



Basic Beekeeping Manual 1



This manual is dedicated to tomorrow's beekeepers. With thanks to all the African Beekeepers who helped to make this manual possible, especially those at Nkhata-bay Honey Producers Cooperative, Malawi.

Author Pam Gregory

Manual sponsored by 

Editorial assistance provided by Gay Marris, UK National Bee Unit (fera)



How to Use this Manual



It is now well accepted that beekeeping can offer people in rural villages a way of generating additional income. However, beekeeping is not always easy. The bees can sting and are often unpredictable. The honey harvest depends on many factors, including the weather and on having a good market. High value honey must be of good quality. Beeswax is also a useful product, which is often wasted.

This field manual is designed for use by field-based trainers in sub Saharan Africa. It is based on colour pictures with few words. The manual covers basic techniques needed to start a beekeeping business. It also offers some new ideas to help beekeepers to become independent by making their own equipment from local materials. I hope that this will help people to start beekeeping at an affordable cost, and maybe to experiment with new materials.

The pictures show some of the many different ways that people keep bees. This is intended to promote discussion and shared experiences to help people to solve problems locally. The manual concentrates on top bar hive beekeeping but many of the techniques and ideas can also be used by traditional and frame hive beekeepers.

It is expected that trainers will be able to translate the ideas into local languages. Thanks to the support of the Waterloo Foundation, another illustrated manual will be available in 2010. This will cover advanced management techniques and problem solving. A text-based trainers manual is also available, on request from Pam Gregory, that explains the 'Why' as well as the 'How'. Please email: pamgregory@phoncoop.coop

Pam Gregory has kept bees since 1974. She worked for the UK National Bee Unit from 1976-2003. She holds the UK National Diploma in Beekeeping and an MSc in Overseas Rural Development. She has spent the last 12 years working with beekeepers in sub Saharan Africa.

**Happy Beekeeping
Pam Gregory June 2009**

The Life of the Bee



A honey bee visiting blossom

Additional images provided by Margaret Cowley, Ged Marshall,
Adrian Waring, Claire Waring and Max Westby

Honey bees are social insects. By working together the survival of all members of the colony are improved. There are three different sorts of bee in one colony each with their own work.



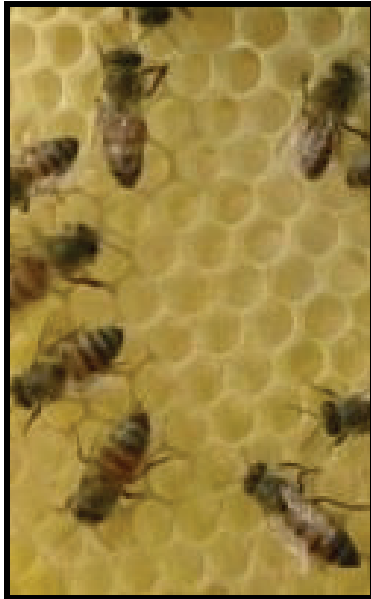
This is the queen bee. There is only one queen bee in a colony. She is the mother of the hive. Her work is to lay eggs that will develop into new bees. She can lay 1000 eggs every day at some times of year.



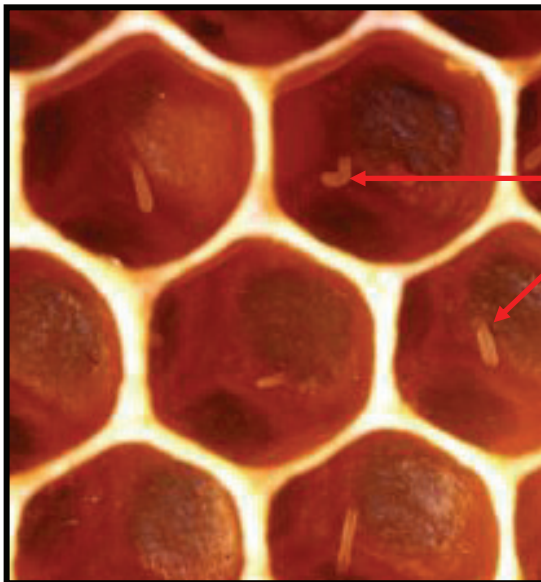
This is the male bee or drone. His only job is to mate with a young queen. There are about 500 drones in a hive when there is plenty of food. They are driven out during the dearth period.



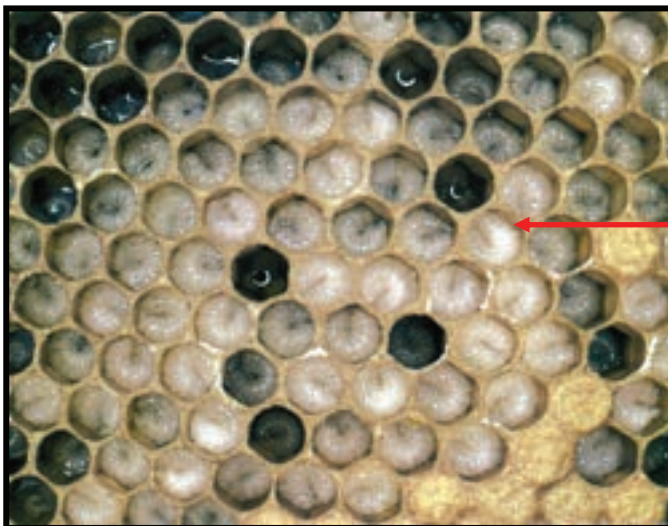
This is a worker bee. She is a female but cannot lay eggs. She does all the work in the hive. There may be as many as 40,000 workers in the main honey gathering season.



Workers make wax from their body to build honeycomb.

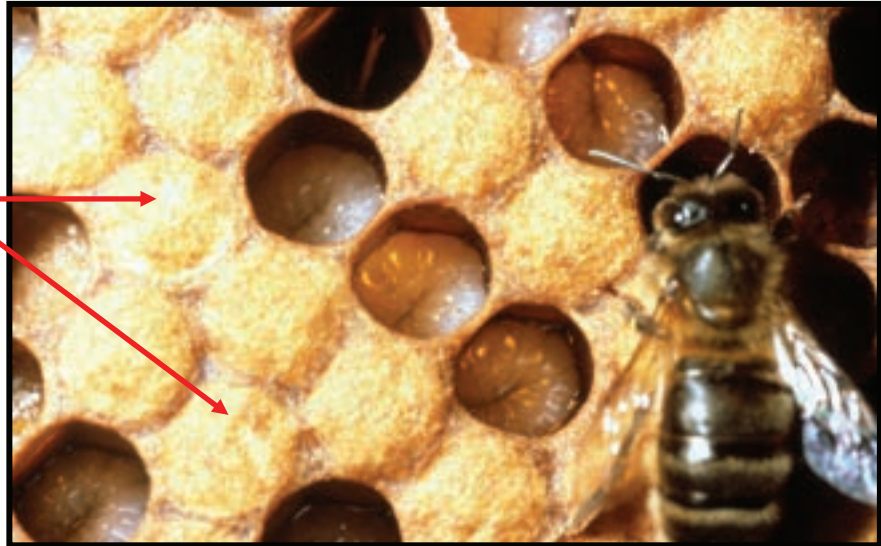


The queen lays an egg in each honeycomb cell.



The eggs hatch and turn into larvae.

The larvae are sealed into the cells to pupate.



A new worker bee emerges from the cell.



Worker bees leave the hive to visit flowers, collecting pollen and nectar to make honey. This worker bee is collecting nectar from Eucalyptus.

Bees improve the crops from mango, coffee, citrus, guava, and many other fruits.



This worker has collected pollen and nectar. One of the bees at the hive entrance has its tongue out to test the quality of the nectar.



Workers store pollen and nectar in the honeycombs.

Flowers can have different coloured pollen.



Bees fan their wings to remove water from the nectar and to spread scent messages.

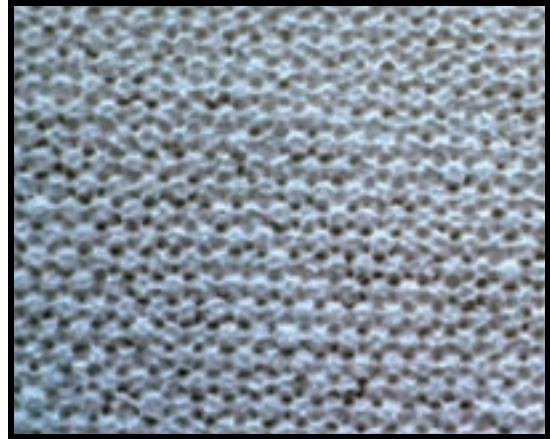
This worker bee is exposing a scent gland, which calls other bees to join it.

