



Advanced Beekeeping Manual 2



Sharing experiences helps to make things work better.

This manual is dedicated to all those beekeeping trainers who work so hard to help others to gain better livelihoods from successful beekeeping.

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How to use this manual



It is well accepted that beekeeping can offer people a way of generating additional income. Beekeeping also offers wider advantages such as pollination services that promote food security and biodiversity protection. Forest trees, that provide the purest honey, are better protected by the presence of beekeepers and beekeepers associations and this in turn protects the environment.

However, beekeeping is not always easy. In 2008 we produced a *Basic Beekeeping Manual* designed to give people the basic information they need to start work as bee farmers. This *Advanced Beekeeping Manual* covers more advanced management techniques and problem solving and offers some ideas about how to tackle them.

Sharing ideas and experiences is always useful. This manual is intended to promote discussion so that people develop successful methods and 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.

This *Advanced Beekeeping Manual* is designed primarily for use by field based trainers in sub Saharan Africa. It is in English so it is expected that trainers will be able to translate the ideas into local languages using the pictures to promote better understanding of the techniques. However, the *Basic Beekeeping Manual* is available in other languages (French, Kiswahili, Chichewa and English). Availability of both manuals can be checked on the UK National Bee Unit BeeBase website www.nationalbeeunit.com or by contacting Pam Gregory on pamgregory@phonecoop.coop A text-based trainers manual is also available, on request to Pam Gregory, that explains the 'Why' as well as the 'How' of development beekeeping.

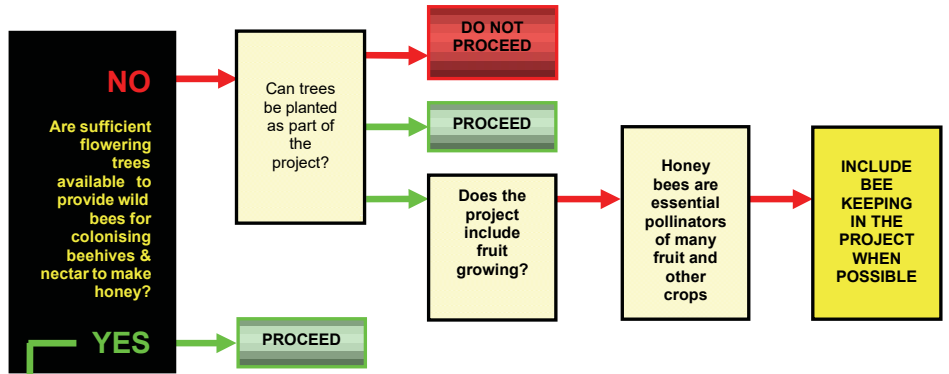
Pam Gregory has kept bees since 1974. She worked for the UK National Bee Unit from 1976-2003. She holds the UK National Diploma in Beekeeping and an MSc in Overseas Rural Development. She has spent the last 15 years working with beekeepers in developing countries.

**Happy Beekeeping
Pam Gregory August 2010**

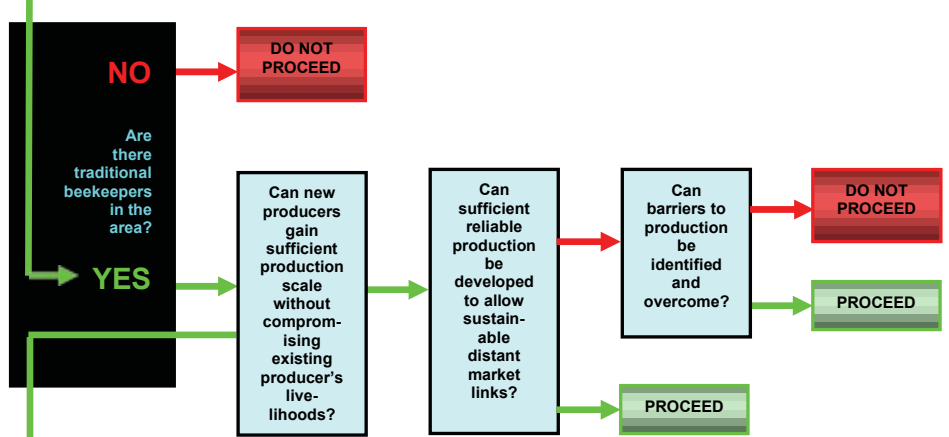
Decision making tool for planning a new beekeeping intervention



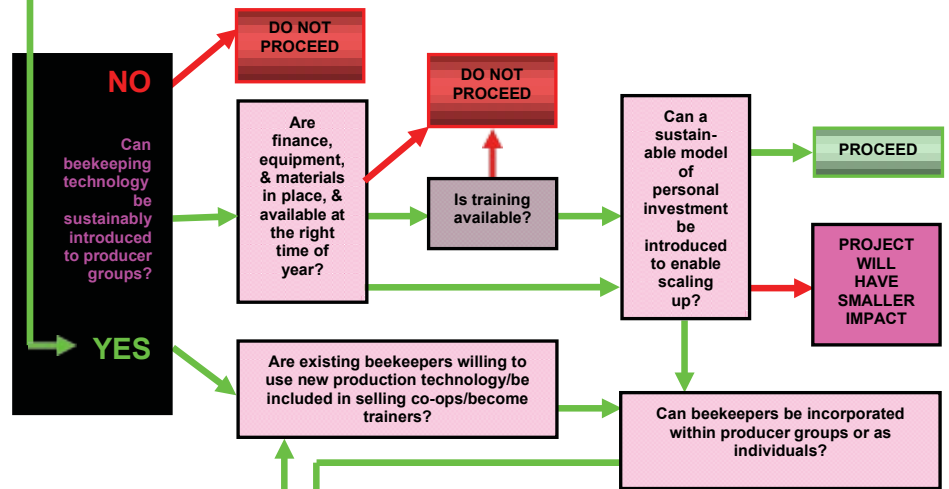
NATURAL RESOURCES



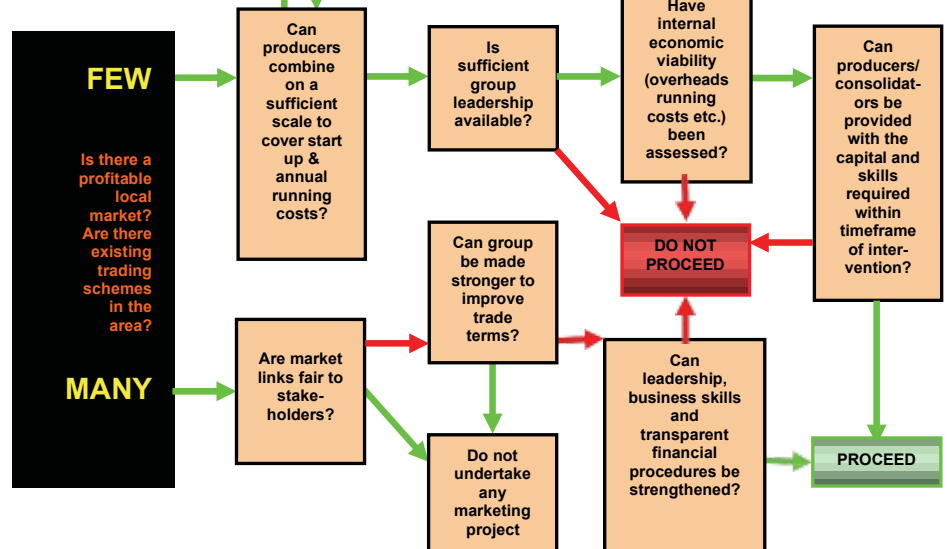
PEOPLE



NEW PRODUCERS



BUSINESS ENVIRONMENT



Improving Colonisation Rates



A swarm of bees is just entering this hive in Garissa, Kenya. They are entering though the roof.

Getting swarms to colonise hives naturally is a key problem in development beekeeping.

Additional pictures provided by John Home, Brian Durk, Felicien Menagon Amakpe, Claire Waring and Adrian Waring

Colonising hives is one of the biggest problems that face African beekeepers. This is because colonisation is normally done by natural means. This means the bees have to find the beekeeper's hive more attractive than any of the natural alternatives.

Lack of colonised hives means that the beekeeper is not maximising the use of the capital that has been put into making the hives.



This crowded apiary is not colonised at all. This means that the investment made in hives is being wasted.

