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Bee Keeping Handbook

by: B. Clauss and L. Tiernan

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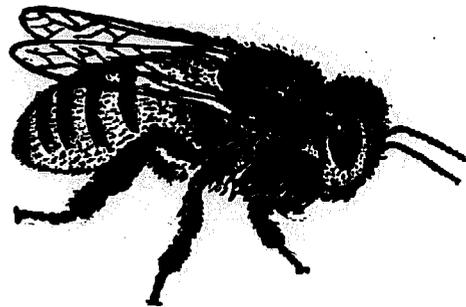
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2nd Edition

Bee Keeping
Handbook

Bee Keeping Handbook

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Preface to the second Edition

When I began beekeeping in Botswana I only had theoretical knowledge of the biology and behaviour of bees. I was stationed as a teacher at the Remote Area Settlement of Kagae in the Western Central Kalahari and so had to discover:

1. if there was a method of keeping bees that was both effective yet cheap, and simple but modern.
2. how to introduce beekeeping into the Kagae community, where the people were only familiar with honey hunting.

The method had to be suitable for both people and the bees. Bees are not primarily aggressive, though the African honeybee has a notorious reputation for being ready to fight fiercely when annoyed. This results in a human fear of bees.

I once observed honey hunters in the Okavango and it was they who taught me how to approach wild colonies, using only the mild smoke from cow or buffalo dung all the time taking every precaution to avoid killing bees.

Together with a group of Kalahari schoolboys I started practising beekeeping, applying the methods that I had witnessed in the Okavango. It was amazing to see how the boys, and later on many other Batswana, switched from "bee-robbing" to "bee-keeping."

It soon became apparent that the simple design of the modern Tanzanian Top Bar Hive was particularly suitable for our bees. This hive is easy to operate and therefore allows us to treat the bees in a friendly way, so that we can get a friendly response!

Since the first edition of the Beekeeping Handbook was published, the interest in beekeeping amongst Batswana has grown enormously. In this second edition some of the materials have been revised and expanded in the light of our experiences over the past two years. Beekeeping on a small, home-based scale has very good prospects in Botswana, especially as top bar hives can easily be made for very little money.

The revision of this handbook has involved a great deal of work and I am grateful to the many collaborators for their invaluable assistance. Last but not least I am indebted to all the Batswana beekeepers who contributed so many worthwhile and innovative ideas.

Gaborone, March 1982

BERNHARD CLAUSS

C O N T E N T S

INTRODUCTION.....Page 2

EQUIPMENT Page 3

THE BEE COLONY.....Page 10

Workers
Nectar and Pollen - the Bees' Food
Drones
Queen
Brood

STARTING A COLONY (BY CATCHING A SWARM)Page 19

Preparation of Hive
The Swarm
Capture
Hiving
Feeding

STARTING A COLONY (BY SMOKING OUT WILD BEES).....Page 31

Preparations
Chopping
Hiving
Honey Cow .

HOW TO HANDLE BEES.....Page 37

Honey Harvest
Brood Nest Management

STARTING A COLONY (BY DIVIDING A COLONY).....Page 48

MISCELLANEOUS.....Page 51

HOME-MADE HIVES.....Page 53

PESTS AND PROBLEMS.....Page 62

GLOSSARY OF BEE KEEPING TERMS.....Page 67

SUMMARYPage 70

Members of the Colony
How to Handle Bees

APPENDIXPage 75

Costs and Measurements of Hives

Introduction

This handbook provides all the information required to start beekeeping. So why not try it? It is not as difficult and dangerous as you might imagine. African honeybees are very industrious, but are also known to be vicious. However, with a good understanding of their behaviour and by practising the methods described in this book, the bees will react in a friendly way towards you.

There are many reasons for keeping bees.

1. Honey is a delicious and highly nutritious food. By the traditional method of honey-hunting, many wild colonies of bees are destroyed. This can be prevented by raising bees in boxes and producing honey at home.
2. The products of beekeeping: honey and wax are sources of income. Both can be marketed locally.
3. Beekeeping has positive ecological consequences. Bees play an important role in the pollination of many flowering plants, thus increasing the yield of certain crops such as beans, melons, sunflowers and various fruits.
4. A beekeeper needs not own land to realize a cash crop from this part time rural enterprise.
5. The honey bee does not compete for resources with any other agricultural enterprises.
6. Honey and beeswax can be produced from areas of little agricultural value.
7. Beekeeping can be initiated by either individuals or groups. It requires limited capital and minimal dependence on foreign technology.

Equipment

The equipment you need to start bee keeping is not complicated and can easily be obtained/made in Botswana.

First we need a home for the bees. This is called a Hive. The one we recommend is the TOP BAR HIVE, a simple long box covered with a number of slats on top ("top bars").



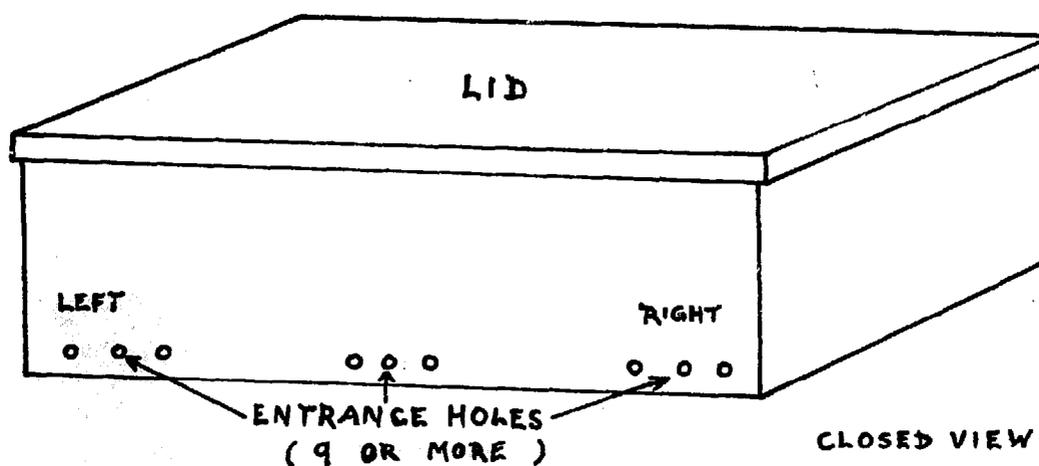
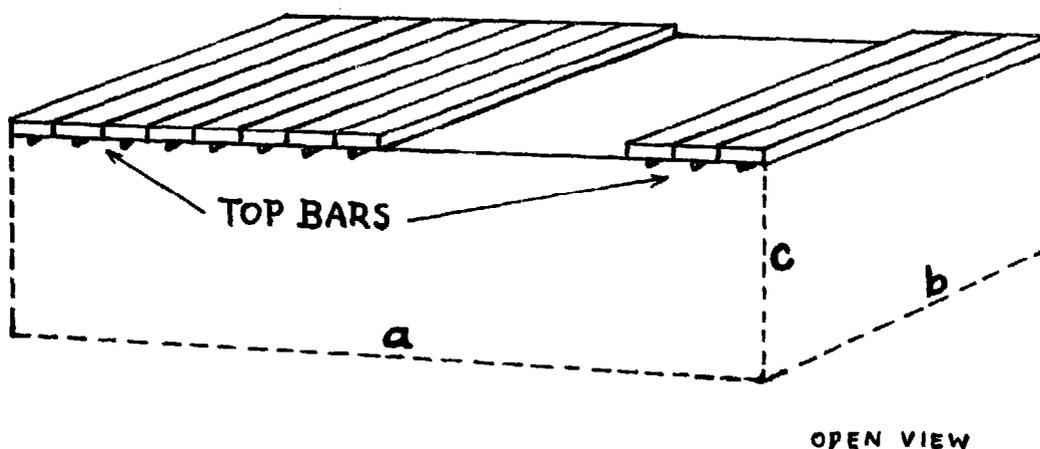
The author demonstrates the use of the Tanzanian Top Bar Hive.