These worker bees are sharing food and pheromones.



The workers are dancing to communicate the quality and direction of the nectar source.

The worker bees have capped this honey perfectly. It is quality honey ready for harvesting.



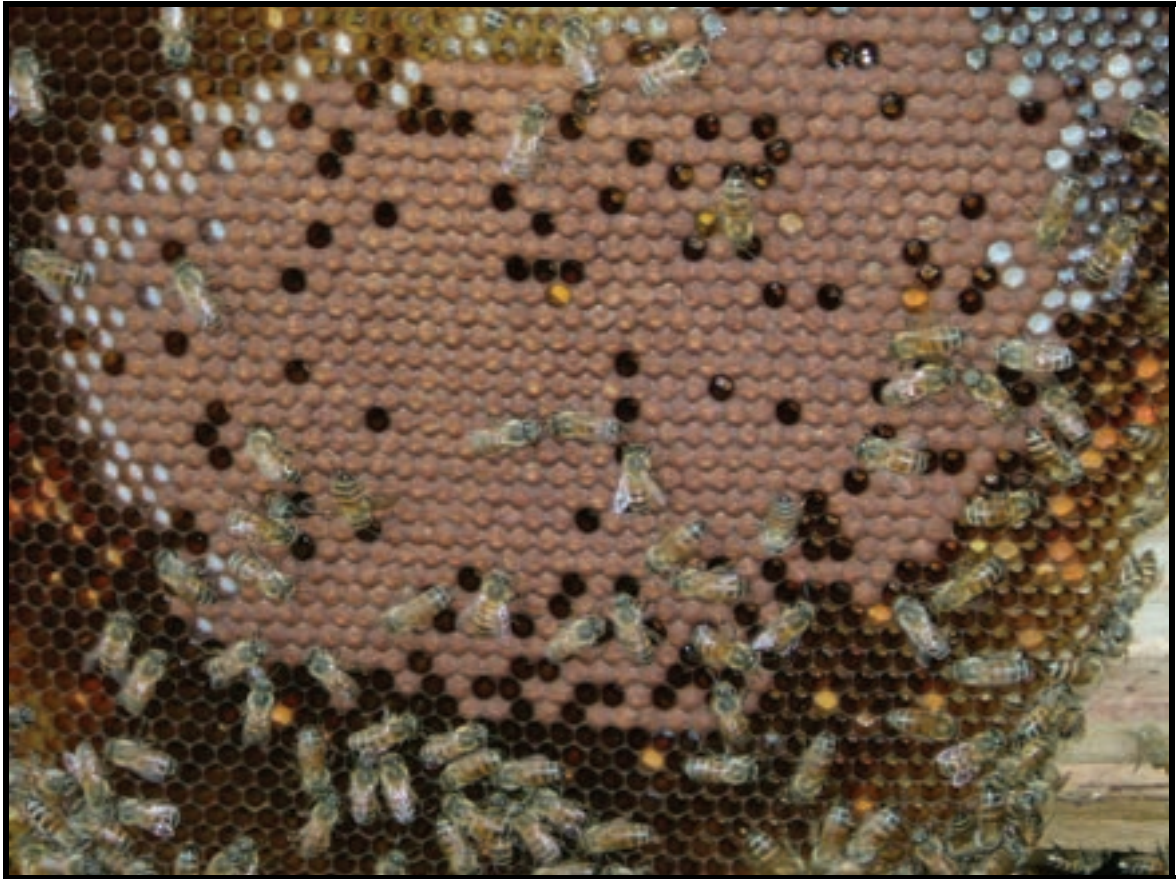
These workers are bringing propolis into the hive. It is a sticky resin that they collect from trees. Propolis is used to seal cracks and to keep the hive clean.



This worker is guarding the entrance. Worker bees sting to defend their home. They die after they sting so they are reluctant to do this.



Only workers sting. If they do they will die. Bees do not sting without cause.



Can you identify the things on this comb?

Look for:

- **worker bees**
- **sealed worker brood**
- **larvae in unsealed cells**
- **empty cells**
- **a few cells with fresh nectar**
- **cells containing pollen**

How to Keep Safe when Beekeeping



Salome from Kenya, wearing a homemade bee suit

Additional images provided by Paul Latham

Bee stings

Bees can sting and stings can be dangerous. Treat bees gently and with respect at all times.

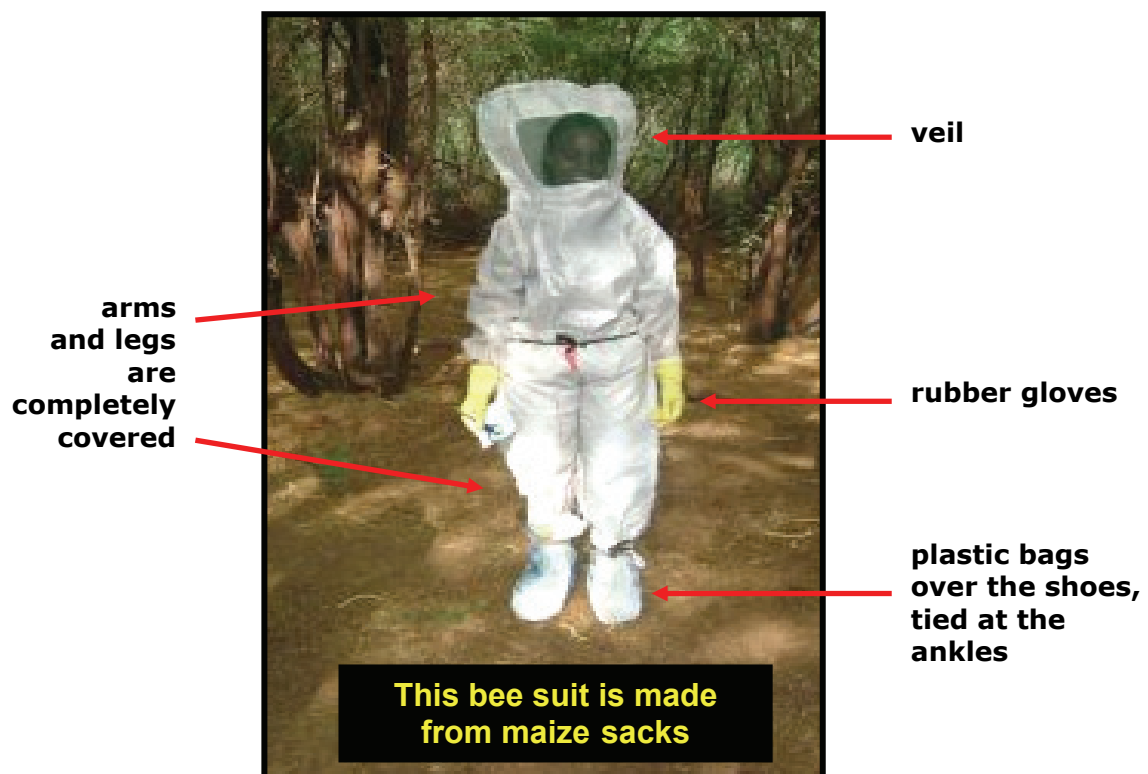


REMEMBER

- Each of these worker bees has a sting
- Every sting gives off a smell that warns other bees of danger
- The smell attracts other bees to sting in the same place
- Cover the sting with smoke to hide the smell from other bees
- Scratch out sting from your skin as quickly as possible

Protective clothing

Always wear good protective clothing that covers your whole body. These bee suits are made from inexpensive local materials:





If you cannot make a bee suit, make a simple veil, like the one shown in the next section.

Wear very thick clothes.

Keep beekeeping clothes clean so the smell of any stings is washed away.

Subduing the bees

Smoke is essential to subdue the bees. There are many ways of smoking and there are many sorts of smokers:

Be safe. Use plenty of smoke to subdue the bees.





This simple smoker is made from a tin can

Do not work alone

Always go to the bees with another person. Be sure all your equipment is prepared.