The following ideas can all be used to improve colonisation. Some are more effective than others. Some are practised but are not recommended.

- 1. Making sure there are wild bees available as parent colonies**
- 2. Setting out hives at the right time of year**
- 3. Baiting the hives**
- 4. Maintaining clean hives prior to colonisation**
- 5. Placing swarm catcher boxes in migration routes**
- 6. Collecting swarms**
- 7. Dividing colonies**
- 8. Queen rearing**
- 9. Transferring a wild or a traditionally managed colony**

1. MAKING SURE THERE ARE WILD BEES AVAILABLE AS PARENT COLONIES

Making sure wild bees thrive will lead to lots of bees for colonising people's beehives.

REMEMBER - TREES MEAN BEES

Good trees make good places for bees to live. Trees give wild bees nest places, plenty of food to eat and shade so it is not too hot.



This rain forest in Benin is an excellent for bees.



This arid land in Northern Kenya has plenty of Acacia trees and scrub to support the bees.

If there is poor colonisation there may not be enough trees to support the bee's life comfortably.



Plant indigenous and multipurpose trees or flowering crops to help the bees.

2. SETTING OUT HIVES AT THE RIGHT TIME OF YEAR



Some times of year are better than others for catching swarms of bees. Talk to local beekeepers to find out the best times for colonisation in your area.

3. BAITING THE HIVES

Good baits and clean hives will help attract a swarm of bees to live in the hive. The best bait is beeswax because it smells good to the bees. Use plenty of wax around the inside of the hive and at the entrance.



A top bar with a fresh wax starter strip is excellent for attracting bees. Don't use honey. The bees will take it away but will not stay once it is gone.



Bees can be attracted to certain leaves and plant materials. Things that sometimes succeed are lemon grass, local wine or beer, cassava or maize flour and banana skins.

Propolis is also attractive to bees and can be rubbed around the hive entrance.

This beekeeper from DR Congo is collecting propolis from the top bars of the hive. Bees use propolis to mend holes and gaps in the hive.

The propolis collected should not be pressed into a ball.





This innovative swarm bait is made of cardboard that has been placed on the top bars of a full hive for a while so it smells strongly of bees.

Some strong smelling wood may repel bees. Some wood used for traditional hives may attract bees. Traditional hives are always colonised most quickly. A hive that has already had bees in will colonise more quickly than a new one.

4. MAINTAINING CLEAN HIVES

ATTEND TO THE DETAILS



Bees are very clean and want a clean home. They will not move into a hive that is leaking or has rats, spiders or other undesirable creatures already living there.

If a hive remains uncolonised after the swarming season, clean it out, sterilise over a fire and add new baits.

5. PLACING SWARM CATCHING BOXES IN MIGRATION ROUTES

Using swarm catcher boxes especially in migration routes or areas that are popular with swarms can be successful for collecting swarms. Local beekeepers may be willing to suggest good places.



A swarm catcher box is a small top bar hive that is easier to move about than a large hive. Once it is colonised, the catcher box can be brought back to the apiary and the combs of bees transferred to a bigger hive.



This transfer is possible because the top bars are the same length as the hive is wide.

It is important that the new hive is put in its intended final position. The bees know the exact place that is their home.

Whenever bees need relocating they must always be moved more than three kilometres, otherwise they will fly straight back to their original home again.

6. COLLECTING SWARMS

Collecting a hanging swarm can also help to colonise empty hives. It is not easy with tropical bees as they are very prone to absconding.

Before a colony swarms it will build up into a very strong colony and start making lots of drone brood.

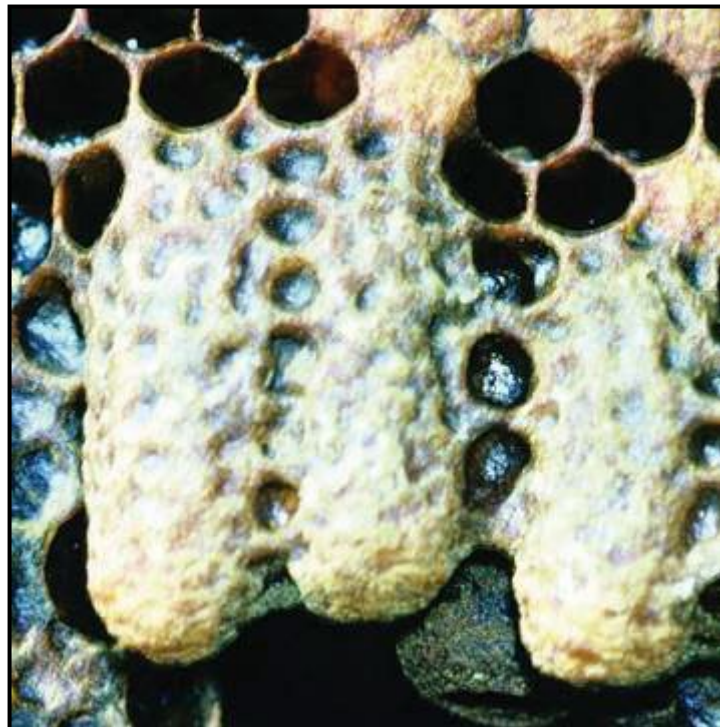


Drone brood is easy to identify as it is larger than worker brood and the cappings are more domed.



Drone brood removal can be used as a simple test for the presence of Varroa mites.

Once the bees have enough drone brood they will start building the distinctive peanut shaped queen cells. Once the queen cells are sealed the bees are ready to swarm.





When they are ready the swarm of bees will fly out of the hive.

This is a swarm flying out of the hive. Bees are usually quite calm when they are swarming.

After a while the bees will cluster together and hang in a tree while they decide where to make their new home.

At this point it is possible for the beekeeper to collect them and introduce them into a hive.



Swarms should be collected in the evening. The swarm is shaken carefully into a box or swarm catcher hive. It is important to be sure the queen goes into the box or the bees will not stay there.



The bees will gradually collect in the box to join the queen. They can be smoked gently to encourage them to go inside.



Prepare a new hive and make a space between the top bars so it is possible to tip the swarm in quickly.

Take the box to the new hive and shake the bees into it carefully, making sure the queen goes into the hive. Then replace the top bars quickly.

The bees will probably abscond unless they are shut in for a few days. Stuff the entrance with grass or use a paperclip stuck across the entrance to keep the queen in. This is sometimes called a "queen includer".



Bees also like comb containing brood very much. Brood encourages bees to stay in the hive. Dead brood will also attract bees as a useful bait. However, transferring brood between hives risks spreading disease.

7. DIVIDING COLONIES

Colonisation by attracting natural swarms into the hive is very random and often leads to low colonisation rates. Colonisation rates from natural swarming are normally about 50%. Relying on natural colonisation can mean the money invested in beehives is not fully used.

Dividing colonies can help to improve colonisation rates without having to wait for swarms to arrive naturally. It is especially useful where it uses the bees' own impulse to swarm.

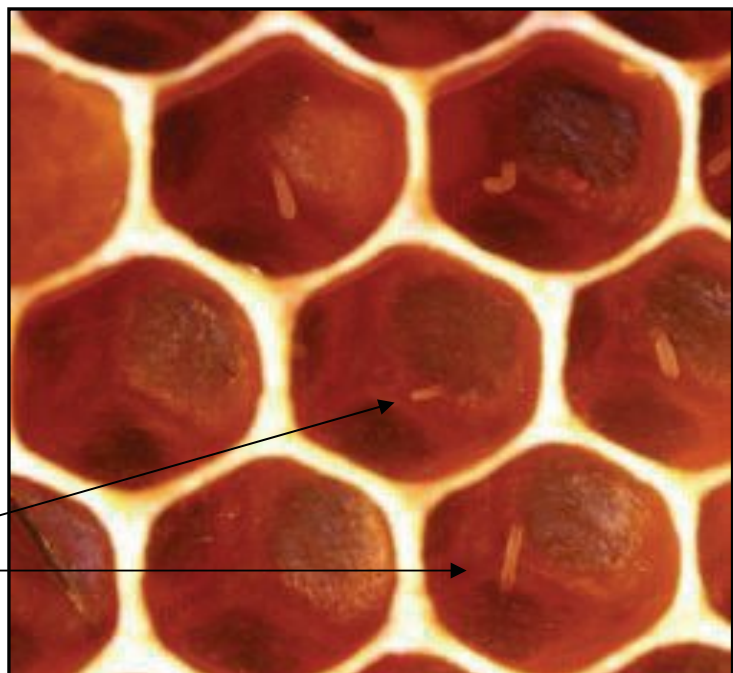
Only big, strong, healthy hives with plenty of brood should be divided.