BC

The Top Bar Hive, compared with other hives has some very important advantages:

1. It can be opened easily and quickly.
2. When you open the hive on the empty side the bees are not frightened and they stay calm.
3. There is enough working space in this long hive for the bees and the beekeeper.
4. The removable top bars enable you to inspect your colony without damaging the combs.
5. The small entrance holes keep natural enemies and "robber" bees out. Only a few guards are necessary at each hole so the bees are not so much on the alert, and you may pass the hive safely at a distance of only a few metres without being attacked.

top bar hive



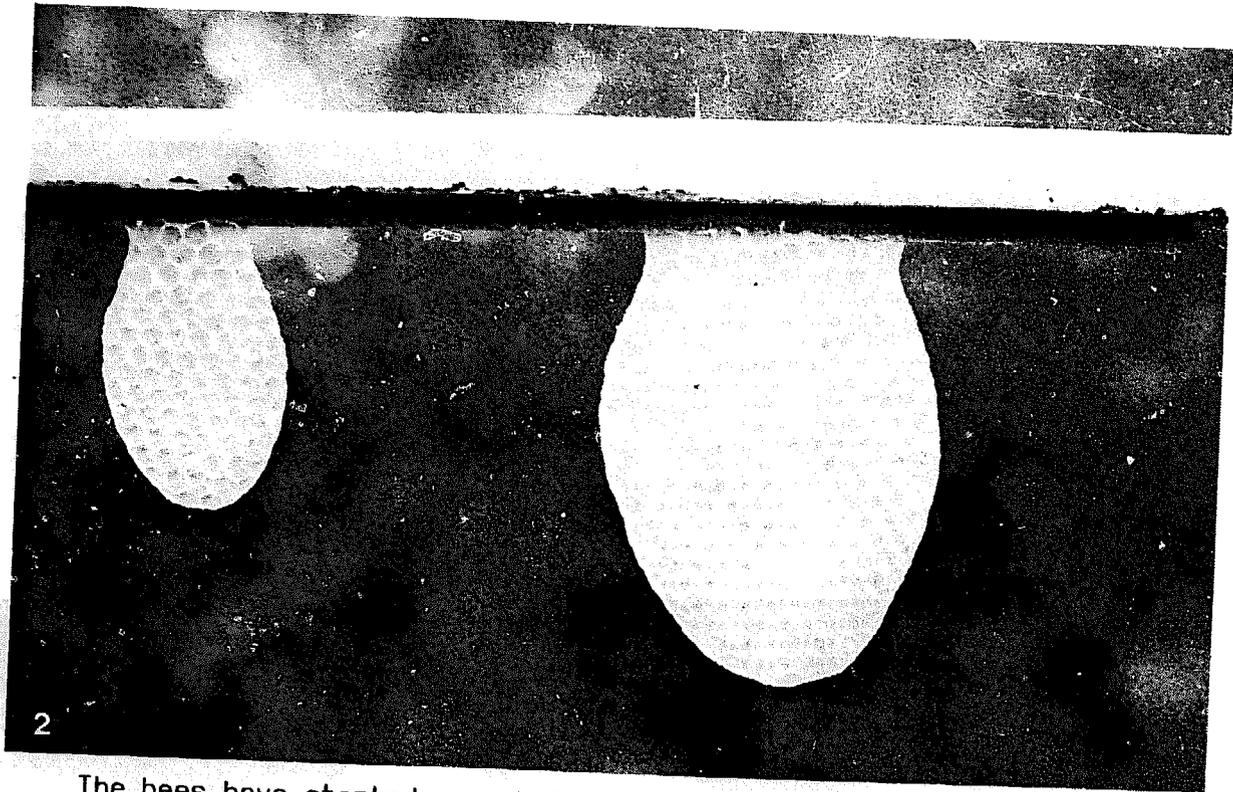
The rough measurements of the box (hive) should be as follows:

length: 100 cm (a)		The boards should be 2 cm thick.
width: 45 cm (b)		The hive must be <u>glued and screwed</u> together.
height: 25 cm (c)		Entrance holes must be 1 cm wide.