REMEMBER

- **Do not open a hive without a good reason**
- **Be gentle when opening the hives**
- **Work quickly and quietly**
- **Use plenty of smoke**
- **Only open hives when the temperature is cool**
- **This will usually be in the early morning or the evening**
- **Opening in the evening allows the whole night for bees to settle again**
- **Bee safe**

How to Make a Simple Bee Veil



Beekeepers from Kisoro, Uganda, have made their own veils

Additional images provided by Dan Ngirabakuzi

HOW TO MAKE A SIMPLE BEE VEIL

It is easy to make a simple veil to protect the face and head from bee stings. Maize flour sack material is tough and cheap.



Cut the sack in half along its length. Then cut each half into three pieces. Each piece will make the hat part of one bee veil.



It is possible to make six bee veils from one flour sack if it is cut carefully.



This material frays (tears) easily so the edges must be turned over and stitched to protect them.

Notice frayed edges of material



Stitch each piece to make a corner.



Next a panel of mesh is put in. Mosquito netting is good.



It should look like this.



Add a square of cheaper material and stitch to the front and back of the hat to give protection for the chest and back. Add some string to tie the sides together.



When you are getting dressed for beekeeping, the veil must be put on first, and then well secured inside thick clothing. If you do not have a bee suit, wear a coat over the top to complete the outfit.

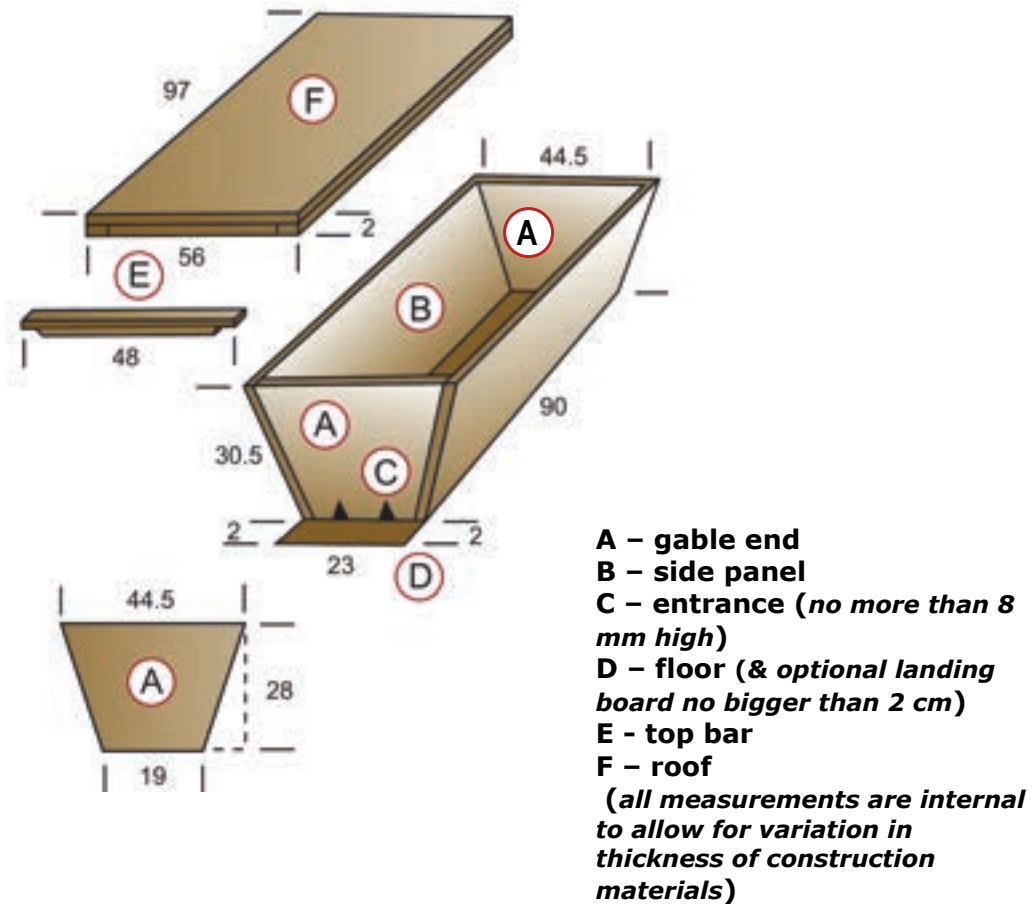
How to Make a Moveable Comb Top Bar Beehive



The women of the Nessuit Project (Rift Valley, Kenya), lining a hive with cow dung and mud

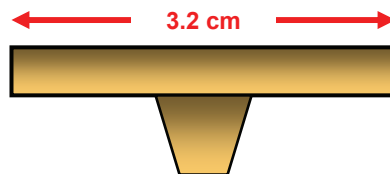
Additional images provided by Roy Dyche and Paul Latham

The plan shows the size to make the hive. Standard sizes allow a beekeeper to move comb from one hive to another. This allows bees to be more easily managed and makes honey harvesting easier.

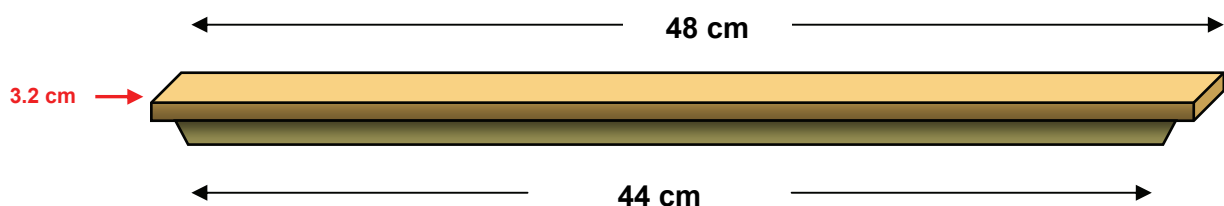


Top Bars are usually wedge-shaped. It is **essential** that the top bars are **exactly** 3.2 cm wide:

END VIEW OF TOP BAR



SIDE VIEW OF TOP BAR



1. MAKING A HIVE FROM PLANKS

Cut selected timber to size. These are the side panels.



The wood may need to be planed to give a neat fit.



Two shorter pieces are nailed together make the gable ends (front and back). Cut the ends off two nails (or hammer flat with a stone) to give a nail with two sharp ends. Hammer the sharp end of the nails into the planks to join the wood.



The joined wood makes the rough gable shapes (front and back).



Saw the rough gable shapes into the correct shape and size.



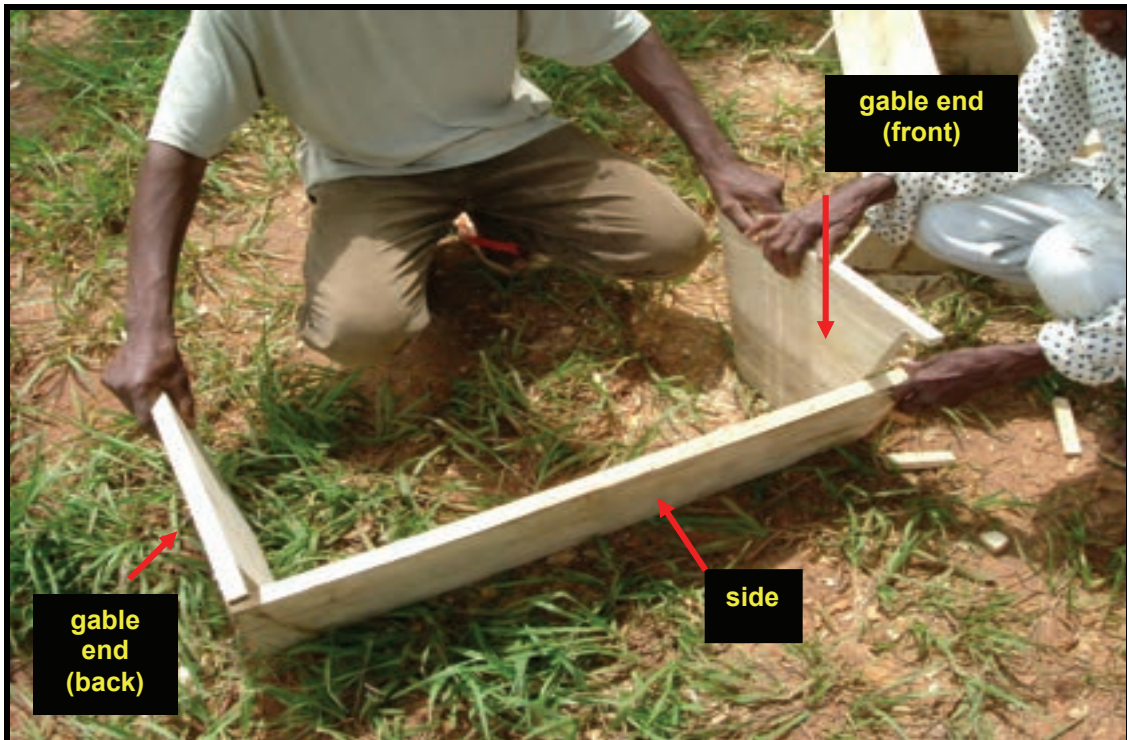
Use a standard template to make measuring easier. This is made of cardboard. Measuring from the middle ensures accurate angles.