This hive is so strong that it may soon swarm if it is not divided. A strong colony like this may have queen cells already present.

It is essential that eggs are present in the colony. The workers in the divided part of the colony need eggs to be able to make a new queen.

This is what honey bee eggs look like.



When dividing a colony it is important that the combs are correctly built – that is one comb on one top bar - so that combs can be shared between two hives. If this is not the case then this should be corrected before dividing starts.



Remember - the width of the two hives needs to be the same so that top bars can be transferred between hives.

Two or three people are needed to carry out the procedure. Work as a team quickly, methodically and carefully. You will need two hives – the **ACTIVE** hive that is to be divided and a new **EMPTY** hive for the new colony.

Here the team is preparing the empty hive and the apiary area ready to make the division.

Hives should be about two to four metres apart.

If necessary, make a clear path between the two hives so walking between them is easy.



There are many methods of dividing colonies. The following method is very reliable. The procedure needs to be carried out in the cool of the early morning. Start time should be at dawn.

PREPARATION AND PROCEDURE

- (i) Select a strong colony for division. Two or three days before starting, inspect the colony to ensure it has eggs. **EGGS ARE ESSENTIAL FOR THE NEW COLONY TO MAKE A NEW QUEEN.** If no eggs are present the procedure should not be carried out. Wait until eggs are present.

- (ii) Smoke the active hive well for two to three minutes.



- (iii) Very carefully lower the active hive that is going to be divided from its wires, and move it into the new position.

Using a hive carrier made of sticks lashed together with string to support the hive makes moving the active hive easier if hanging wires are used.



- (iv) **HANG THE EMPTY HIVE IN THE POSITION THAT WAS OCCUPIED BY THE ACTIVE HIVE.** You will notice the flying bees will quickly start moving out of the active hive and into the new empty hive.

- (v) **The active hive is now on the floor close to its new position. Continue smoking the bees well. They will be less troublesome as the flying bees will have already returned to their original hive site.**



- (vi) **Go through the colony and select the combs to be transferred to the new hive. First select one comb with honey and pollen.**



- (vii) Gently brush ALL the bees off the comb and back inside the active hive. Then transfer the comb from the active hive to the new hive.**



- (viii) Next find the brood combs. Inspect each brood comb and if it is suitable (it should contain plenty of eggs and brood), once again brush ALL the bees back into the hive and transfer the comb to the new hive.**



- (ix) Repeat this for each comb until enough good brood combs have been transferred into the new hive. Transfer the combs carefully one at a time. Transfer at least six of the best combs from the active hive to the new hive.



- (x) **REMEMBER: IT IS ESSENTIAL THAT ALL THE BEES ARE BRUSHED BACK INTO THE ACTIVE HIVE SO THE QUEEN IS LEFT BEHIND.** About half the combs must be left in the active hive to provide space for the queen to lay eggs and for food storage.
- (xi) The selected combs are taken to the new hive one at a time and put into the hive starting from the entrance. All the brood combs must be placed next to each other when they are placed in the new hive.



- (xii) **REMEMBER: IT IS ESSENTIAL THAT EGGS ARE PRESENT ON THE BROOD COMBS PUT INTO THE NEW HIVE SO THEY CAN MAKE A NEW QUEEN.** They will first make special cells called queen cells.

Sometimes queen cells will already be present in the active colony. This is especially good as the active colony is already making a new queen. If **UNSEALED** queen cells are present the colony is already planning to divide naturally by swarming and the chances of success will be increased.



This is an unsealed queen cell. The bees are busy feeding the young queen larva.

If **SEALED** queen cells are present the colony has already swarmed. New queens are already forming inside the queen cells.

This is what sealed queen cells look like.



If queen cells are already present, at least one brood comb with queen cells on it should be very carefully transferred into the new hive. One brood comb with queen cells on it should be left in the active hive in case the queen is lost during the division.

- (xiii) Replace each brood comb that is removed with a new top bar. If possible the top bars should be primed with wax so the bees will build new comb in the correct position – one comb to one top bar.**



- (xiv) Fill up all the empty spaces with new top bars so both hives are complete, and then replace the lids.**

- (xv) Hang up the active hive in its new position.**



(xvi) Check the new queen has been successfully reared and is laying eggs. This can take up to four weeks.



Plenty of new worker larvae show the new queen is well mated and active and that the division has been successful.

WARNING: Dividing bees always carries some risk of damage to the bees so should only be done if the beekeeper is willing to take this risk. Only experiment if you have plenty of colonies and do not mind losing one.

8. QUEEN REARING

Many people think that queen rearing will help with colonisation problems. **It will not.**

Because of the problems with absconding and the possibility for laying workers the queen rearing methods designed for temperate bees are not ideal for African bees.

Queen rearing is best used for very specialist areas such as:

- bee breeding and selection to improve the traits of honeybee colonies
- commercial sales of colonies and queens
- royal jelly production.



If dividing colonies is not enough to meet your needs then contact me personally by e-mail or letter to discuss it.

9. TRANSFERRING COLONIES

People often want to transfer colonies of bees from traditional or wild hives. Transferring colonies usually fails. This is because the queen is lost during the transfer or because the bees abscond afterwards. Unless a hive has fallen or is in danger:

DON'T TRANSFER IT

Keep hives as parent colonies to provide swarms for the future.



This fallen hive may be a good one for transferring.

Cut each comb out carefully. Tie each one onto a prepared top bar. Brush and shake all the bees gently into the new hive making sure to include the queen. The queen will probably be hiding in the bees left behind so is very easily lost or killed.



The bees will obligingly reattach the comb and remove the string.



This transferred comb was not tied tightly enough and the bees are struggling to fill the up gap. Notice how the honeycomb is crooked too.

Trees for Bees

**No trees – no bees
No honey – no money**



The very best honey is produced from the great diversity of indigenous forest trees.

***Brachystegia spp* *Combretum spp* and *Julbernadia globiflora* are nectar bearing trees found in the miombo forest. Miombo honey is one of the finest.**

Images provided by Paul Latham with additional material by Pam Gregory, John Home, Roy Dyche, Gay Marris, Selwyn Wilkins and Tom Carrol

African honey bees are not normally fed sugar. This makes it very important that plenty of nectar bearing flowers are available for as long as possible during the year.

In many places beekeepers and farmers plant multi purpose trees to meet their household needs. There is a great selection of multi-purpose trees but trees that also produce nectar are very helpful for improving honey production. Try to select some plants that flower early or late in the season so bees have more food during dearth periods. This will help to reduce absconding. Multi-purpose trees commonly selected by beekeepers are: -

Mango – *Mangifera indica*



Used for firewood, fruit, fodder, soil conservation and gum.

Pigeon pea – *Cajanus cajan*



Used for firewood, food, fodder, nitrogen fixing, and soil improvement.

Acacia spp



All species of Acacia produce excellent nectar.



***Faidherbia albida*. Used for nitrogen fixing, fodder, firewood, timber.**

Eucalypts



All species of Eucalyptus produce nectar.

NOTE: Eucalypts should not be planted near other crops as the crops' yields will be reduced.

Ornamental and live fencing trees that produce nectar and pollen can be used to screen apiaries, making it easier to keep bees near the homestead.

**Bottle brush –
Callistemon citrinus.**



Can be used for firewood.

Citrus



All species of citrus produce nectar and fruit better if they are pollinated by honey bees.

***Leucaena leucocephala*
(alt *L. glauca*).**



Used for firewood, fodder, soil improvement.

These special trees are also excellent bee forage trees. Check if they grow in your area.

Moringa oleifera
(*M. pterygosperma*)



Used for flavouring, medicine, fodder, soil conservation, fibre, live fence, tannin, oil and water purification.

Macadamia nut –
Macadamia tetraphylla



Used for cash crop nuts, timber, cosmetic oil, timber and firewood.

Jatropha curcas



Used for fuel oil, medicine, soap and cash crop for biodiesel oil.

Do not overlook small flowers that can be valuable to bees.



This common species, *Bidens pilosa*, also makes a soothing balm for bee stings.