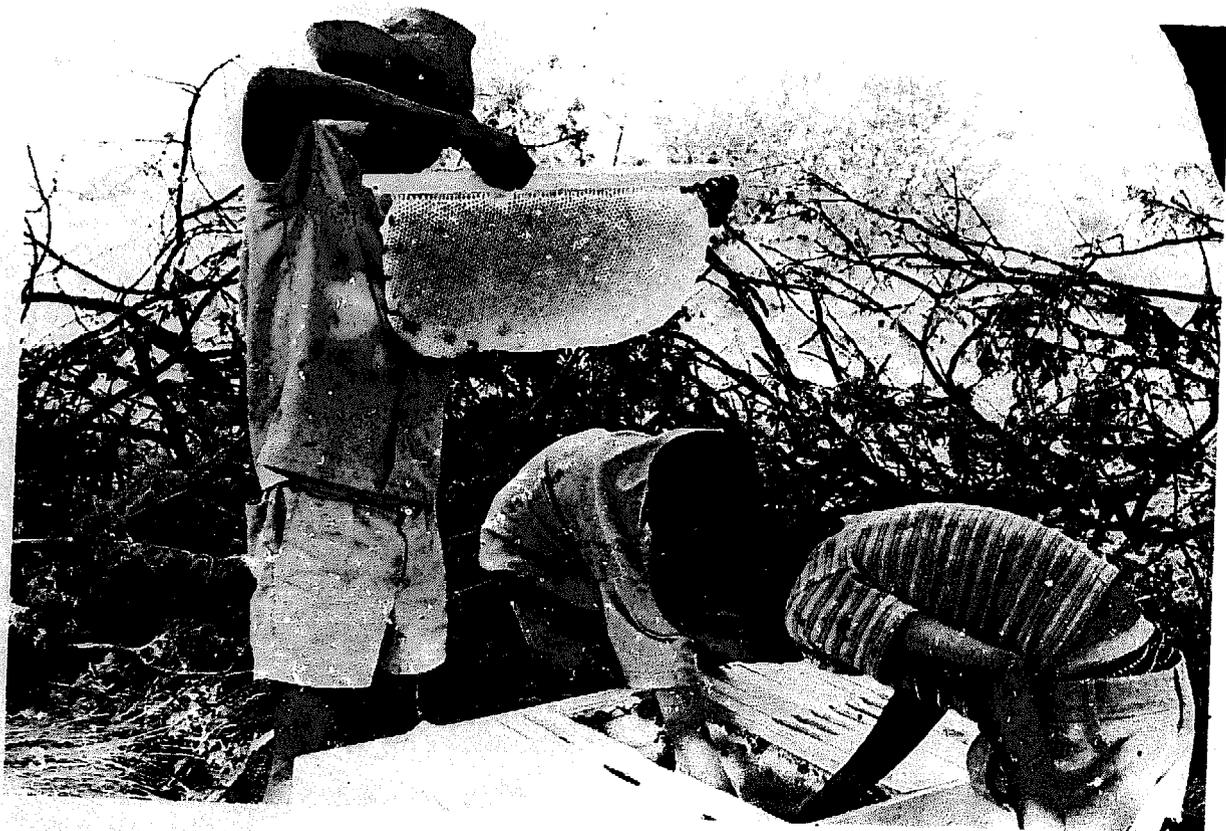
The slats (top bars) must be:

- as long as the hive is wide in order to fit across
- about 1.5 cm thick to support a heavy honey comb
- exactly 3.3 cm wide to give the bees the natural spacing they need to easily build one comb to each separate top bar.

Additional information about hives and prices can be found on page 75.



The bees have started a comb from the ridge of a top bar *BC*



... and as you can see, the comb will grow enormously. *LT*

The SMOKER is the second important piece of equipment. This can be made from a beer tin. We use the smoker to protect ourselves from bee stings and to control the bees. Smoke helps to keep the bees calm. They engorge themselves on honey when they smell the smoke and are then not so likely to sting.



LT

Cemaha and Karoha are filling their smokers with smouldering cow-dung.



LT



6

LT



7

Cemaha swings the smoker to get more smoke.

LT



Spooki smokes his face to protect it from stings

LT

Bee Stings

Before proceeding any further, it is necessary to say that bees do sting. This cannot be completely avoided, but certain steps can be taken to minimise the number of stings received:

- Smoke your face repeatedly, or even better, rub vinegar on your face and arms.
- Never make sudden movements or loud noises.
- If bees are buzzing around your head, or if you are stung, DO NOT flap your arms about and run away. Instead walk away slowly with your head bent down. (See treatment of stings on page 39).



Other Items of Equipment

Broad brimmed hat: used to protect the eyes and nose from stings.

Knife: used to loosen the top bars and to cut off the honey combs.

Feather: used to sweep the bees from the combs.

Queen Excluder

Match-box

} The use of these will be explained later.

The Bee Colony

To understand HOW to keep bees we must learn about the different members of the colony, what their jobs are, how the young larvae grow and the importance of the Queen.

The size of a bee colony can vary between a few thousand and as many as 60 000 bees.

A cluster of bees the size of a medium fist contains about 1 000 bees.

The three different castes (types) of bees are:

1. The Worker
2. The Drone
3. The Queen

Workers

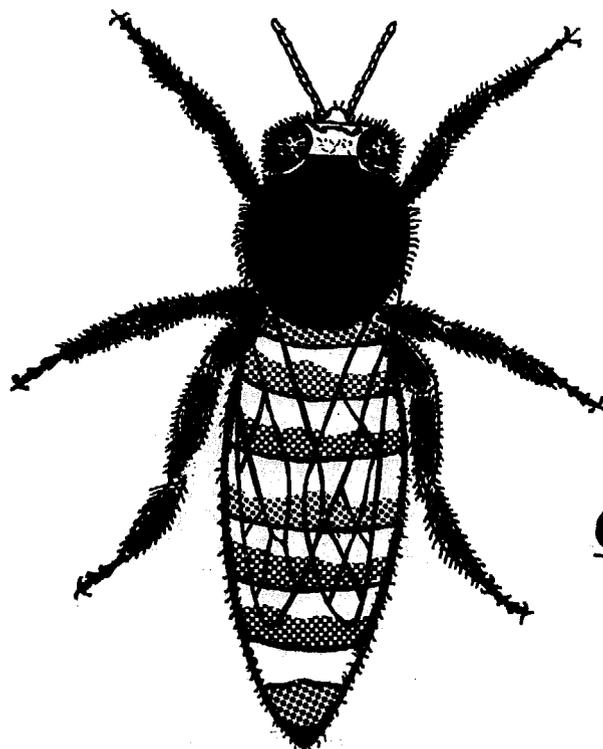
The vast majority of bees are workers. These are underdeveloped females which do not lay eggs, but do all the various duties in the colony. During the flowering season they have to work very hard. They live no longer than six to seven weeks and then die of exhaustion. Workers born before the winter sometimes live for a few months because work is not so intensive at this time.



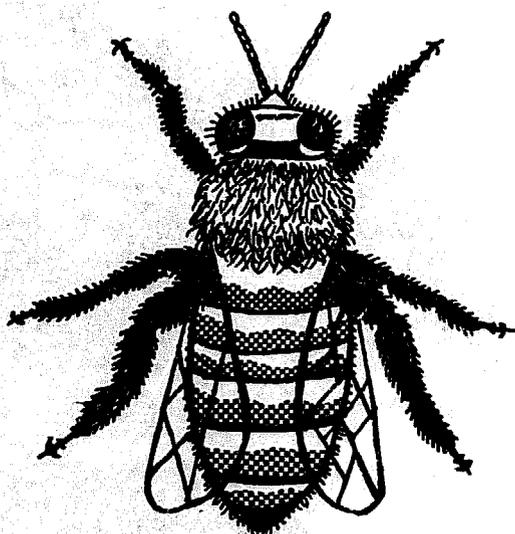
Cute is holding a huge comb with workers and capped worker brood. LT

Members of the Colony

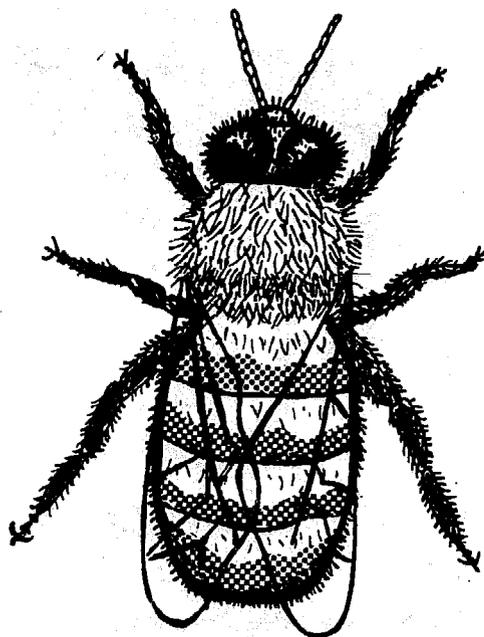
(Enlarged about 4 times)



Queen



Worker



Drone

Worker bees have to work as "house bees" for the first three weeks when their duties change as follows:

- covering and warming the brood (eggs, larvae, and pupae),
- keeping the cells clean,
- feeding the brood and queen (as "nurse bees"),
- producing wax and building the combs with regularly shaped cells,
- ensuring that the temperature inside the hive is kept constant,
- keeping the hive clean,
- changing nectar into honey and storing it in the cells.