Cut a slot or a row of 'V' shapes or drill holes (no bigger than the diameter of a biro pen) in one gable end for the entrance. The entrances must not be more than 8mm high to prevent pests entering the hive.



Once the pieces are cut the hive is ready to put together. Here the sides are being nailed to the gable ends. Then add the floor.



Constructing the hive body.



Some people make hives with the gable ends a little higher than the sides to accommodate the top bars.



The top bars fit neatly because of higher gable ends

Other people put a runner inside the hive so the top bars fit neatly with the sides.



runner

top bars fit level with the sides

2. MAKING A HIVE FROM CHEAPER LOCAL MATERIALS

Hives do not have to be made of expensive wood. Many easily available local materials can be used successfully. This is raphia palm wood.



You can make the shaped gable ends of scrap timber, and the sides and floor of local materials. This hive is made of straight sticks.



This “Grande Ruche” top bar hive from the Congo is cleverly made using no nails or plank wood at all. The soft material is pinned together with sharp sticks.



The gaps in this bamboo hive must be filled carefully with suitable material to keep pests out.



This Ugandan hive is made of stalks. It is mudded with a mixture of mud, wood ash and cow dung.



This strong Ugandan hive is woven from wicker.



The floor and sides of these hives need to be mudded to keep them dark and to prevent ants and other pests getting in.



The roof doesn't have to be made of expensive materials, as long as it protects the hive from the rain. This roof is covered with plastic.



This roof is made of a wooden frame with two pieces of bamboo matting placed on top of each other. There is layer of waste plastic in between, to help make it waterproof. The top is also covered in plastic.



This roof is thatched like the local houses. It has solid ends so snakes or other pests cannot enter, and handles so it is easy to lift off.



A hive roof can be made of split bamboo – like the roof of this local building in Kenya.



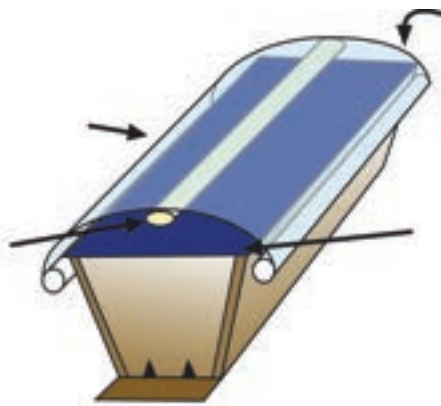
The bamboo is split in half and then laid together like this –the same way as corrugated tin. Cover the bamboo with polythene for extra protection.



A very simple roof can be made of a large polythene bag with two poles inserted at the sides. Their weight holds the polythene down.

4. cover over with banana leaves or other vegetation

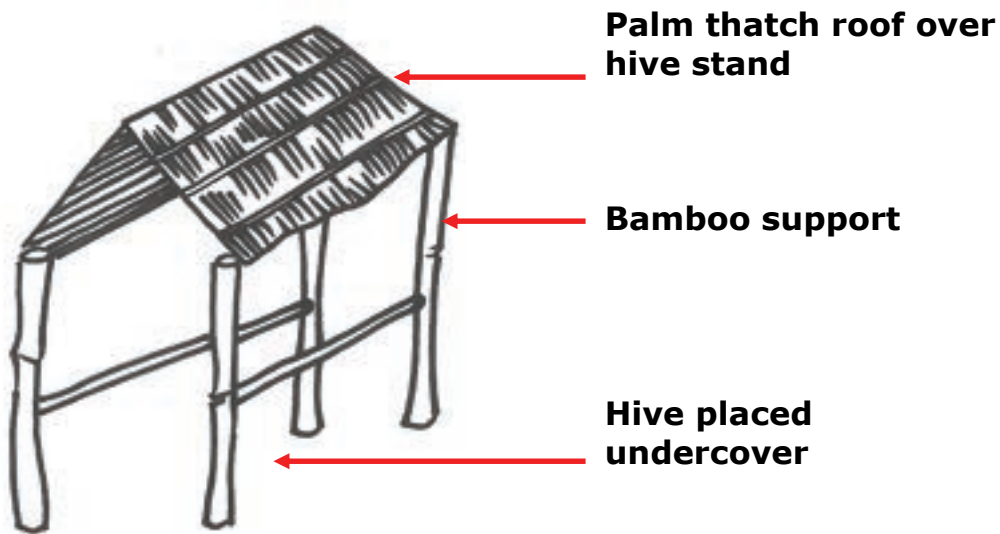
2. bamboo support over polythene sheet, so water will run off sloping roof



3. polythene bag with poles to hold down sides

1. sheet of polythene over top bars

If it is not possible to make a fitted roof this thatched cover may help to protect the beehives from the sun and rain.

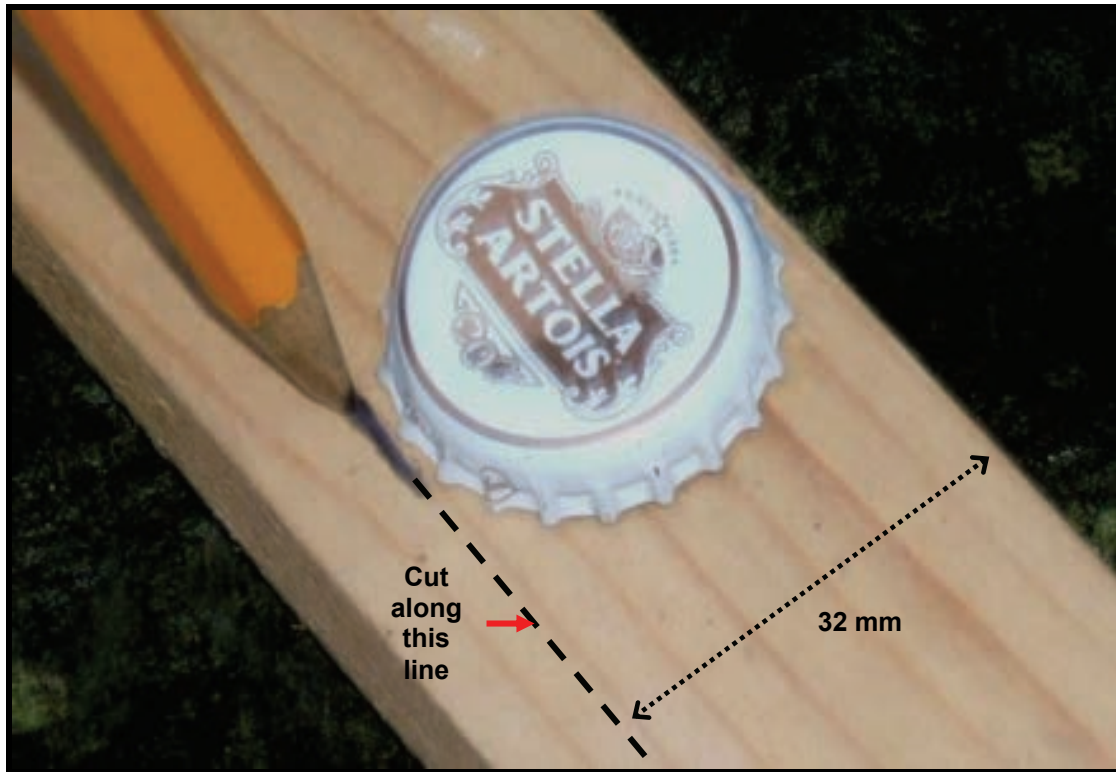


This completed stick hive is put into a wooden carrier made of lashed together sticks, to which wires are attached. This makes the hives easier to hang and protects the more fragile local materials from damage. The hives can be moved by lifting them from the carrier, making colony division easier.