This tiny *Fuchsia* plant flowers in the dearth period and reduces absconding.

Many nectar bearing plants are also useful food and cash crops. Avocado, coffee, cotton, egg plants, guava, mango, paw-paw, pumpkin family and sunflower are just a few of the food crops improved by bee pollination.

Paw-paw – *Carica papaya*



Cassava - *Manihot esculenta*



Avocado – *Persea Americana*



Sunflower – *Helianthus annuus*





Sunflower – *Helianthus annuus*

Sunflower is used for seeds and oils. In some areas it is an important cash crop.

Kenyan kale - *Brassica oleracea*



All Brassica species are very attractive to bees, and bee pollination greatly increases their yield. Honey from Brassicas will granulate more quickly than other honeys.

Coffee - *Coffea canephora*



Coffee yields are increased by bee pollination, and beekeeping makes an ideal livelihood diversification for coffee farmers.

Banana – *Musa spp.*



Banana is a nectar and pollen bearing plant but does not depend on honeybee pollination for propagation.

Some trees, like this *Gliricidium sepium*, provide out of season nectar which is very important for the bees during the dearth period. Look out for suitable trees and flowers in your area.



It is also important for honey bees to have water in the dry periods. This should be supplied in a shallow container so that the bees do not drown. It will need topping up regularly.

Things That Can Go Wrong

And how to make them go right again



Beekeeping is not always straightforward. Sharing experiences helps to make things work better.

Additional pictures provided by Roy Dyche, Robert Kajobe, Mike Allsopp, James Morton (CSL), Claire Waring, David Wilkinson (Fera), Felicien Menagon and Fera Photographic services

CORRECTING CROSSED COMBS

To get best results from moveable comb hives **ONE COMB ON ONE TOP BAR** is needed. Inspection and harvesting is more difficult and the management advantages of having top bars are lost if bees attach combs to more than one top bar.



The width of the top bar is important to encourage the bees to build one comb on one top bar. It should be exactly 3.2 cm wide.

This can be checked using a bottle top as a simple measuring device.



Is this one the correct size?



Is this one the correct size?



If the comb is wild inside the top bar hive then the advantages of this type of hive are lost.



Sometimes it is possible to reduce top bars that are too big.

A soft but durable wood such as the raphia palm is very good for making top bars.

Sometimes the bees will build more than one comb on one top bar. It is usually possible to correct the situation by cutting and retying.

Two people are needed to do this – one for holding and one for cutting and tying.



1. Cut comb along shortest distance of incorrect attachment to separate the comb from the wrong top bar.



2. Bend comb around and tie it to the correct top bar with string.



3. The bees will reattach the comb to the top bar and remove the string.

PESTS, DISEASES AND OTHER PROBLEMS

Like any animals, honey bees need to be cared for if they are to be productive. These simple guidelines will help to look after the bees:

- Visit the apiary often, to check the hives are safe and healthy.
- Keep the ground around the hives clear, to reduce pests such as beetles, toads and lizards.
- Where practical, fire breaks should be made around apiaries to give some fire protection.
- Protect against unwanted visitors such as thieves and large animals.
- The most significant problem in tropical beekeeping is ants. Ants can destroy a hive easily if they are not kept out.

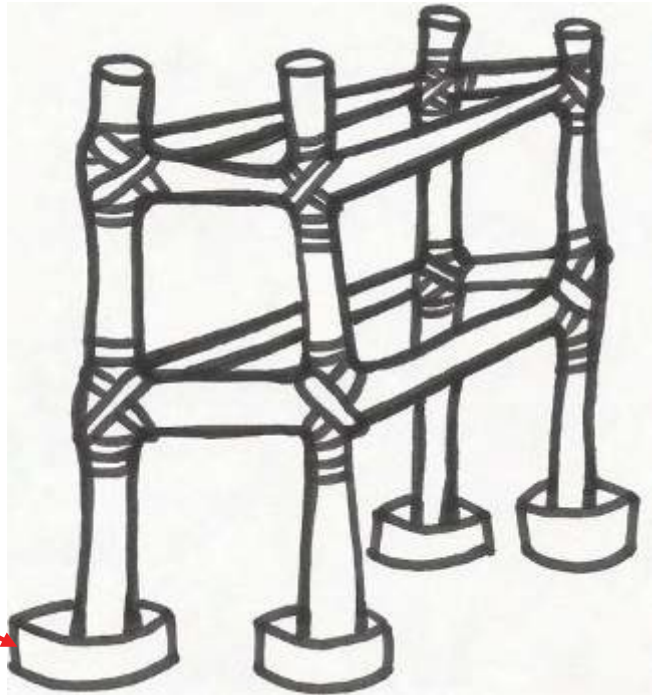


This thick string of ants has destroyed this hive.

A band of grease prevents ants from crossing into the hive. The hive hanging wires or the legs of the hive stands must be greased regularly to have any chance of avoiding ant problems. Keeping the apiary free of vegetation will help. It may help to remove ants' nests in the area.

- **The legs of stands must be covered with grease or put in tins of oil so ants cannot climb into the hive.**

Putting the feet of the stand into tins of oil can stop ants from climbing up.



- **Termites will damage neglected hives. Neglected hives may also fall and cause danger to people.**



Termite damage.



A fallen hive causes danger to others.

- **There are many other pests that cause problems for the bees. Lizards are insectivorous and will eat the bees.**

Lizards can be avoided by not having landing boards on the hive and by keeping the ground clear.



- **Honey guides, bee eaters, woodpeckers and other insectivorous birds will eat bees.**



Normally, birds do not eat so many bees that it damages the hive. If birds do cause a problem the hive should be moved to another place.

This shows woodpecker damage.

- **Uncolonised hives must be kept clean. Otherwise, they provide good homes for unwanted visitors such as snakes, rats, millipedes, spiders, cockroaches and scorpions.**



Bees will never colonise hives that are like this.

- **Other insect pests include bee pirates, bee wolf, wasps and hornets.**



These need to be destroyed individually when they are seen. If they get too many, the hives will have to be moved.

- **Neglected combs can get infested with wax moth.**



Wax moth can kill weak colonies. Caring for your colonies keeps them strong. Harvest wax combs from hives where the bees have absconded colonies to prevent infestation.

Wax moth is often called “the beekeeper’s friend” because it destroys honey comb, as well as any disease this might contain.

- **The Small hive beetle makes the bees appear uncomfortable. The beetles are scavengers in the hive. Their larvae eat bee brood, pollen and honey.**

Small hive beetle in the colony.



Be very clean in the apiary – don't leave hive debris lying around to attract beetles. Strong colonies withstand the beetles better. Some colonies are better able to resist infestation, and should be selected preferentially. In severe cases, where serious damage is being caused to the bees, a soil drench can be used on the ground around the hives to kill the beetle pupae.



- **Large hive beetle can also be a nuisance.**



They can be excluded from the colony by keeping the hive entrances small.

Hive entrances should be no wider than the size of a biro.

Lots of small entrances are better than one big one.

- **Some mammals can be pests too. Where the honey badger is a problem, hives need to be raised up out of their reach.**



Notice how the wires are twisted into a single strand. This tips the hive so that it swings if a honey badger attacks it.



Use hanging wires if honey badgers are a danger. The hanging wires must allow the hive to swing easily to keep animals away. Hang hives at least 1 metre from the ground.

If stands are used, they must be very firmly fixed.

Hives need to be protected from man and other primates. The biggest problems can be caused by vandals and thieves.



If monkeys are a problem, spiky sticks can be put on top of the hive.

- **African bees can suffer from diseases too. American foul brood (AFB) is the only serious disease of African honey bees. AFB is a bacterial disease that kills the brood. The colony gets weaker and weaker until it finally dies. It is very infectious and there is no cure.**



Dark, sunken, perforated cappings and patchy brood are characteristic of AFB.

This comb is badly infected and the colony should be destroyed by burning.

Ropiness test for AFB:

If you suspect your colony has AFB, push a small stick into a cell and pull it out again. If it is ropy, this is a clear diagnostic indication of AFB disease.