After orientation flights some of the house bees work as entrance guards and finally start to collect nectar, pollen, and water as "field bees" (foraging bees).



Worker collecting nectar and pollen

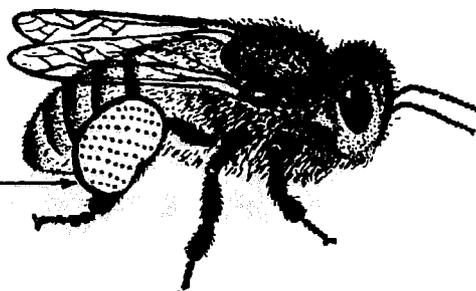
BC

Nectar and Pollen — The Bees' Food

Provided there is sufficient rain, plenty of flowers "advertise" food for the bees by their various colours and scents. Bees collect nectar and pollen generally in a radius of 2 km from the hive.

Nectar is a sugary juice secreted by flowers. Bees collect nectar and change it into the more concentrated honey. This takes place in what is known as the "honey stomach" (the front part of their stomach). Honey is the energy providing food. It is the "fuel" which keeps the "engine" (activities of the bee's body) running. Stored in great quantities in the combs, sometimes for long periods, it is always ready for consumption.

pollen load



The bee touches the anthers (pollen sacs) of the flowers in search of nectar. The pollen sticks to the dense hair of the bee, she then brushes this colourful dust off and carries it home in large loads on the hinds legs. Pollen contains protein, vitamins, mineral salts and fats and provides the "building material" for the growth and development of the bees. Without pollen there could be no brood production.



Most of our trees and bushes are important bee plants, from which the worker bees collect their FOOD. We must keep these trees and bushes so that the bees do not have to travel far to collect their nectar and pollen.

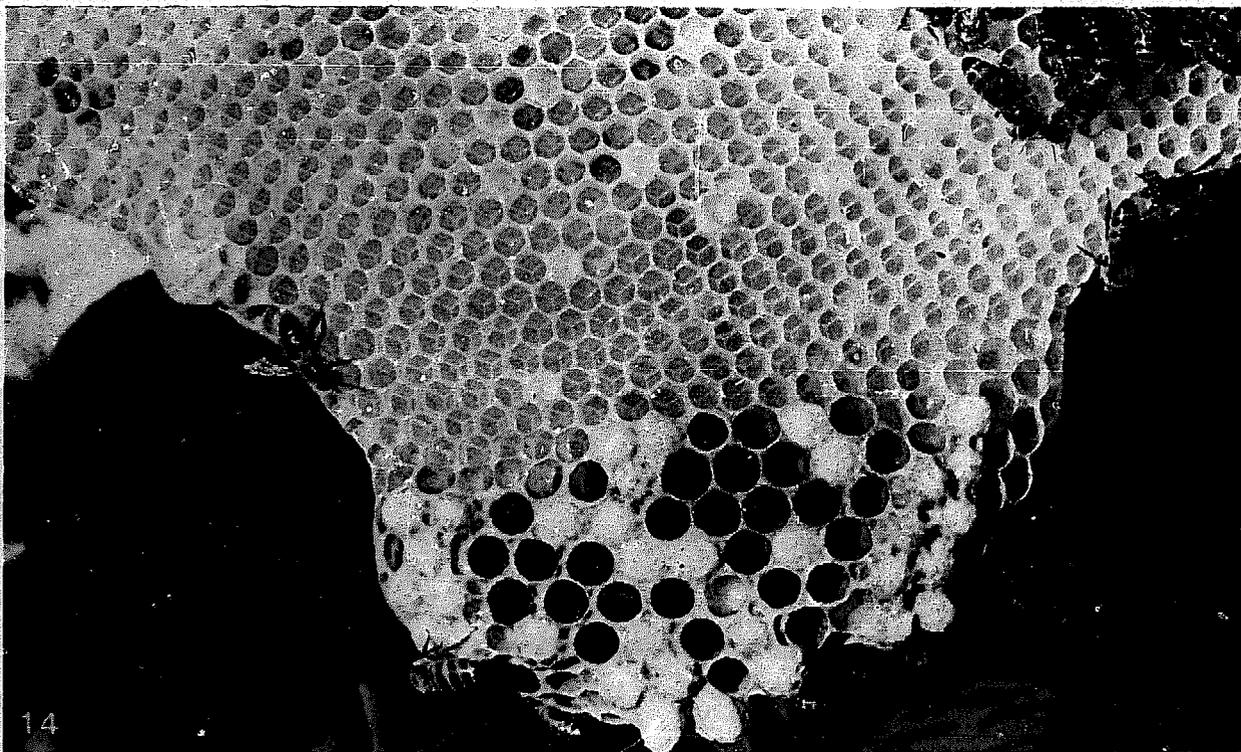
Do not cut trees and bushes within two kilometres of the hives, or half an hour's walking distance, otherwise beekeeping may become uneconomical.

Many bees in the colony appear to be idle. However they are the reserves of the colony, ready for any unexpected and urgent task, e.g. to cope with abundant amounts of nectar or with the sudden need for water in hot weather. Every bee, except the very young ones (lighter in colour and very hairy) is always ready to work and fight for the colony.

When there is enough food the colony grows fast, and the workers rear some hundred drones. These are the males and are bigger in size than the workers. The cells they grow up in are therefore more spacious than the normal ones. The cappings are dome shaped.

They have huge eyes and do not sting, yet buzz very noisily. They do not take part in the communal work of the colony, but are fed by the workers. During the warm time of the day they fly out in search of virgin queens. When food gets scarce, most of the drones are thrown out of the hive and then they die.

Amazingly drones develop from unfertilized eggs!



See the different size of worker cells (top) and drone cells (below) ^{BC}

Queen

The Queen is the overall mother of the colony, who can live between 3-5 years. Nurse bees feed her with "bee milk" which they produce in special glands. This food is very rich in protein and helps to develop her ovaries. She is able to lay up to 3 000 oblong, white eggs per day during the main pollen season. She lays one egg per cell.