3. MAKING THE TOP BAR

Cutting top bars is the most difficult and expensive part of hive building. It is essential they are 32 or 33 mm (3.2 or 3.3 cm) wide. The width of the top bars can be measured using a bottle top or a used 9 volt battery (the only square shaped battery).



Most top bars are wedge shaped in cross section. However, many people have success with simpler top bars made of local materials that are easier to cut than best timber. This top bar is made of raphia palm.



This top bar is not wedge shaped. It is cut flat.



Sticks, bamboo, or other suitable materials can be carefully cut to size.



The wax starter strip can be easily made with a beeswax candle.



Have a look at this picture. You can discuss it with other beekeepers. These top bars are made of bamboo filled with wax, which is a good idea to try. However, the beekeeper will have trouble getting the bees to build one comb on one top bar because the bars are not accurately cut.



Badly cut top bars are the cause of most problems that can happen when using top bar hives.

If the top bars are cut correctly and waxed well, bees will build one comb on one top bar. This allows the beekeeper to harvest easily and move combs between hives to manage bees in a similar way to frame hives.



How to Set up a Good Apiary



A good bush apiary in Malawi

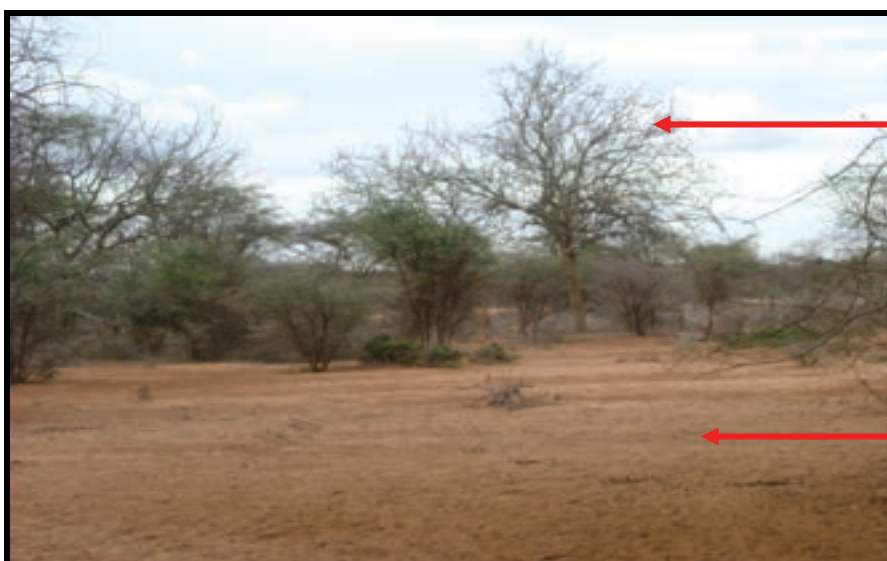
Good honey starts with a good apiary. An apiary is a place where small groups of beehives are kept.



These steps are needed to start a good apiary:

1. Choose a site:

- **That is easy to go to;**
- **Away from people and noise, and safe from thieves;**
- **Near a place where bees can find water;**
- **Near flowers, and trees that produce flowers;**
- **Protected from strong sun and winds;**
- **It can be a place that is not useful for other activities such as crop farming.**



**plenty of trees
for shade and
for hanging
hives**

**acacia trees
are good bee
plants**

**poor soil is not
good for other
uses**

2. Prepare the apiary site by:

- **Clearing obstacles and vegetation around hives to allow easy movement;**
- **Protecting against unwanted visitors such as thieves and large animals;**
- **Planting nectar-producing plants to provide forage.**



The SBDARA trainers clearing an apiary site

Clearing the ground will also help to remove pests, such as beetles, toads and lizards.

3. Place the hives:

- **So that they are level;**
- **Some people use stands. Others hang hives using wires;**
- **Stands should be at least one metre high;**
- **They must be made of strong wood, so they will last;**
- **Live stands will not rot - use types of wood that will grow easily into new plants when stuck in the ground;**
- **The legs of stands must be covered with grease or put in tins of oil so ants cannot climb into the hive.**



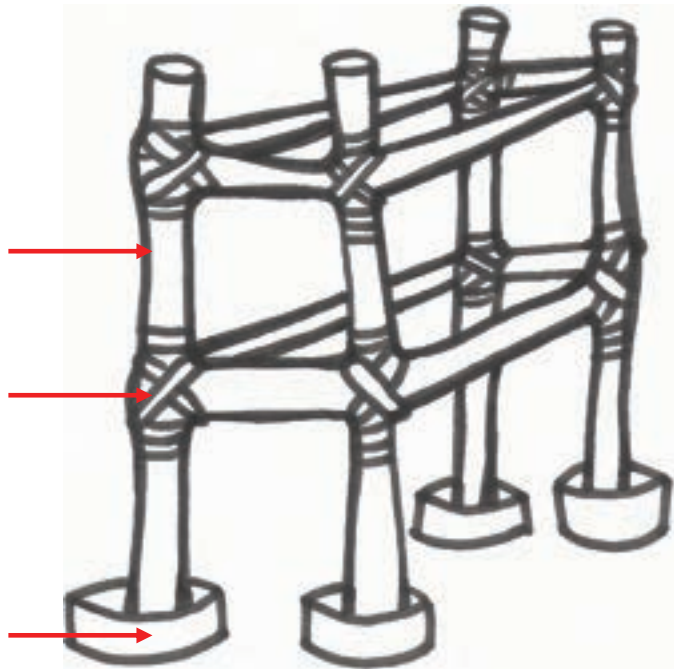
Stand 1 m off the ground – notice it is as high as the man's elbow

A simple hive stand:

use straight wood cut from local trees

fix together with rope or string

put stand feet into tins of oil to stop ants from climbing up



1 m

- Use hanging wires if honey badgers are a danger;
- The hanging wires must allow the hive to tip easily to prevent raiding animals;
- The wires need to be well greased to keep ants away;
- Hang hives at least 1 metre from the ground.



Notice how the wires are twisted to make a single strand to defend the hive against honey badgers.

- Leave enough space between hives to make it easy to work without disturbing bees in other hives;
- Make sure the hive entrances face away from footpaths;
- Limit the number of hives in an apiary to 10.



4. To attract bees into the hives, a “bait” is used:

- The hives need to be clean and to contain a good bait to attract honeybees to live there;
- Use plenty of bees wax around the inside of the hive and at the entrance;
- A top bar with a fresh bees wax starter strip is excellent for attracting bees. Bees also like comb containing brood very much;
- The bees like some leaves, especially if they smell of lemon and these are sometimes used as extra baits. Other baits that sometimes succeed are local wine or beer, cassava or maize flour, or banana skins.



5. Inspect hives regularly to check if bees have moved into them:

- **If there are no bees check hives are clean and dry and that no pests, such as ants, rats and spiders, have moved in;**
- **Add more wax bait if needed;**
- **The best time to colonise hives is when bees are swarming or migrating;**
- **Discuss with experienced local beekeepers when the best colonising times will be.**

6. Keep the apiary clean and protected by:

- **Clearing grass and other vegetation away from the hives;**
- **If possible, plant live fences of good bee plants around the apiary.**



This apiary has failed because there are no trees to give shade or food for the bees. None of the beehives were colonised. No trees, no bees – no honey, no money.