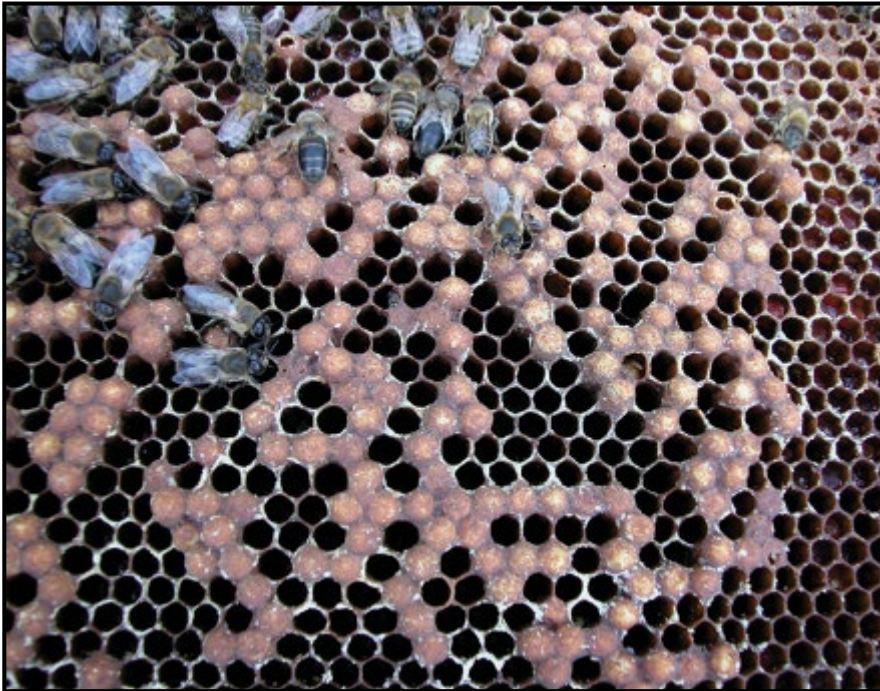


Top bar and traditional methods of beekeeping keep the incidence of AFB low, because much of the comb is harvested, removing infection from the colony. However, modern management methods that encourage combs to be moved between hives will increase the risks of spreading disease.

- **Varroa mites are occasionally found in Africa. In temperate areas, they are strongly associated with a range of bacterial and viral diseases. However, African bees appear to be naturally resistant to the mites.**

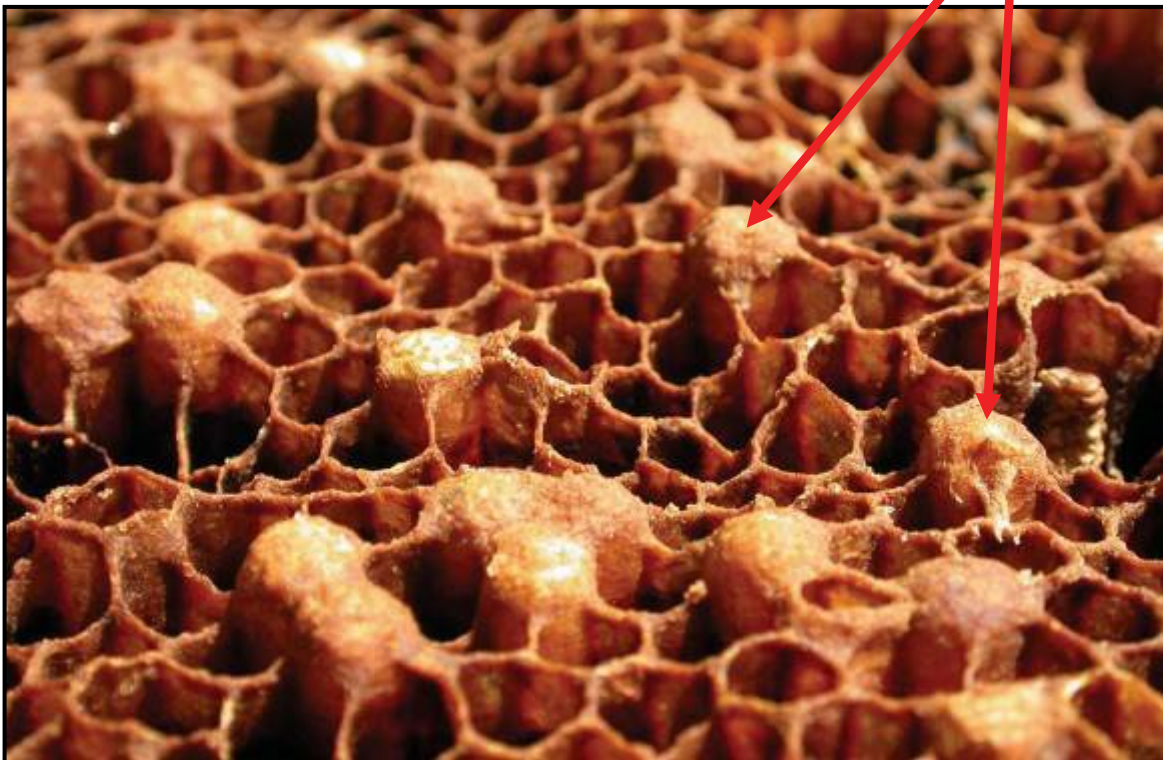


- **African bees are very susceptible to laying workers. This is usually caused when the beekeeper carries out an unsuccessful manipulation – for example a failed hive division. The queen is lost and the bees are unable to replace her. Because there are no queen pheromones to stop them, the workers will eventually start to lay eggs. Since the workers are unmated, their eggs will always become drones. As a result, the colony will inevitably die out.**



Laying workers and drone-laying queens are easily recognised because they lay drone eggs in worker cells.

The result is these very raised capping, which are easily recognised.



Queens become drone-layers when they run out of sperm, either because of poor mating or because they are old.

SWARMING, MIGRATING AND ABSCONDING

Swarming, migrating and absconding are all different. These behaviours help bees to survive in a tropical environment.

Swarming is the natural means of reproduction or division of a colony. Part of the colony is left behind and part forms a new colony.



- It usually occurs because the queen does not have strong enough pheromones (or hive smell) to keep the workers together as one unit – often because she is old.
- It may happen several times a year or not at all. It depends on the size, the resources and the circumstances of the hive.
- A hive that swarms a lot will not be as productive as a hive that does not swarm because the resources of the colony are being used by two or more colonies.

Migration is the natural seasonal movement of colonies to new resources and happens every year in a predictable cycle.

Absconding is the response of the colony to limited resources or unpleasant circumstances.

- Absconding can be planned or unplanned.
- Planned absconding is usually in response to lack of food. As the food coming into the hive gets less the queen stops laying eggs and the whole colony moves out after the young brood has hatched. The bees take as much of the hive's resources as they can.



- Unplanned absconding is usually in response to poor circumstances such as bush fire, ants or other pests, water leaking into the hive or excessive disturbance.

In both migration and absconding ALL the bees leave the hive to find a new home.

How to Make a Bee Suit



Salome in Kenya has a bee suit made from a maize sack. It is made of two parts so it doesn't need a zip.

HOW TO MAKE A BEE SUIT WITH BUILT IN VEIL

Bee suits can be made of a variety of materials. Good bee suit material is tough, cheap and protects from bee stings. A well-washed maize flour bag is an excellent choice.



Open up the bags and trim any torn edges. Select the material to be used carefully to make the most of what is available.



Use an old pair of trousers to outline the shape of the suit bottom.



Notice how the shape of the pieces allow room for the gusset area (this is where the leg pieces join).

gusset



Don't waste material. Make the most of the material available by putting one leg upwards and one leg downwards.



Cut four trouser pieces.

Stitch together inner edges of the gusset area first to make the front of the trousers. The material can also be stitched by hand.



Repeat for the other two pieces to make the back of the trousers.



Next join the inner leg edges.



Now join the outer edges of the trousers.



A "seam" is where two edges are joined.

Neaten the seams where they have frayed.



Try trousers on to check the size.



The waist and bottom of the trouser legs are folded over twice and stitched. This will make them neat and gives a gap to insert a string or elastic, which will hold the trousers up and keep the ankles tight.