The queen mates only once in her lifetime with several drones high in the air. The sperm is then stored in a "bag" which is connected to the oviduct. When an egg is released the queen opens the sperm "bag", and the egg is then fertilized. This produces a female larva. If an egg passes without being fertilized, the result is a male larva (drone larva).

The workers rear a number of new queens when the old queen weakens or dies. They do the same when the colony expands rapidly. In this case roughly half of the population prepares to separate, taking the old queen with them. They leave the hive as a "swarm" in order to establish a new colony. This happens just before a new queen emerges from her cell.

The workers can only rear a new queen if the brood contains fertilized eggs or young female larvae which are not older than $2\frac{1}{2}$ days. These young larvae float on a drop of bee milk, which is their food for the first $2\frac{1}{2}$ days of their lives. At this stage, therefore, all female larvae are still potential queens. From the 3rd day onwards female worker larvae are fed on a modified bee milk which is e.g. less rich in protein. This change of the diet causes the ovaries of the "workers-to-be" to stay underdeveloped.

Female larvae which are chosen to become queens, are fed only on the protein rich bee milk. They are raised in special queen cells which look like peanut pods. Normally a colony has just one queen. If a colony does not intend to swarm, the workers allow only one of the new queens to survive to replace the old queen. The new queen mates about 5 days after emergence and starts to lay eggs about 2 days after mating.

The queen is by no means the "ruler" of the colony. She is an "egg-laying machine." All "communal" activities are organized by the workers. The queen on the other hand secretes special substances which are taken by the workers and then distributed throughout the colony. These substances help to control the behaviour of the bees and bind them together as a working community.



Queen surrounded by workers.

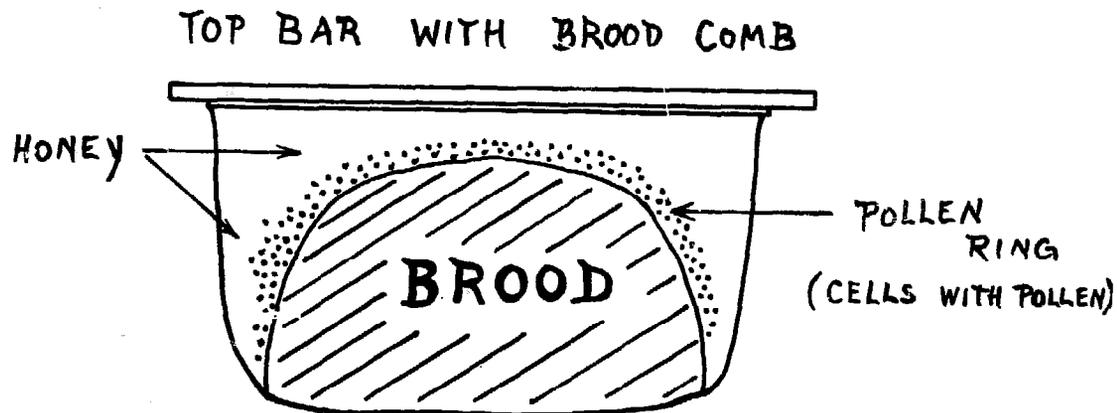
BC



Three open queen cells. Can you locate a drone in this picture?

LT

Brood



The brood nest (with eggs, larvae, and pupae) is usually situated in the centre of the colony which is the safest and warmest place. In a top bar hive it is generally located within the first eight to ten combs. A permanent breeding temperature of about 35°C is maintained here, almost the same as our own body temperature. When it is cold, the bees cluster together and burn up more "fuel", i.e. they consume more honey to generate heat. If it is too warm the cluster of bees disperses, and a lot of water is collected for both drinking and cooling purposes. To cool the hive even further, warm air is fanned out of the entrance holes.

Development of Brood in Days

	Queen	Worker	Drone
Egg period	3	3	3
Larvae feeding period	4-5	4-5	6 $\frac{1}{2}$
Pupae (cell capped period)	7-8	11-12	14 $\frac{1}{2}$
Total Development	14-16	18-20	24

The above table enables you to roughly forecast the emergence of young bees.

Water is of great importance for regulating the temperature and humidity. It should therefore always be available within a radius of 10 to 150 metres from the hive. If necessary, put water in shallow containers and make "islands" of pieces of wood or stones, so that the bees can land and take off safely. Do not worry about dirty water, e.g. polluted by cow dung. Bees seem to prefer this to clean water, and it does not contaminate the honey. Regular water supply is not only economical and saves you more honey, but it also keeps the bees calm.

Bees desperately in need of water may become a nuisance around open water, i.e. standpipes, wells, taps, water containers.



A section of a worker brood comb.
You can see from left to right cells with:

1. eggs
2. young larvae floating on drops of bee milk
3. fat older larvae
4. capped brood
5. a nurse bee is feeding bee milk to a larva.

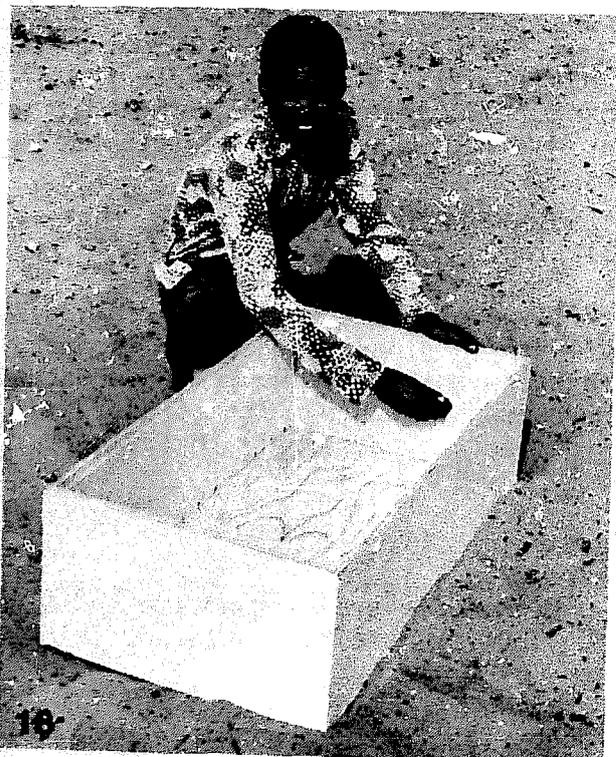
Starting a Colony

by Catching a Swarm

Do not start beekeeping with more than two hives as there is too much to learn.