How to Manage the Bees



Beekeepers in Nigeria inspect a top bar hive

Additional images provided by Mike Brown, Brian Durk and Claire Waring

PLANNING THE WORK

Visit the apiary often. Only do one thing on each visit, and have a work plan that is relevant to the time of year. These are examples of work plans:

1. Clean around the hives and check that they are colonised and safe.

2. Inspect inside the hives to see if:

- **The bees are building combs correctly (one comb on one top bar);**
- **The queen is doing her work correctly;**
- **There are any leakages of water;**
- **There are intruders like ants, beetles or spiders;**
- **There are diseases harming the bees.**

3. Harvest honey:

- **Harvest only ripe honey;**
- **Do not harvest brood;**
- **Do not kill the bees;**
- **Leave some honey in the hive as food for the bees.**

4. After harvesting:

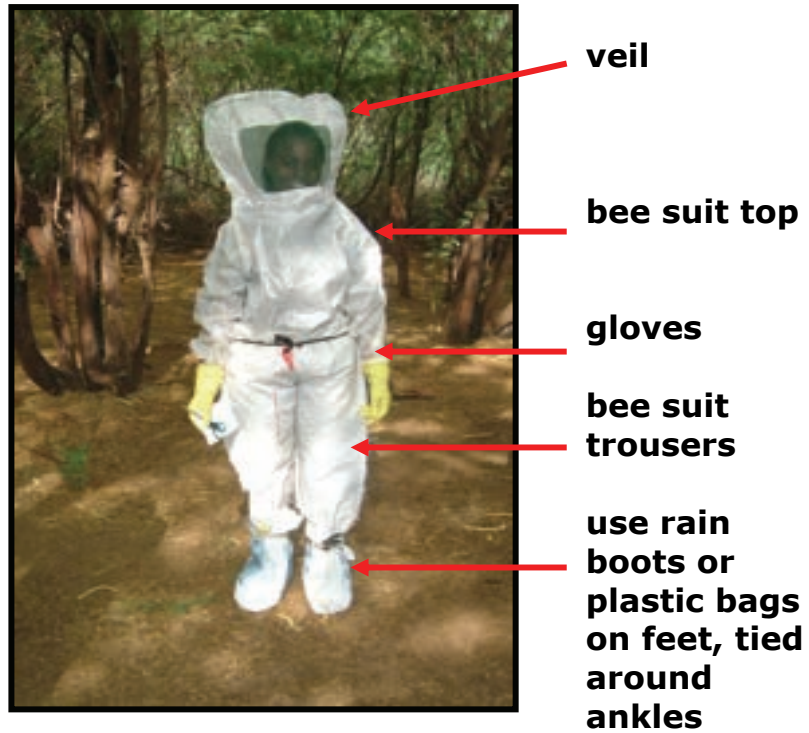
- **Take out old, empty combs;**
- **Rearrange the remaining combs so there are no gaps between combs;**
- **Leave some honey for the bees;**
- **Feed the bees if possible or necessary.**

5. If bees have absconded:

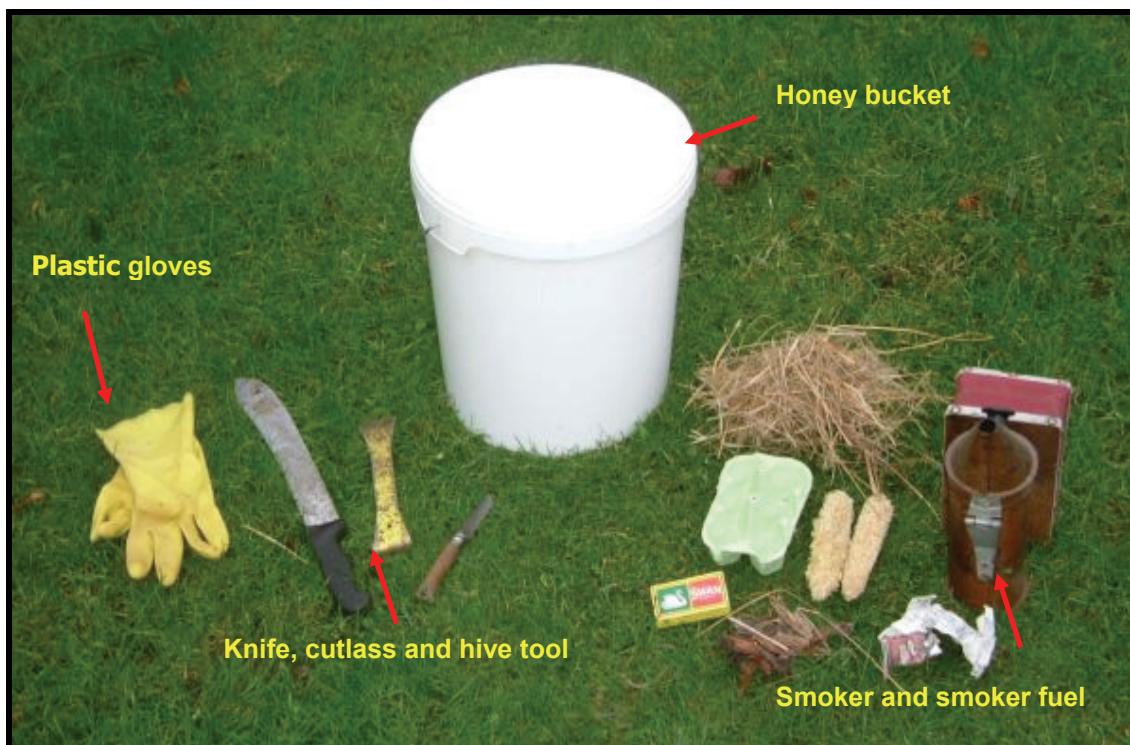
- **Harvest all the combs to reclaim the wax;**
- **Clean dirt and debris out of the hives;**
- **Carefully sterilise inside the hives to kill any pests and diseases by using fire;**
- **Rewax the top bars and replace them inside the clean hive.**

THIS SECTION WILL HELP YOU TO INSPECT A HIVE SAFELY AND UNDERSTAND WHAT YOU SEE

1. Wear protective clothing.



2. Make sure you have all your tools ready. It is good to have a friend to help.



3. Light the smoker so there is plenty of cool smoke. Maize husks, dry grass and rotten wood all make good smoker fuels.



4. Smoke the entrance well and wait for the bees to become calm.



5. Smoke under the roof well and then remove the roof.



6. Check where the bees are by tapping the top bars. A hollow sound indicates the empty part of the nest.



7. Gently remove the first empty top bar.



8. Gently ease the next comb so it is free and easy to remove.



9. Lift each comb out carefully to inspect it.



Here the beekeepers are inspecting the activity of the worker bees and the queen to make sure that the colony is building up correctly.

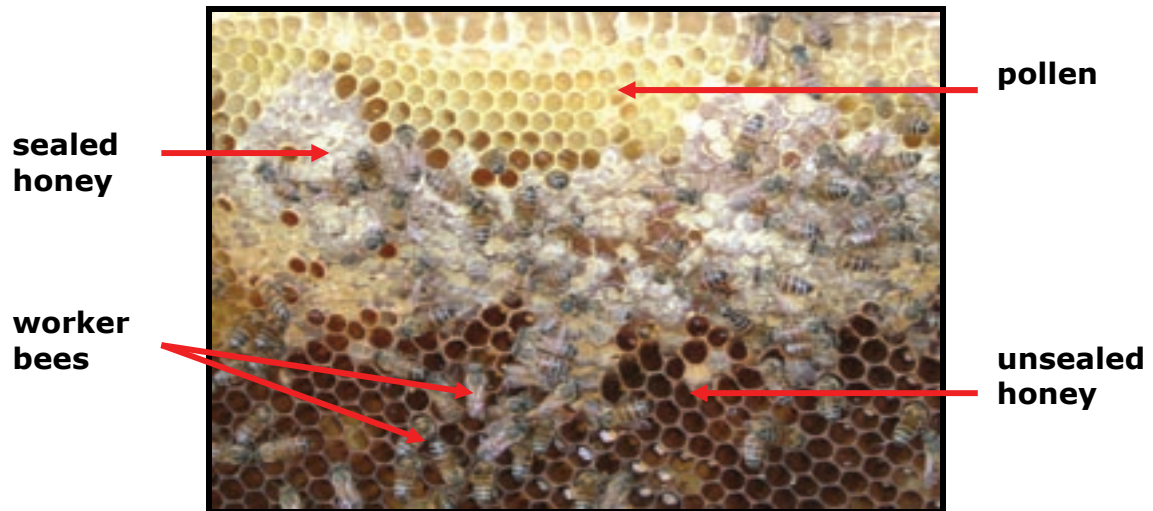
10. Only move one comb at a time.



