a box under the swarm.
- Drive the bees into the hive with a bee brush or smoke.

# Hive inspection

## Check:

- a) Surrounding are not overgrown with grasses - slash;
- b) Evidence of pests especially along the supporting poles, wires or even on the outside of the hive itself; and
- c) For the presence of water in the containers provided as the water source.

Morning or evening hours are considered as being suitable for inspection purposes due to relatively low temperatures and at these times of the day, bees are calmer and less aggressive.

# Indicators and techniques for assessing the presence of mature honey

- The indicators for the presence of mature honey in a hive include:
  - the smell of honey from the hive;
  - clustering of bees outside the hive;
  - bees are observed not to be carrying pollen;
  - bees become more aggressive; or
  - the honeycomb being fully capped or sealed during inspection.
- The state of the local flowering plants can be very useful .... Often mature honey can be obtained when the local flowering plants drop most of their flowers - at this time the bees have capped most of the honey in their nest.

- ❖ During harvesting only sealed/capped combs shall be harvested and then sorted according to colour of the comb.
- ❖ It is a good practice for farmers to keep bee calendar which can provide guidance on the time when harvesting is expected to take place. The bee calendar shall among others indicate the flowering regime of the plants, time of colonisation, time of siting, etc.



# PESTS, PREDATORS AND DISEASES

A number of bee pests, predators and diseases occur and affect to a significant degree the health and productivity of bee colonies world over.

Examples of Bee pests and predators

1. Wax moth, Ants including safari ants, Honey badgers
2. Hawk moths , Man, Cattle
3. Baboons, Termites, Hive beetles
4. Birds, Wasps and hornets Louse
5. Spiders , Lizards, Mice

## **CONTROL**

Maintain hygiene, smoke predators and grease the stand of the hive

# Insecticides and pesticides:

- Pesticides poison bees. A colony can die within 3 hours of exposure to insecticides as they quickly pass it in the nectar to other bees and brood in the hive. A bee spinning on the ground outside the hive is a sign of insecticide poisoning.
- Also bees often die with their tongues sticking out. Keep in touch with other farmers and know when they are spraying. Ask them to spray at night when the bees are not flying.
- When spraying is taking place close your colonies using mesh wire to allow ventilation. **NEVER totally block up the holes** or the bees may die of suffocation!
- Feed the bees with sugar syrup whilst they are enclosed.
- As a last resort move the hives from the area either temporarily or permanently.



# APPLICATION OF BIOPESTICIDES

- ❖ **Tobacco water** - Soak tobacco leaves in water over night with some ashes and some cow's urine. Add a little soap powder and sprinkle this on the affected plants.
- ❖ **Neem Water** - Soak neem leaves and fruits in water over night and sprinkle this on the affected areas. The mixture should be concentrated and taste very bitter. If it does not taste bitter try boiling the leaves in water.
- ❖ **Ashes** - Apply ashes around the affected plants.
- ❖ **Myrrh water** - Soak about 250g myrrh in 7 litres of water for 6-7 days and spray this on the plants.
- ❖ **Datura** - Mix together about a half ( $\frac{1}{2}$ ) kg of dried powdered leaves in 10 litres of water and soak them for 24 hours. Beware that Datura is toxic! Spray on plants but avoid bees and do not spray anything you will eat in the next week.

# Module 3 : Harvest activities in Honey

## Exercise 2: **Harvesting ripe honey hives**

Suggested minimum instructional time: **40 minutes**

### **Learning outcomes**

- 1.1 Safe and sustainable harvesting practice
- 1.2 Signs of mature honey
- 1.3 Risks to product quality associated with harvesting

### **Teaching strategy:**

Learning activities for the trainee must include:

- Discussions on safety
- Discussions on Hive sustainability and regeneration after harvesting

### **Assessment condition: Trainee must be given access to:**

- i) information and handouts
- ii) Examples of hives
- iii) Examples of honey comb

### **Assessment criteria:**

- 1.1.1 Signs of mature hives are identified correctly
- 1.1.2 Risks associated with bee keeping practice are understood