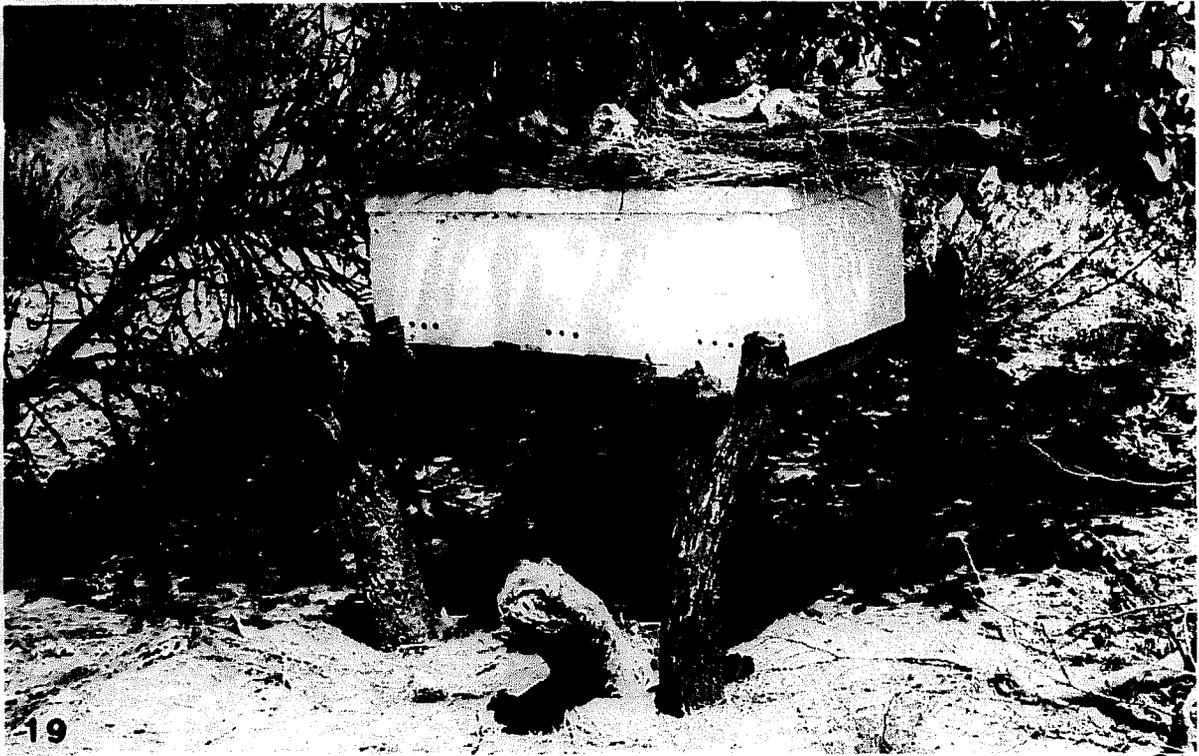
Before you put a swarm or even a colony (that means combs included) in your hive you should make some preparations:

1. To help the bees accept the hive readily, it is important to make it smell familiar. This can be done by rubbing either of the following substances (or a mixture of both), on the inside of the hive:
 - (a) Propolis - this is bee glue used for glueing down anything loose in the hive and for filling holes. (See also p.68) You will often see it sticking the top bars together; when you do, scrape it off and save it.
 - (b) Old brown comb pieces. Both substances (propolis and brown comb pieces) can be softened in hot water or in the sun and then used.



Gcumate prepares a new hive

2. Make sure the hive is under a bush where there is shade for at least the 6 hottest hours of the day.
3. The hive should stand on bricks or on a trestle of strong branches. It must be off the ground in order to be protected against ants, termites and other animals. In northern and eastern Botswana it is often safer to hang the hive up with strong wire tied to branches or two strong poles (see page 64)



4. The front of the hive should face north/east. The early morning sun prompts the workers to start earlier. The left (empty) half is exposed to the cold southern winds. The occupied right half is exposed to the warm midday and afternoon sun during wintertime.
5. Lift metal lid 2-3 cm by putting some sticks underneath. This is essential for assisting ventilation.
6. Do not forget to place a thick layer of grass on the lid. This serves as insulation keeping the hive warm in winter and cool in summer, thus maintaining a constant temperature within the hive. If adequate insulation is not provided the bees will waste a lot of energy (provided by the honey which you want to conserve!) in trying to maintain an even temperature.
7. Hives should be at least $\frac{1}{2}$ metre apart.
8. Hives should not face places where people are very active and also should not be closer than about 100m or more to kraals and chicken runs.
9. It is advisable to have some bushy vegetation around the hive, but especially in front of the entrance holes. If your hive stands more in the open then put up a screen (at least 2 m high).
Reasons: - You force the bees to fly higher up, and there is no mutual interference by passers-by and bees.
- In case the bees have been made aggressive this helps to prevent them from unhindered dashing around.

Daosa wants to have
a look into his hive.
(Note the sticks lying
on the top bars)



A kraal protects the hives against cattle and goats.

The Swarm

When a colony is strong and has plenty of honey and brood, the workers prepare to divide it. (See p.15). Often no real indication for swarming can be detected from outside the hive, but when bees are clustering outside the hive entrances this may indicate that swarming is about to occur. (But these clusters may also indicate that the bees in the hive are getting too hot!)

Suddenly vast numbers of bees, sometimes more than half of the colony rush out together with the old queen and cluster on a branch of a tree nearby. This is known as the "prime swarm" (the first swarm). A strong colony sometimes divides up to 8 times, forming separate swarms each with a new unmated queen ("secondary swarm"). Each swarm takes with it a considerable amount of honey from the honey combs.

Reasons for swarming are:

1. A natural urge to multiply and propagate colonies.
2. Too little space within the colony to carry out the most important activities, like building combs, storing honey, rearing brood.

Capture

A natural swarm hanging from a tree is normally docile and can be easily removed and hived. You are in luck if you find such a swarm. A swarm which has absconded from its home because of external interference, might be more difficult to handle.



People preparing to catch the prime swarm hanging in the tree above the hive 27



The swarm

27



Zasa wants to find the queen and has the match-box ready for her.

27



25

LT



26

LT

Swarming bees rarely attack when you shake them off

If a swarm you find hanging in a tree is a "prime swarm" it contains the old queen which is able to lay eggs immediately after the workers have started to build combs in the new hive - a big boost for the growth of the colony. After three weeks you will have the first young workers.

"Secondary swarms" and remaining rest colonies however, have a virgin queen. Such a queen can only lay eggs after about one week (see p.15). Therefore there is a slower initial growth within these units. Look for the queen or young brood after two weeks. (See page 49.4).

Have a smoker ready if you want to catch a swarm, even if the bees seem docile. However do not use it if possible. If the swarm is hanging on a thin branch, cut it off and carry it home. Alternatively shake or brush the bees off with a feather directly into the catching-box. Before brushing bees off smoke them repeatedly but gently. Now cover the box leaving a small space open and wait for at least 20 minutes. If after this period most of the bees have entered the box, you can be almost certain that you have got the queen. If you have the queen, you also have the swarm.