11. Notice how the natural shape of the comb in this wild colony is similar to the shape of a comb in a top bar hive.



12. These worker bees are storing honey and pollen.



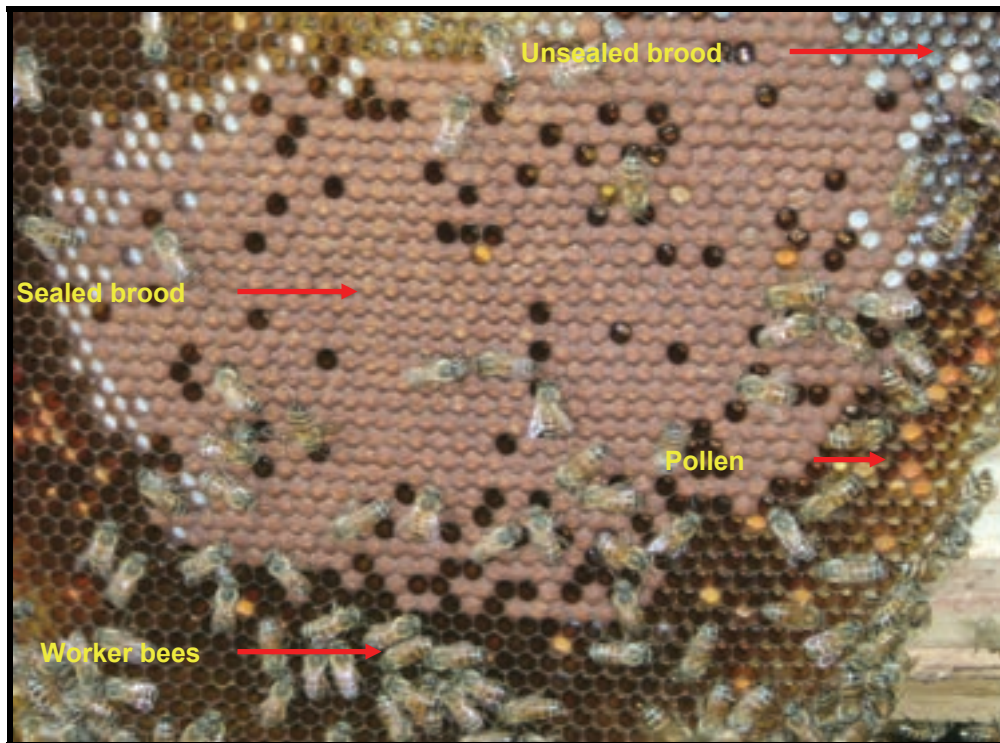
13. These worker bees are building new wax honeycomb.



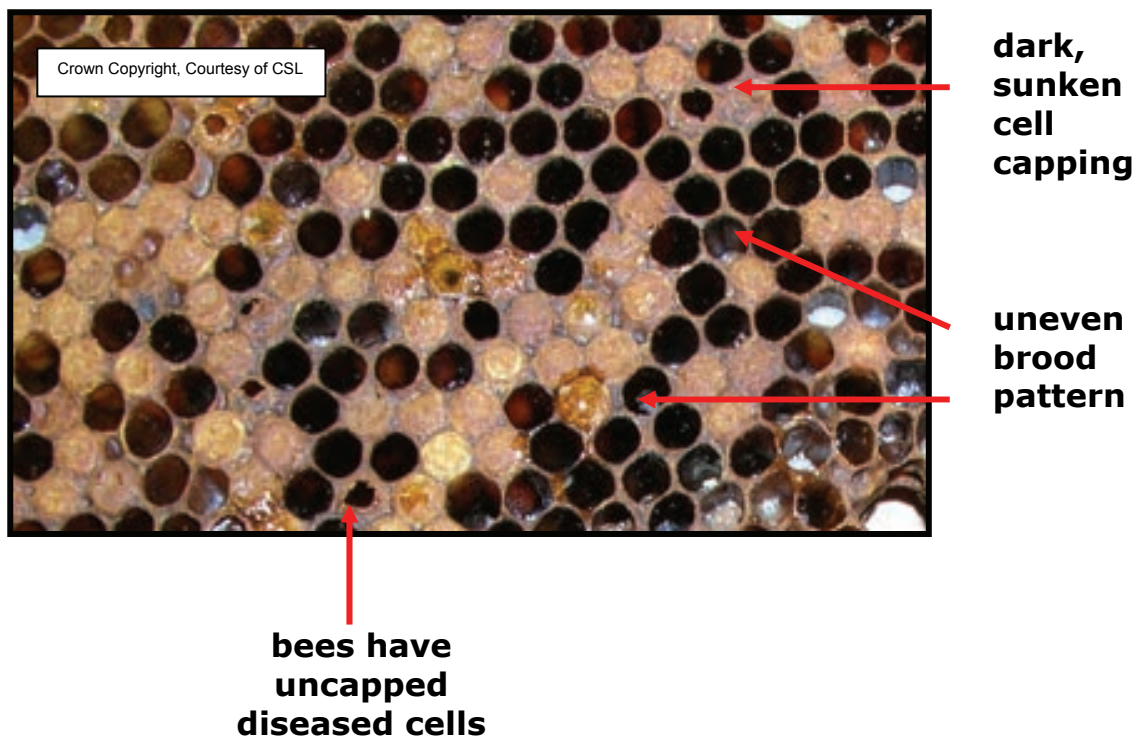
14. This hive is very crowded and needs harvesting.



15. These worker bees are looking after brood (the young bee larvae before they hatch). Can you identify the sealed brood, unsealed brood, worker bees and pollen in this picture?



16. These bees have bad disease and should be destroyed by burning the comb.



How to Harvest Quality Honey



Additional images provided by Len Dixon and the National Bee Unit (fera)

A good honey harvest is important. Good quality honey keeps well and gets the best price. It may be possible to take several honey harvests in one year. Honey harvesting time will vary from place to place. Local beekeepers are the best people to ask for this information.



This hive is full of honey and needs harvesting. However, the top bars are the wrong size here so the honeycomb is cross combing, and will take more time to harvest. "Cross combing" makes a top bar hive into an expensive traditional style hive.



One comb on one top bar makes honey harvesting easy



a good comb

For safe and easy harvesting work with a friend



You will need these tools for harvesting honey.



Give smoke to calm the bees. Honey is usually stored as far as possible from the hive entrance. Here the entrance is in the front gable end so most of the honey will be stored at the back of the hive.



Check where the bees are and open the hive gently.



Gently brush the bees covering the honeycomb back into the hive. You can use a brush made of chicken feathers or a brush made of grass.



Only select honeycomb with well sealed honey for harvesting. It is best to harvest honey in the cool of the evening, so disturbed bees have the night to settle down again. Harvesting honey at night makes it hard to see if the honey being harvested is good quality.



Harvesting just after the rain will increase the moisture content of honey and reduce its quality.

Cut the honeycomb from the top bar into a clean bucket. To keep bees out, the bucket lid must be replaced as soon as the comb is cut off the top bar.



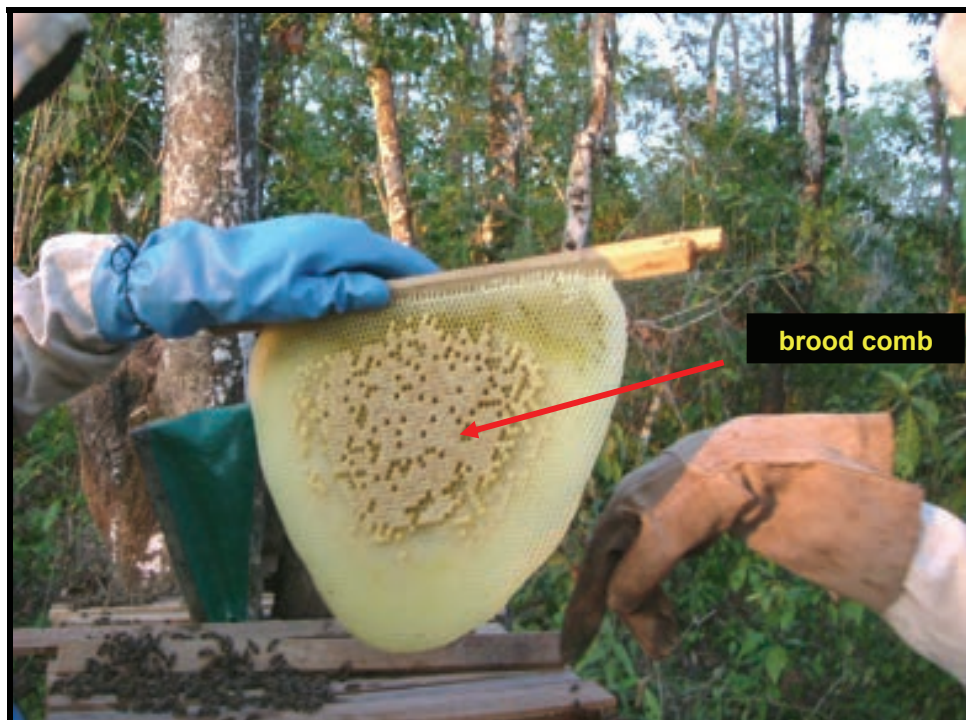
A clean bucket with a good lid is needed to keep the bees away from the honey, and this also keeps the moisture content of the honey down.