### **Assessment method: To demonstrate** achievement of the above criteria the trainee will be given:

- oral questions
- or written questions
- Practical demonstration

# Preparation for harvesting of honey

## 1 Inspection of the apiary

The apiary shall be inspected to ensure that the conditions are conducive to harvesting of honey; especially the environment should be hygienic and not polluted with agrochemicals, human or animal waste or garbage in general

## 2. Preparation of equipment

Before the harvesting of honey, equipment such as airtight buckets, knives, etc that may come into direct contact with the product shall be washed with potable water and shall be dried properly.

# Techniques for honey harvesting

1. The tools for harvesting include clean airtight honey containers, knives, bee brush or quill feather and hive tool.
  - a) Honey containers may be made of earthenware, stainless steel, or airtight buckets, but shall always be rustproof.
  - b) Safety equipment
  - c) Smoking instruments/materials.

d. Before opening the hive, a minimum amount of smoke shall be puffed into the hive using a smoker.

Then open the hive and, remove the combs one by one (giving a very small puff of smoke, if necessary) and examine the combs carefully.

Empty combs, brood combs, and combs containing both brood and honey or uncapped honey should all be returned to the hive.

- e.) Select only combs that are either full or three quarters full of ripe honey. When such a comb is found, brush any bees on it into the hive and use a knife to cut the comb honey away into an airtight bucket. Close the bucket immediately after the honeycomb is put in.
- f) Leave about 1 cm of the comb on the top-bar to guide the bees to work the next honey crop.
- g) Carry on with the harvest until combs containing honey and brood are reached and at this point harvesting should be stopped as mature honey is finished from the hive.

- h.) Some combs may not be easy to remove because the bees may have attached them to one another (This happens when inadequate space was left between the top-bars) use a hive tool or knife shall be used to separate them.
- i.) In hives where the hive entrance is located in the mid-section (rather than at the end), honey is always found on both sides of the entrance. Harvesting shall start on one side of the entrance, after which treat the other side in the same manner, but leaving ten combs in the middle. The bees will then work faster to produce the next honey crop than if all honeycombs were taken away.
- j.) After removing the surplus honey, rearrange the top-bars carefully in the same manner as before.

# Precautions while harvesting at night

Harvesting at night requires a source of light, It is therefore important that all necessary precautions are taken to ensure that

- a) as few bees as possible are burnt to death by the lanterns or hive torches that are used;
- b) the loss of brood combs shall be minimized;
- c) accidental crushing of bees between top-bars shall also be minimized; and
- d) the bars shall be fitted promptly .



# Precautions while harvesting in daylight

- The following precautionary steps may be taken during harvesting.
  - a) Bring along to the site an empty hive and a container with a lid for carrying the harvested honey.
  - b) Smoke the hive heavily from the outside to force the "security guards" and any other bees of the colony that are waiting outside the hive to return to it. Continue smoking until the bees have lost all their aggressiveness

.

c) Carry the hive away from the site, at least 50m from the nearest hive in the apiary. The empty hive is left at the hive site to serve as a temporary home for any returning foragers or for any bees that escape from the moved hive.

d) Working as quickly as possible in order to avoid robber bees, carry out his harvesting or control operations in the normal manner

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- e) When the work is completed, the hive is closed and carried back to its original position, and the empty hive is removed.
- f.) Collect only “mature” honey. The honey is “mature” when at least  $\frac{3}{4}$  (around 75%) honey comb cells are capped at the honey frames, and when by light shaking of frame the small drops of honey do not drop down.

- g.) Do not collect frames with honey from the brood chamber area of the hive. During the collection, check that there is no brood nest (to prevent killing bees and existence of larvae in honey after extracting). If the brood nest is present, such frames should be put back into the hive till the bees are bred.
- h.) Do not use insect repellents during the collection of honey, as this may contaminate and destroy the natural characteristics of honey (flavour, scent, color etc.).
- i.) Take care about the hygienic measures and measures for preserving honey quality.