If you want to be on the safe side: Secure the Queen. Look for her and seize her gently by her thorax (chest). She will not sting you! Place her in a match-box which you leave open wide enough to stop her escaping, but still allow her to spread her special scent which attracts the other bees. Pin the match-box to the upper part of the catching-box. As the bees prefer a hanging position they will cluster around the match-box.



Qkaizabe and Cute are searching for the queen.
(Note the docility of the swarm)

27



28

Here she is - place her in the match-box carefully!

27

Hiving

PLACING THE SWARM INSIDE THE HIVE

At home you should remove two thirds of the top bars from the hive, leaving the remaining top bars on the extreme right.

Should you have the queen in a match-box, put it on the bottom of the hive below the top bars.

If possible insert a top bar with a capped brood comb from another already established colony. The swarm will feel more at home if you do this. But do not forget to sweep off the bees covering the brood beforehand. Bees are normally hostile to those from strange colonies, and only drones are accepted into every hive, provided there is enough stored food.

Lower the swarm into the hive and gently, but quickly, shake it off the branch or out of the catching-box (see picture below). The bees will move now towards the darker right hand side. As the queen is already there the bees keep relatively calm and gather under the top bars. Many of them are beginning to cover the inserted brood comb.

Release the queen now by opening the match-box close to a cluster of bees and she will quickly creep into it.

Perhaps you have no hive available, when you come across a nice swarm. Well, that's no problem. In the following pictures and on page 48 and 49 you can see that any cardboard box can be used as a temporary hive, provided it doesn't smell unpleasant (e.g. of engine oil or washing powder).





A brood comb is taken out of an established colony. The covering bees are swept off.

LT



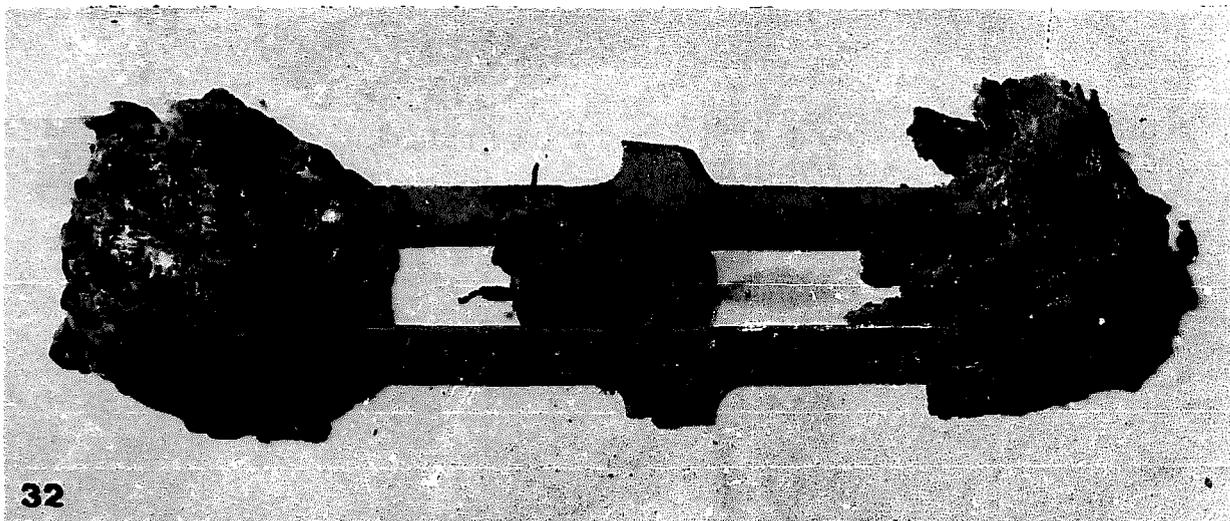
This brood comb will help the freshly caught swarm to feel at home, and it is unlikely to abscond.

LT

If the swarm is small, only leave open some entrance holes on the right hand side until the colony has grown in size. The other holes can be closed using twigs. The bees can thus protect their new home easily.

In case you haven't got a brood comb for your newly hived swarm fix queen excluders in front of the entrance holes using soft wax or tape. This reduces the size of the entrance holes allowing only the worker bees to pass in and out, thus preventing the queen (and drones) from escaping. If the bees do not like their new home they will try to abscond and will cluster nearby, but as the queen is unable to follow them they will return.

Initial feeding will help them to settle down (see next page).



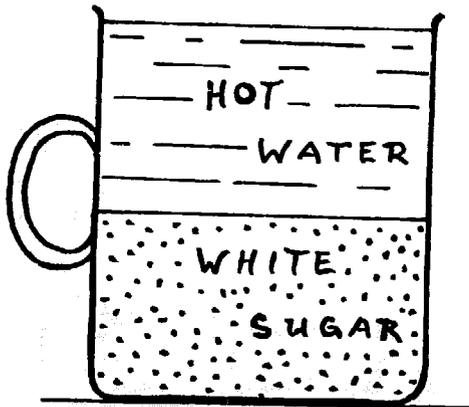
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BC

Watch the situation for several days. Remove all dead drones blocking the entrances with a thin stick. You can be sure that the bees have accepted their new home when they cluster quietly inside the hive. The queen excluders can then be removed, so that the drones are able to fly.

Feeding

The honey stored in the "honey-stomach." of every bee may last only for a few days. Therefore it is necessary to feed the hived swarm for some weeks. It will build combs along the top bars rapidly and will fill them with sugar water "honey".