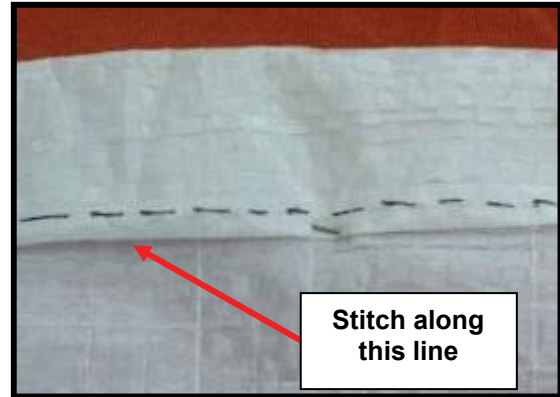
Insert strings into both legs and at the waist using a safety pin, hairpin or similar thin, blunt object that will help guide the string through the seam to finish the trousers.

This is how to insert the string or elastic:

1. Fold the edge over once.



2. Fold it again so all the torn (frayed) edges are inside the fold and stitch together.



3. This is the view of the gap that the string will be pushed through.



4. Push the string through the gap using a blunt object to guide it.



5. Push the string through the gap using the blunt object to make it go along until it comes out of the other end.



6. When the string is pulled tight it will look like this and help to keep the bees out.

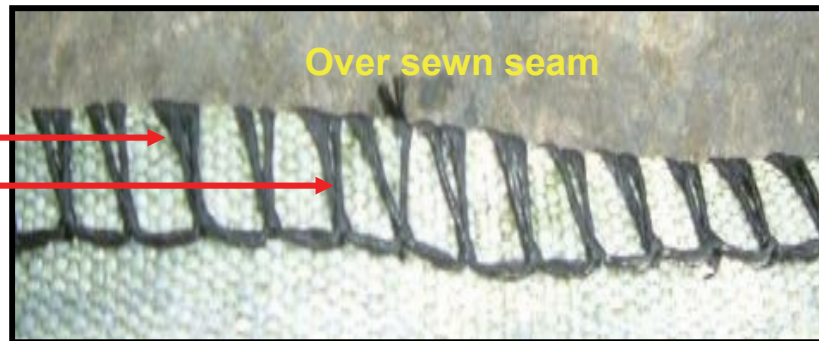


TAILORING DETAILS

The seams must be made stronger to prevent the material from fraying (breaking).

You can do this by over sewing the seam:

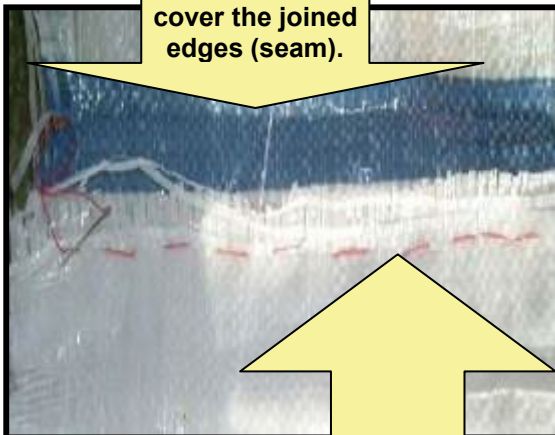
Putting stitches over the edge makes an "over sewn" seam



Alternatively, you can make a "run and fell seam" that will protect the edges of the material and makes a very strong join. Making a run and fell seam:

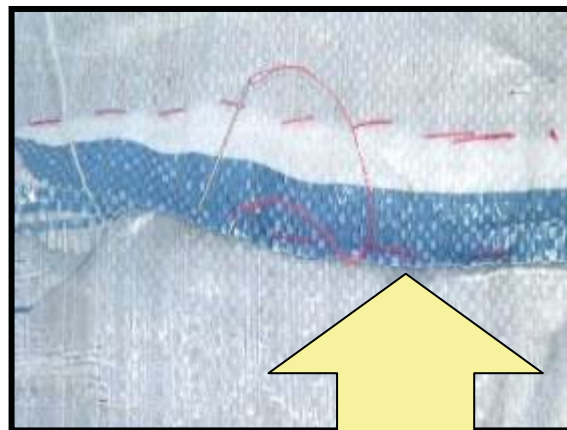
1.

Leave enough material here to cover the joined edges (seam).



Stitch along this line to join the two edges. This is called a seam.

2.



Fold flap of material over the seam and stitch down.

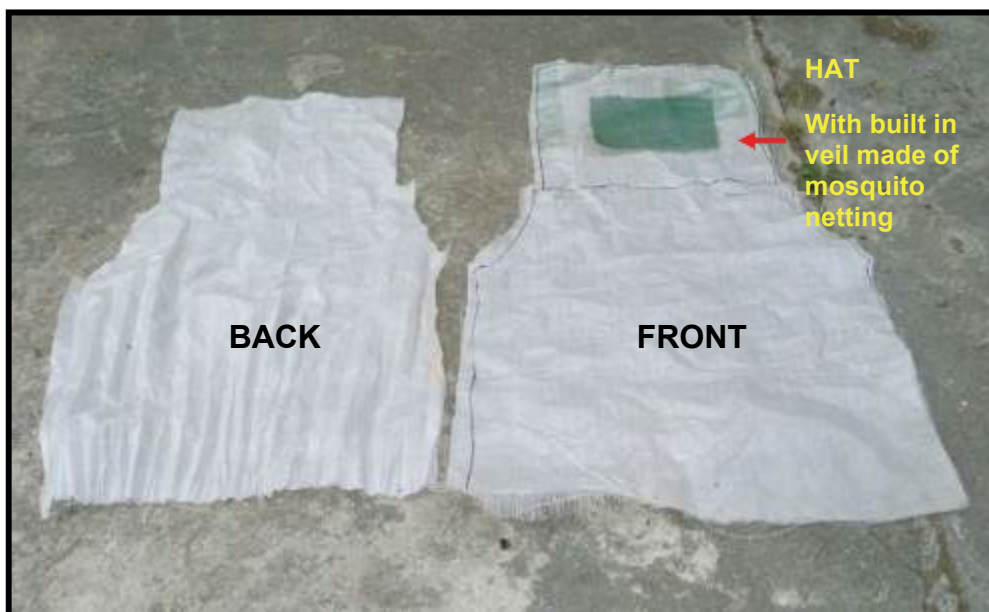
You can also cover the seam with tape or extra strips of material, and this will make joins stronger too.

To make the top of the bee suit, start with an old coat and draw out the shape on the material allowing plenty of room to turn over the edges.

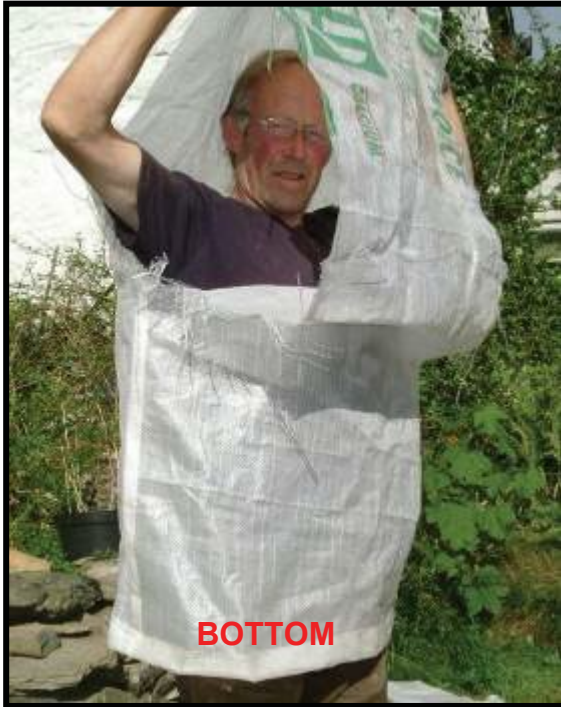
Add a square on the top to make the hat and veil of the suit.



Cut two pieces - one front and one back



Stitch the side edges and neaten the bottom so that it will take a string or elastic. Then try for size.



Before stitching netting into place, check position of shoulder joins and face area. Then stitch netting into place. Get help to do this.



Mark out the position of the hole for the veil hole on the front of the hat. This is made of an insert of mosquito netting stitched into place.



This is the bee suit top without the sleeves inserted.



Draw out two sleeve shapes. Notice the special shape that will allow the sleeve to fit over the shoulders when the suit is stitched together.



Cut the two pieces.



Stitch sleeves together, neaten the material at the wrists so they will take a string and then insert sleeves into the bee suit top.



The completed bee suit. Notice plastic bags over the shoes and tied at the ankle to protect the feet. Rubber gloves are the best bee gloves to use.



rubber gloves

plastic bags
over the
shoes, tied at
the ankles

The completed bee suit

This bee suit is made in one piece with a more complicated hat design. A one piece suit needs zips to get into it.