# Honey harvesting

For traditional and top-bar hives, harvest once or twice a year. For the Langstroth hive, harvest three or four times a year.

## **Steps in harvesting honey:**

1. Wear protective clothing: overall, veils, gloves, boots
2. Light the smokers and put on the bee suits.
3. Smoke the bees and check for combs that are at least 2/3 capped or sealed full of honey. Honeycombs are usually at the back of the hive opposite the entrance.
4. Always leave the combs with brood, large portions of pollen and some honey for the bees.
5. Always hold the combs in a vertical position to avoid breaking.
6. Lift the comb, blow smoke on both sides and quickly brush the bees back into the hive with a feather or bee brush.
7. Cut away the light-coloured combs with a knife leaving about 1 cm of comb. This will serve as an orientation line for a new comb.

8. Place the capped honey in a clean and dry container with a sealed lid to keep the bees out. Return the top bar to the hive.
9. Put combs with little or no capped honey into a separate container.
10. Make sure there is no dirt or bees in the honey and avoid propolis and too much pollen in the honey.
11. While harvesting also scrape the propolis off the top bars before replacing them and keep this for future baiting of hives.
12. Continue cropping all the ripe combs in the same way but do not crop too much or the bees may abscond. Leave at least 8 combs for the bees.
13. Before closing the hive push the unripe combs behind the last brood or pollen comb and put the cropped top bars behind these.
14. Carry the containers out of reach of the bees still buzzing around.

# Recommended extracting methods

- Honey should be processed in a space where bees cannot enter (all openings must be closed with fine wire mesh). It is also possible to work in the evening.
- You can also spin honey in a tent which seals well with the ground so that there are no gaps.
- If necessary you can store well-capped frames in a well-sealed container.
- If your honey contains too much water, you can dry your uncapped honey by making a chimney of the honey supers and blowing air through them with a ventilator.
- If you place newspapers on the floor of the room you can easily remove spilt honey

# PREMISES FOR HONEY PROCESSING

- ❖ The premises should not be in the location which present significant source of contamination and high risk for the safety of bee products, such as: close to highway, industrial plants, big animal farms, landfills, centers for storing and distribution of chemicals, etc.





- ❖ The premises should have smooth and undamaged walls and ceiling, light colors which enable easy detection of filthiness, out of material which enables easy maintenance.

- ❖ The premises should have smooth and undamaged floors designed from nonsorbent and waterproofed material which enable easy maintenance.
- ❖ In case of honey extracting in bee pavilions, the floor must be cleaned before extracting and cover with the adequate protective synthetic material which enables easy maintenance during the honey extraction.



- ❖ During the performance of beekeeping works in the Premises for extraction, storage, processing and packing of honey and other bee products, it is necessary for all present persons to apply **the basic hygienic measures** (smoking is prohibited, the food and drinks are allowed only at the place designed for that purposes, the use of alcoholic drinks and strong fragrances – perfumes, deodorants, etc are not allowed)

- ❖ The honey processing environment should be free of pests, contaminants and pollutants i.e. it should be free from filth, fumes, stagnant water/breeding places for mosquitoes, swampy areas, agrochemicals, human or animal waste or garbage.
- ❖ The premises should be suitable in size for the purpose of handling/processing food
- ❖ It should be spacious to allow smooth flow of processes
- ❖ Adequate lighting should be provided
- ❖ It should be vermin and bee proof
- ❖ Have good drainage
- ❖ Have high roof-the ceilings shall be smooth, impervious and easy to clean

- ❖ The hand washing is necessary after meals, after each toilet going and other kinds of breaks, the access is not allowed to the persons with open wounds, as well as persons with infective diseases who might be the source of disease, i.e. persons with the symptoms of such diseases – high temperature, vomiting, diarrhea, etc, the wearing of jewelry is also not allowed, the long, unbound hair, etc.).