Harvest each comb in turn until you reach the combs with brood. Leave a starter strip for the bees to build a new comb. Some honey should be left for the bees own food or the colony may abscond or die.



If you wish to protect the life of the colony, brood combs should not be harvested.



How to Extract Quality Honey



Brighton Chitenje delivers honey to NHPC in Nkhata Bay Honey Coop. Below, a selection of Ugandan honeys.



Additional images provided by the National Bee Unit (Fera)

You need two buckets, a clean straining cloth and a place safe from the bees when removing the honey from the comb.

straining cloth



Everything, especially hands, must be kept very clean.

The honey will be strained through a clean straining cloth. The wax will be left behind in the cloth.

wax



The honeycomb is cut up into small pieces to release the honey.



Then strained through a clean mesh cloth into a second bucket.



The bucket is covered and left to drain until most of the honey has run out. The very last drops of honey can be squeezed out of the cloth using clean hands. Different trees produce different colours and flavours of honey. Different grades of honey should be kept separate.

People with many hives can extract honey using a honey press.

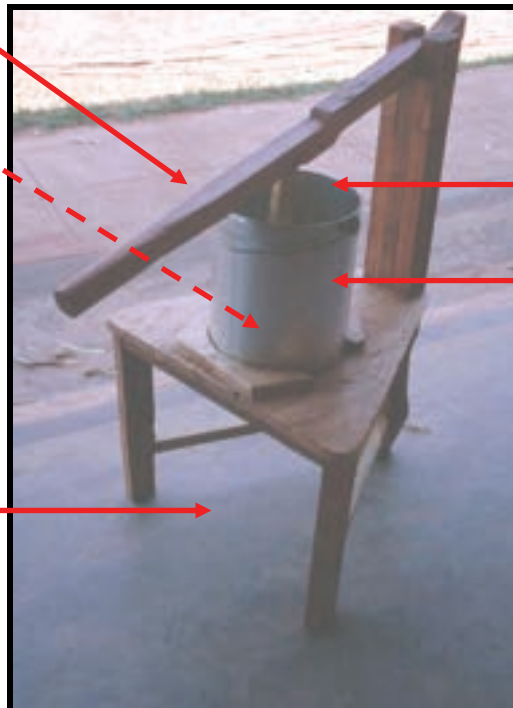


A much cheaper alternative can be made in this way.

presser handle

**central presser
made from a
circle of wood**

**empty bucket
is put here to
collect honey**



**bag containing
honeycomb for
pressing is put
into here,
under the
presser**

**straight-sided
metal bucket
with holes in
the bottom**

The straight-sided metal bucket has holes in the bottom. A bucket is put underneath to collect the honey. There is a central presser made from a circle of wood. The honeycomb for pressing is put into a mesh cloth or bag and is pressed by putting it under the presser. The handle is used to apply pressure to the honeycomb bag to squeeze out the honey.

How to Harvest Beeswax



Refined beeswax from Malawi



Ugandan beeswax products, provided by Hives Save Lives Africa

Beeswax is a valuable commodity that can be used to make a variety of products. It should not be thrown away.



Keep wax from comb harvested for honey separate from the dark or old combs that have contained bee brood (the young bee larvae before they hatch).



Clean comb from harvested honey makes the best wax.



Wash the crushed honeycombs in water until they are free of dirt and honey. Put them into a suitable cloth sack and tie with string. Heat a good quantity of water in an old cooking pot. Put in the sack of honeycomb and push it down under the water.



**push the sack
under the water**

cloth sack

**cooking pot
containing hot
water**

Keep heating the water gently. It should not boil. Keep pressing the bag until all the comb has melted. The melted wax will run through the mesh and rise to the surface of the water.

**squeeze
the sack
to remove
the wax**

**the wax
runs out of
the sack
into the
water**



Squeeze the last wax out of the bag between two sticks with a rolling movement. Take care, the bag is hot. The wax will go solid on the surface of the water as it cools.

The solid wax should be processed again to remove remaining dirt:



Break the dirty wax into small pieces.



Melt the wax in a pan placed inside a second pan of boiling water.



**outer pan
containing
water**

fire

**inner pan
containing
wax**



boiling water

melting wax

Heat until all the wax is melted. You can see the dirt from the wax on the bottom of the pan in this picture.

**debris
in
bottom
of pan**



Pour the melted wax through straining material to remove the dirt. Clean tee shirt material is ideal.



A plastic mould will make a pleasing or useful shape. Smear the mould with soap to stop the wax sticking as it hardens.



**smearing
the inside
of the
mould
with soap
prevents
wax
sticking**

The wax cools in the mould and can be removed when it is solid. The dirt is left behind on the cloth. The cloth can be cleaned and used again.



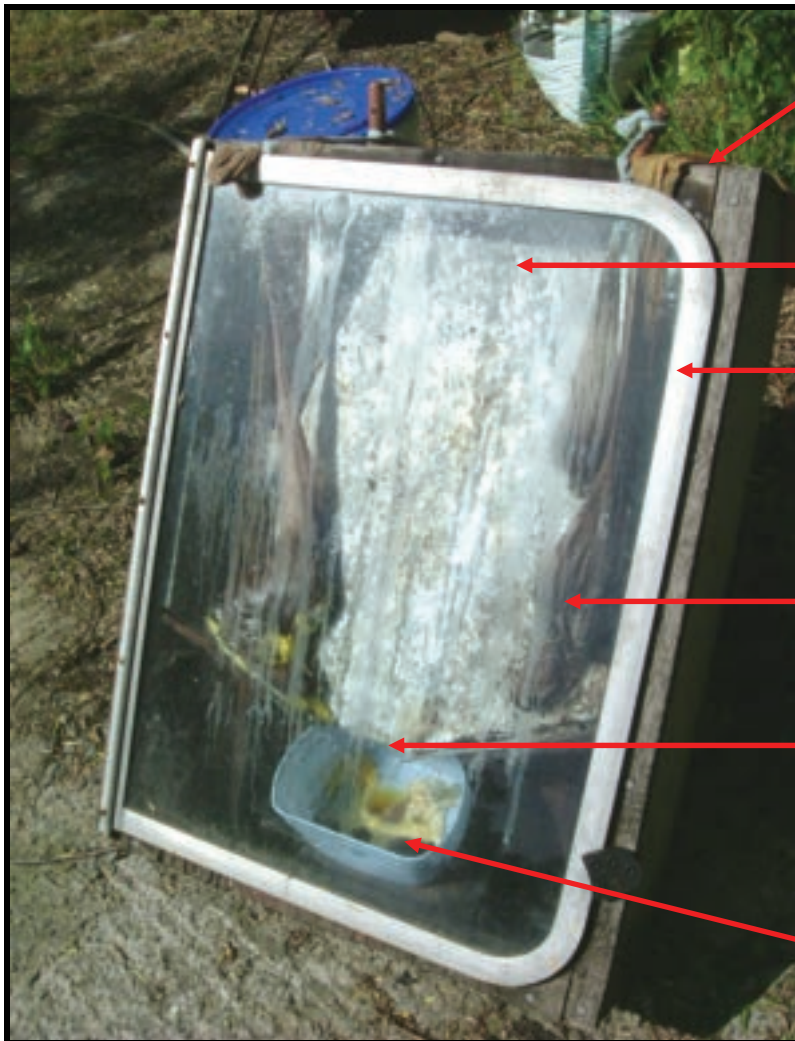
Clean everything afterwards.

Wax for sale in ½ and 1kg blocks.
(refined by NHPC, Malawi)



OTHER METHODS OF COLLECTING WAX

- 1. Solar wax extractor:** The heat of the sun can be used to melt wax. The wax is put into a filtering bag and placed on a metal tray in an insulated box under a glass cover and set in the sun. A metal lip directs the melting wax into a container. Care has to be taken not to allow the wax to overheat and blacken or burn.



wooden box
made of scrap
materials

tin sheet to
collect heat

glass or
polythene
cover to
increase
sun's heat

cloth filtering
bag
containing
wax

metal lip
directs
melting wax
into container

wax
collecting in
container

2. Steam wax extractor: Wax can also be cleaned using steam. A sack of wax cappings or comb is hung above a metal container floating on boiling water. Melting wax drips from the bag to collect in the container. Take care the water does not boil dry.