Adding Value to Honey bee Products



Distilling alcohol from fermented honey in Zambia. Honey has been used for centuries to make fermented drinks such as mead or honey beer.



A wide range of other value added products can be made that includes candles, polish and cosmetics as well as cooked products made using honey. Making value added products is especially suited to women's traditional skills.

Additional images Janet Lowore (Bees for Development), Fera, John Home and Roy Dyche

VALUE ADDED PRODUCTS

Adding value means turning more of the hive products into complex goods, or accessing the selling chain more effectively so that extra money and sales return to the beekeeper. It is especially effective for products using beeswax.

The range of ingredients and containers available for value added products is often limited. Variations can be made by adding extra ingredients that may be available locally.

Experimentation with recipes to develop a good range of products is essential for good value added production. Some basic recipes are included at the end of this section.



Making candles

Many types of candles can be made. The choice will depend on the type of market and the available moulds. Candle moulds can vary - eggshells, bamboo, water pipes or papaya stalks are all successful.



This women's group in Malawi is making candles using plastic water pipes as moulds. The bottom is closed with a bottle top.



This disabled woman in Tanzania has a candle made using an imported mould.

The principle of candle making is the same in each case. The wax must be clean. The method for cleaning wax is shown in the Basic Beekeeping Manual 1.

To make a moulded candle:

1. Melt wax to liquid in a double boiler over the fire.



2. Cut the wick to size. Some people coat the wick in wax to keep it straight.



3. Soap the mould to stop the candle sticking. This mould is bamboo.



4. Make sure the bottom end is well plugged so the wax cannot run out.



5. Set the wick in the centre of the mould using a split stick or hairpin to hold it in place.



6. Pour the melted wax carefully into the mould.





The finished item

These candles are made using a commercial mould from Zimbabwe.



Candles can also be made by dipping the wick directly into a container of melted wax, drawing it out and allowing the wax to set. This is repeated many times to build up the layers of wax into a large candle.

With skill candles as good as these can be made.



Making a simple light

This simple light is made in a tin can, a clay pot or a cut off beer can. The candle is burned in the mould and lasts well because all the wax burns and none runs down the edge of the candle.

Night lights are made in a similar manner.



1. Melt beeswax in a double boiler over the fire.



2. Prepare tin and wick.



3. Support wick with split stick.



4. Pour in wax and leave to set.



It is not necessary to remove the finished candle from the tin.

Making a basic body cream or ointment

1. Measure oil and beeswax into a heatproof container.



2. Place the container into a double boiler over the fire.



3. Heat until the wax has melted and blended into the oil. Stir well.



4. Add any scents or medicinal ingredients at this point. Stir well and pour into a container. Leave until set.



Lip balms can be made using this method. Pour into a suitable container.

An effective medicinal skin cream can be made by melting propolis into Vaseline using the double boiler method described above.



Making a soft cream

To make a softer cream, add water to the basic recipe. As oil and water don't mix, this requires an emulsifier.

1. Measure oil and beeswax into a heatproof container and heat until blended together. Measure water and emulsifier (if available) into a second heatproof container.



2. Make a suitable container for stirring.



3. Blend the water into the oil and wax mixture stirring hard all the time until it goes thick. It needs two people.



4. Pour into a suitable container.



The simplest emulsifier is borax (sodium borate). To make a liquid lotion add alcohol until the desired consistency is reached. Soft creams will need a suitable preservative if they are to keep well.

Making polish

1. Collect together ingredients.



2. Melt beeswax in a double boiler.



3. Put turpentine or suitable spirit into mixing container.



4. Pour melted beeswax into turpentine mixing constantly until they blend.



5. Beeswax can be coloured using different dyes. Here hair dye has been used to colour black shoe polish.



6. Uncoloured polish will still polish all types of things keeping them protected and waterproof.



Appendix of honey, propolis and beeswax recipes



Beeswax recipes

The following basic recipes have been compiled using ingredients that are likely to be available in all areas. Experimenting with the basic recipes using locally available ingredients will enhance the product. Only use oils that are normally used for human consumption. If it can be safely eaten it will be safe to put on the skin. In each country the ingredients that are easily available will vary. Look for ingredients that are available at a reasonable cost so that the resulting creams can be sold profitably. Be warned though – using unrefined palm oil will make the cream look very red although this colouration does not appear to stain skin or clothes.

Oily cream

The basic recipe for oily cream is as follows (this recipe will also work as a lip balm):

- 1 measure beeswax; 4 measures of oil.
- Heat all the ingredients together in a double boiler.
- Stir thoroughly.
- Remove from the heat and add any desired colouring, perfume or medicinal extracts into the mixture.
- Stir thoroughly again and pour into the sales container while still warm.
- For softer cream add more oil; for harder cream use less oil. Adding a few drops of glycerine will also make the cream softer. Adding 4 measures of Vaseline to the basic recipe will give a smoother consistency. Glycerine can also be a nice addition to this oil.

Herbs, propolis, lemon grass, aloe vera, vetiver root, herbal oil extracts, essential oils or honey can be added for specific medical or cosmetic uses: for instance, eucalyptus for chest and nasal congestion. A reasonable quantity of essential oils can be extracted from suitable plants and herbs by packing them tightly into good quality oil (vegetable or coconut is preferred) and then baked in a closed container in a very cool oven – (max 100°C) for 2-3 hours. The resulting oil can be used in any cream or lotion recipe.

Soft cream – or ointment

The soft body creams are a mixture of oils, including beeswax, and water. Oils and water don't normally mix so in order to join these otherwise incompatible ingredients together an emulsifier is used. If a suitable emulsifier can be found then this is a more economic product to make as it includes a significant quantity of water. It is essential to get the ingredients all at the same temperature before combining. Preservatives such as neem oil, tea tree oil or alcohol will help the product to keep for longer.

Soft cream basic recipe:

- ½ measure melted beeswax, 2 measures vegetable oil, 2 measures scented or herbal water, 1 teaspoon borax (sodium borate). Follow directions in the pictures section.
- The temperature of the liquids in both containers should be the same. Prepare everything well.
- Remove the container with the melted wax and oils from the heat.
- Very quickly pour the scented water mixture into the wax mixture stirring continuously without stopping until the mixture becomes thick.
- Put into small pots for sale before it cools.



This cream can be made very much more liquid – and become a lotion – by the addition of ethyl alcohol and stirring well as the mixture is beginning to set. The amount of alcohol added is determined by how liquid a lotion is wanted and how long it is to be stored - the alcohol may evaporate if the storage is not cool. Too much alcohol will dry the skin. Alcohol should be diluted to no more than 50% strength using distilled water.

Wood, furniture or floor polish

In polish recipes, beeswax is dissolved in turpentine or white sprit. Other solvents may not work so care must be taken to get a suitable product. *Polish basic recipe:*

- 1 measure beeswax; 2 ½ measures of turpentine (equivalent to 50g beeswax 125 ml solvent);
- Follow the directions shown in the picture section.
- When combining wax and spirit, ensure stirring is continuous or ingredients can separate and spoil. You may need a helper.
- Pour into suitable containers and label attractively.



Propolis

Propolis is collected from plants and is very different from beeswax. It has excellent antiseptic properties and is valuable both internally and externally. Collect propolis carefully to avoid getting it dirty. It should not be crushed into a ball. Store in a clean, dry container and use either dry or as a tincture. *Propolis tincture recipe:*

- Take the desired quantity of propolis and soak in water for 3-7 days to clean and soften it.
- Soak the propolis in ethyl alcohol ideally 70% proof, shaking it every day.
- Do NOT use contaminated or denatured alcohol as this will be poisonous.
- 50 gms of absolute alcohol (100% proof) with 100mls of water will give a 50% solution.
- Maximum extraction of the active ingredients will take 1-3 weeks.
- Filter through a very fine filter such as a coffee filter.
- The medicinal part is the filtered liquid.
- This should be kept in a dark glass bottle in a cool place. Since alcohol is a good preservative the tincture will last for a very long time.