## **Keeping records**

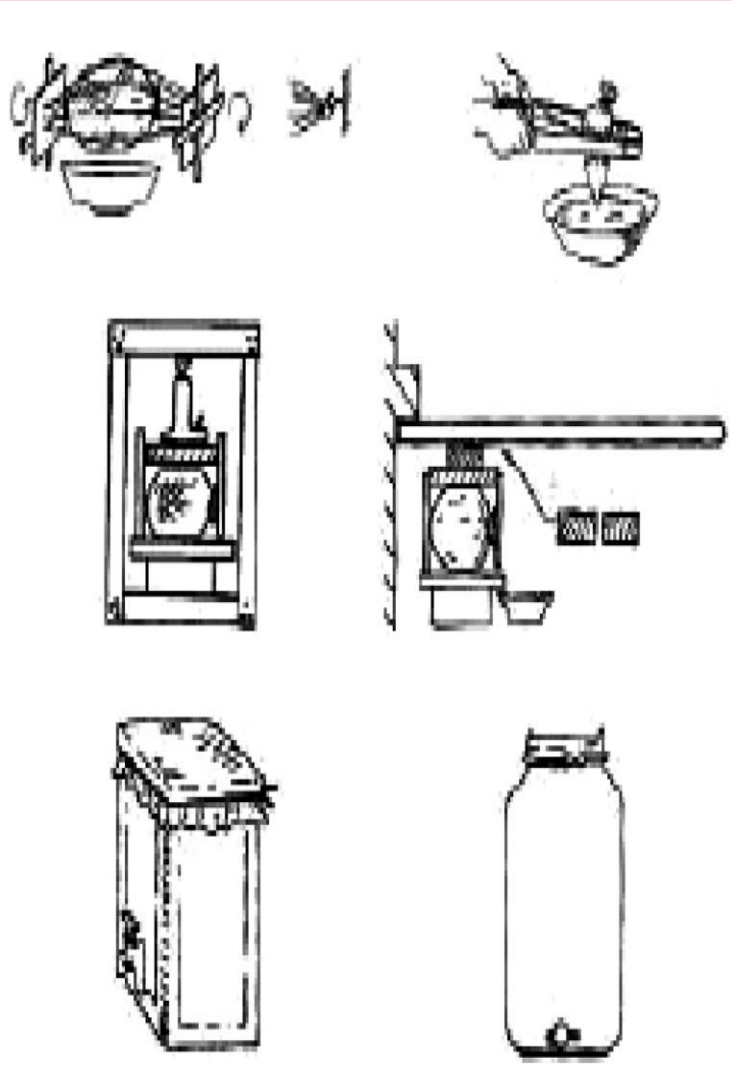
It is important to keep records during each hive inspection in order to follow the progress of each colony and monitor its condition. Hives should be inspected two to three-times a month. Entries may be made under the following headings: hive number, date hive occupied, date of inspection, observation, yield in kilogrammes.

# Processing of honey

*Different types of Honey Press and locally made bottling containers*

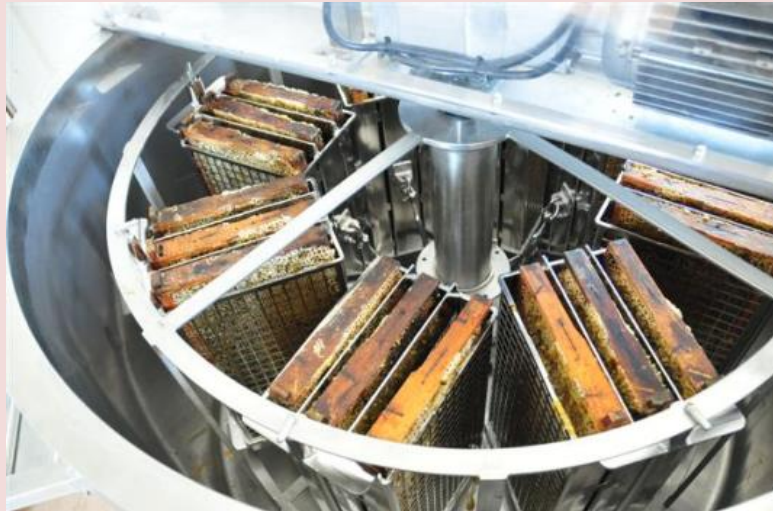
## Processing of honey

- Use a hot rod or knife to de-cap the honeycombs (by passing it over the combs).
- Place the de-capped comb on a piece of fine white linen tied over the top of a plastic container. The de-capped side should face downwards.
- Let the honey drip through the cloth until the cells are empty.
- Turn over the comb and repeat the above process.
- Pack honey in clean, dry jars with well-sealed lids. Label with date harvested and store in a cool place.





# USE OF EXTRACTOR



- ❑ The most convenient way to remove the honey from the comb is with the use of an **extractor**.
- ❑ Or:
  - use someone else's equipment
  - crush the comb thereby squeezing out the honey
  - uncap the honey and allow it to drip from the comb.
  - \* If the honey has too much moisture, it ferments!!!



SETTLING TANK AND  
CENTRIFUGE EXTRACTOR



- ❑ Using commercial equipment and filters to extract honey will produce a large number of tiny bubbles, so:
  - Empty your honey from a container with a gate at the bottom.
  - Maintain sanitary conditions.
  - Observe codes of practice with regard to bottling and product labeling.



# Filtering

❑ When extracting honey, filter out...

- any unwanted hive debris
- bits of wax
- anything else that tends to appear in extracted honey no matter how carefully you perform the extraction process.

❑ A double filtration system (when large particles are found in the extracted honey)

1. The first strainer or sieve  
(e.g. household  
strainer)



2. The second strainer or  
sieve (e.g. fine-mesh  
nylon)



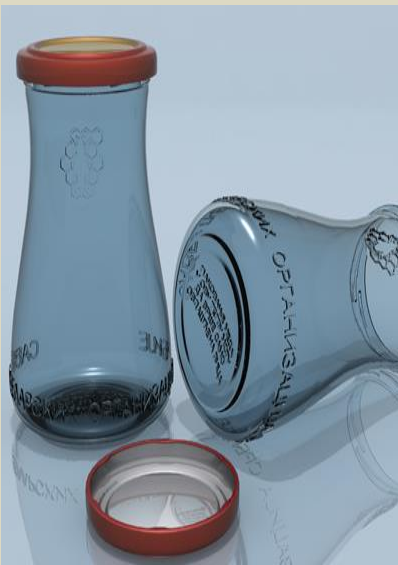
# Specification

| <b>Component</b>      | <b>Design Specification</b>   |
|-----------------------|---|
| Frame Holder          | The extractor supports up to 15 frames.                               |
| Vat                   | The extractor has a vat capacity of 20 Gallons.                       |
| Heating System        | The heating system maintains a vat temperature of 43 degrees Celsius. |
| Motor                 | The motor is capable of spinning the frame holder up to 250 RPM.      |
| Wireless Connectivity | The extractor can be operated wirelessly from a distance of 30 feet.  |

# Bottling



- Make sure the bottle is labeled, appealing and properly packaged
- Use commercial honey bottles/nice looking canning jars
- Fill the honey nearly to the brim (leaving about 5mm of air space for expansion)



# Storage

- Suitable for long term
- Recommended to be stored for 2 (max. 3) years
- Main goal is to prevent fermentation
- Best honey is that in the comb that has been sealed with wax by the bee
- Should not be stored in metal containers, ceramic or wood are best
- Dark, dry place to prevent moisture absorption
- Do not store uncovered in the fridge as it will absorb odors and flavors from other items

# Grading

- Voluntary
- Quality is based on
  - Soluble solids
  - Water content
  - Flavor
  - Aroma
  - Clarity
  - Absence of defects
  - Color

## **Honey grades**

- ✓ Grade A-Good
- ✓ Grade B- Reasonably Good
- ✓ Grade C-Fairly Good
- ✓ Substandard- Poor, Failing