Baked honey products and honey sweets

Chewy honey bars

- 1 $\frac{1}{3}$ cups honey**
- $\frac{3}{4}$ cup sugar**
- 3 tablespoons margarine**
- 4 cups wheat flour**
- 1 teaspoon baking powder**
- $\frac{1}{2}$ cup chopped nuts (macadamia or peanuts)**
- $\frac{1}{2}$ cup sun dried fruit**
- $\frac{1}{4}$ teaspoon ginger powder**
- $\frac{1}{4}$ teaspoon cardamom**
- 2 teaspoons cinnamon**
- $\frac{1}{8}$ teaspoon cloves**

Warm honey, sugar, and margarine together until melted. Mix flour with other dry ingredients. Add to melted mixture and stir in well. Spread into well greased cake tins and bake in an oven at 350°F for 25 mins. Cut into squares when cool. The bars are hard at this point but will become soft after about a week in storage in an airtight container. They will keep for up to 6 months in an airtight tin.



Fruit honey bread

3 cups wheat flour
3 teaspoons baking powder
1 teaspoon ground cinnamon
½ teaspoon salt
1 ¼ cups milk (milk powder+water may do – or try replacing milk with water)
1 cup honey
1 egg
2 tablespoons vegetable oil
1 cup chopped dried fruit (mango, banana or even forest fruit)
½ cup nuts
½ cup sunflower seeds (optional)
½ cup raisins (optional)

Combine dry ingredients in large bowl. Combine milk, honey, egg and oil in a separate large bowl. Blend liquid mixture with dry ingredients until just moist. Fold in fruit and nuts gently. Pour into 9 x 5 x 3 inch well greased baking tin. Bake for 60 minutes at 350°F or until tested to be fully cooked. Slice into 12 pieces.

**Marzipan (proportions by weight)**

10 parts sweet almonds (experiment with other nuts such as macadamia and/or peanuts to make a new product)
1 part bitter almonds – or extract
7 parts of honey
1.5 parts lemon (or orange) juice

Blanch and peel almonds to remove skins then grind finely. Add lemon juice and honey and leave for 24 hours.



No baking is necessary. The marzipan can be rolled out using icing sugar (finely ground sugar to prevent it sticking to the rolling pin) then cut into shapes and sold as cookies or sweets. It can be covered with chocolate or icing sugar or coloured with food colouring.

Greek Halvah

5 parts honey
3 parts olive or sesame oil (other vegetable oils give cruder flavour)
2 parts chopped or ground nuts (add some sesame seeds also)
10 parts sugar
5 parts flour
3 parts water
ground cloves and ground cinnamon to flavour

Heat oil until very hot. Gradually stir in flour stirring slowly until flour turns brown (30-45 minutes). Meanwhile, make a syrup of sugar, honey and water and boil for approx 30 minutes over low heat until a 'soft crack' stage is reached. Add spices and nuts, then mix in browned flour.



Stir constantly over low heat until thickened. Turn off heat and cover pan for 5 minutes. Pour onto oiled baking sheet or tray. When cool cut into squares or bars and sprinkle with icing sugar or cinnamon.

Honey roasted nut bars

10 parts sugar
2.5 parts honey
1.25 nuts (whole or broken)
2.5 water
1.25 white vinegar

Dissolve sugar in water and vinegar, place over medium heat and stir continuously. When

boiling add honey, mix and reheat to a boil. Cover for 3 minutes to remove crystals from side of pan. Uncover and without stirring, bring to a golden brown 'soft or hard crack' stage according to preference (this will affect the hardness of the bar). Add nuts and cook for a few more minutes without raising the temperature. Pour onto a cold, oiled tray. Cut before candy goes hard. Recipe can be modified to give a caramel coated nut bar (using more nuts) or a solid caramel bar with fewer nuts. If a bar with extra nuts is wanted, nuts should be stirred into a small amount of hot syrup before adding to the mixture.



Honey sauces and relishes

Honey and chilli dressing

**1/3 cup honey
(preferably wine vinegar)
1 teaspoon dried oregano
1/2 teaspoon salt
1/8 teaspoon red pepper**

Combine all ingredients together.



Honey and lemon dressing

**1/2 cup honey
1/4 cup lemon juice
1/4 cup vinegar
2 cloves chopped garlic
1 tablespoon oregano
Salt and pepper to taste**

Combine all ingredients together.



Honey and orange sauce

**2/3 cup orange juice
1/2 teaspoon ground ginger
1/2 teaspoon ground nutmeg
1 tablespoon margarine
1 tablespoon cornstarch
1/3 cup honey**

Combined ingredients and cook until corn starch thickens the sauce.



Molly's honey sauce

Mix equal quantities of honey, tomato sauce and vinegar. Add as much garlic as liked to give good flavour plus salt and pepper to taste.

**Honey and fresh fruit chutney**

1 cup chopped fruit (e.g. mango, pineapple)
 ¼ cup finely chopped onion
 ½ cup finely chopped vegetables (carrot or cabbage)
 5 tablespoons honey
 3 tablespoons mixed mustard powder
 2 tablespoons lemon juice
 2 teaspoons grated ginger root
 Salt and red pepper to taste



Combine ingredients and cook gently together until well blended.

Notes

1 teaspoon = 5 ml

1 tablespoon = 30 mls

¼ cup = 60 ml

½ cup = 125 ml

1 cup = 250 ml

2 cups = 1 pint = 500 ml

4 cups = 1 quart = 1 litre

1 ounce = 30g

8 ounces = 225g

Simple medicinal uses of honey

Since ancient times honey has been widely used as a healing medicine (as well as in conjunction with traditional herbs, where the sweetness of the honey can help to make them more palatable). Honey stimulates the immune system and is an excellent healer. It removes dirt and dead skin from wounds, reduces inflammation and bacterial growth, stimulates healing and prevent dressings sticking to the wound. Its absorbs pus and other liquids oozing from an open wound.

Minor burns and wounds: Clean the wound then cover with plenty of honey and a clean dressing. Change daily.

Coughs and sore throats: Honey is soothing for inflamed tissues. Honey and lemon mixture is a delicious way to sooth a sore throat and aid recovery from a cold. In a cup or mug mix together 1 large spoonful of honey with the juice of ½ small lemon. Fill the mug to the top with hot water. Drink all of once it is cool enough. Especially good before sleeping.

For sore eyes, conjunctivitis and other eye infections: 2 drops of best quality liquid honey dropped carefully into the affected eye. Repeat twice daily until healed. If problem persists seek medical advice.

Gastro-enteritis and rehydration: Use honey at a concentration of 5% (vol/vol) to reduce the duration of bacterial diarrhoea in children.

Sleeplessness: Honey is a mild sedative. Take a large spoonful of honey in a mug of milk before bedtime.

High energy food source: Honey is quickly absorbed into the bloodstream so is excellent for fatigue or as a reviver after exercise. For elderly people or invalids with little appetite and for children it gives a delicious source of calories and energy. It is excellent combined with maize meal and peanut powder to make a nutritious porridge.

Honey and oatmeal face pack: Mix liquid honey with oatmeal – preferred as this also has helpful skin healing properties - (or maize meal) until it is spreadable. Apply as a face pack. Leave for half and hour while relaxing. Wash off. Good skin cleanser and helps to reduce acne.

Honey should not be used by diabetics unless under medical supervision. Honey, propolis or apitherapy should **NEVER** be used to replace proper medical advice.

Finding further information sources

There is plenty of information available on the Internet but it is not all of high quality. Much of the information can be conflicting and confusing and may not be based on research evidence, practical beekeeping experience in the tropics or take the development objectives of beekeeping into account.

While there may be many more, the following sources are recommended for quality information:

- Krell R; (2001), Value-added Products from Beekeeping, FAO Agricultural Services Bulletin, FAO Rome (available freely from FAO corporate document repository <http://www.fao.org/docrep/w0076e/w0076e00.htm>)
- Bees for Development www.beesfordevelopment.org.uk
- UK National Bee Unit Advisory Leaflets; FERA <https://secure.fera.defra.gov.uk/beebase/public/Advisory/advisory.cfm>
- Practical Action - <http://practicalaction.org/practicalanswers>
- Control of Varroa. A guide for New Zealand Beekeepers. MAF New Zealand.
- <http://homepage.ntlworld.com/gandboss/BeeginnersFAQ/Problems/control-of-varroa-guide.pdf>
- Bees Abroad – info@beesabroad.org
- Locally based beekeepers or beekeeping organisations and traditional beekeepers
- Search for publications on CGIAR and FAO websites.

Happy and profitable beekeeping

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