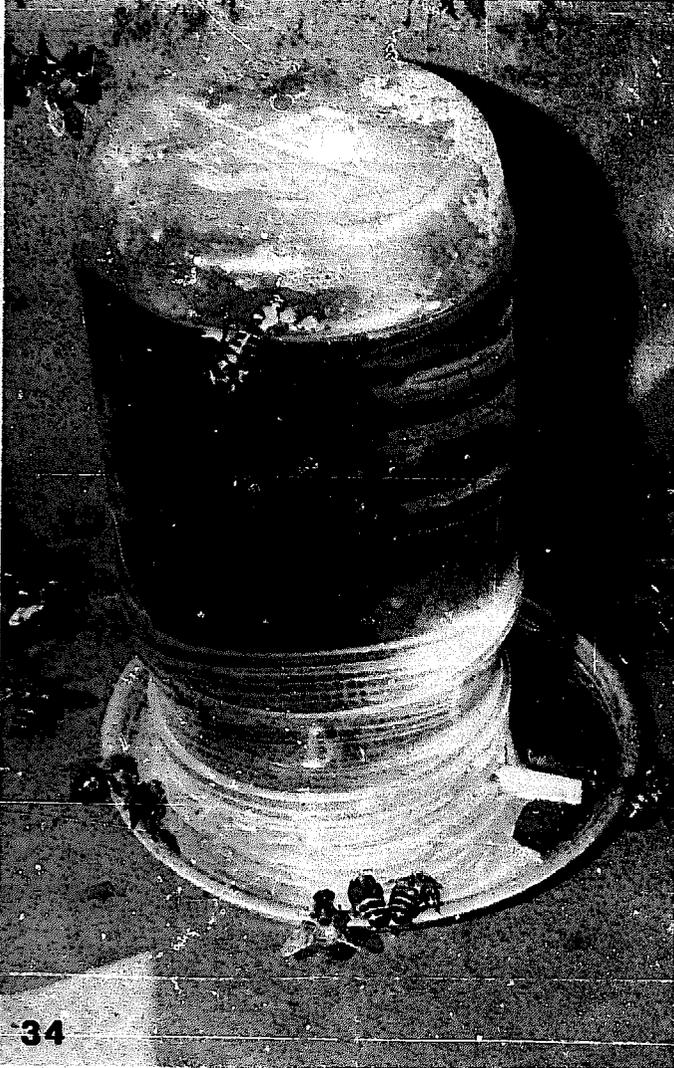


Dilute half a cup of white sugar in half a cup of hot water.

Stir until the sugar is dissolved.



Fill a jar with this sugar water and cover it with a large lid. Quickly turn the jar upside down and place it into the hive.



Place a match between the jar and the lid. This allows the sugar water to trickle out as the bees drink it. Avoid spilling any as it will attract ants.

80

If you catch the swarm in winter, you should feed it for about 2 months. A medium sized swarm of about 5 000-8 000 bees will need about 3 kg of white sugar during this period. In summer feeding is only necessary for about 4 weeks in order to help the bees settle in their new home.

Whilst feeding smoking may not be necessary for the first two weeks or so. However as they become settled and established some bees might start being a little difficult, and so it is advisable to begin using smoke.

Starting a Colony **by Smoking out Wild Bees**

It is slightly more difficult to start beekeeping by removing a colony from an earth hole, tree, roof, etc. Each situation and difficulty which arises varies considerably. General rules apply however:

1. Tie up your trouser legs and close your shirt so the bees can't get inside!
2. Have your equipment ready, especially enough smoking material.



3. Before any action, blow smoke into the entrance at frequent intervals, but in small doses. The bees suspect a bushfire and will rush to fill themselves full of honey. They then become slow and docile and less likely to sting.



36

BC



37

BC

4. After smoking start to chop, and as you get closer to the bees, blow in more smoke. This will help to keep the bees quiet, so that they hardly sting.



The first brood combs out of the tree

BC

5. When you get near the combs, smoke the bees off the parts which you want to handle and cut the combs off carefully. Try as hard as possible to avoid dripping honey, as this can drown bees and also the queen. Place combs with brood only into the corner of your catching-box (e.g. cardboard box); where combs contain brood and honey, the honey should first be cut off. The brood combs should be parallel to each other with sufficient space between them (supported by wax pieces), so that the bees can cover them and keep the brood warm.

Put all the honey combs into a separate container.

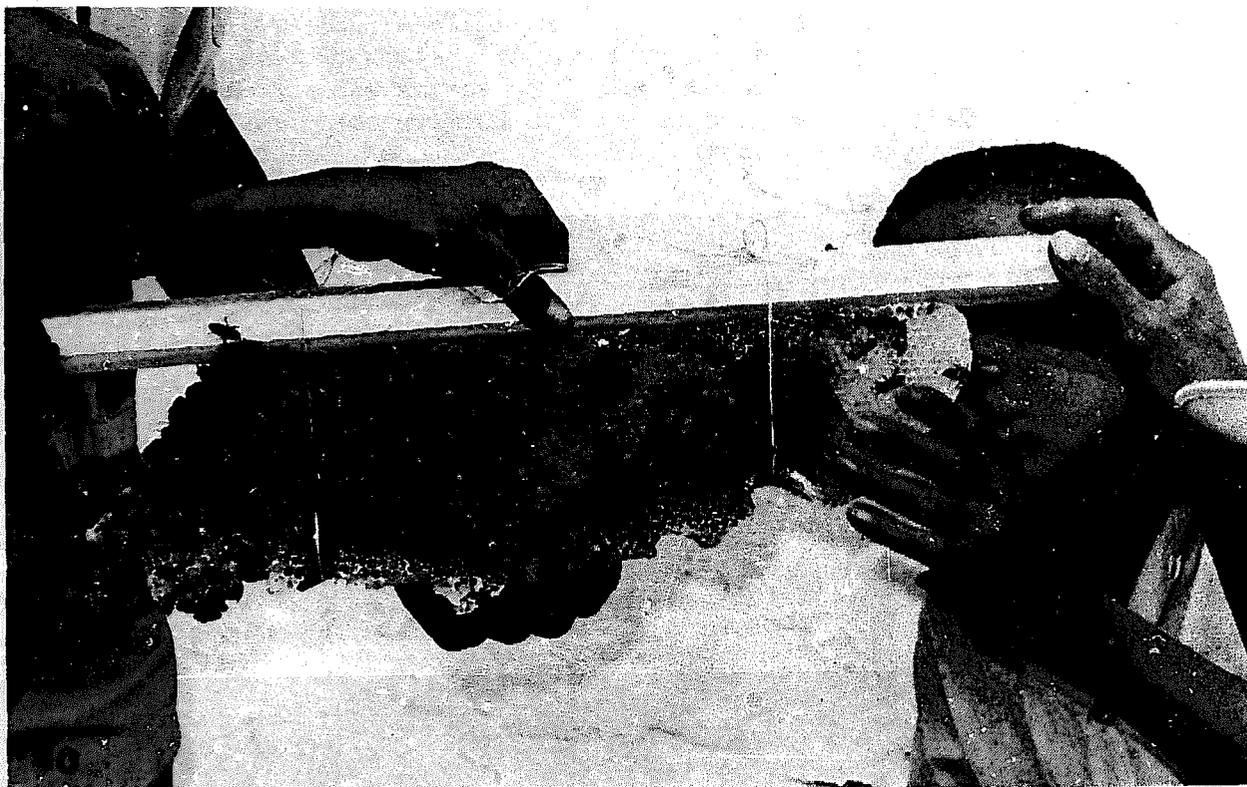
If you have to travel far (more than half a day), only take capped brood, not open brood containing eggs and larvae. This is because during the journey the bees won't cover the combs well, and hence the eggs and larvae will die as they must be kept constantly warm by covering bees. Dead eggs and larvae make an unpleasant mess which can upset the bees and even cause them to abscond. Any empty comb pieces should be saved for rendering into wax (see page 52).



6. After the removal of all combs, blow in enough smoke to drive the remaining bees and the queen out. Do this at intervals. The bees should not be overcome by smoke!
7. Watch the bees forming clusters. If one of the clusters increases in size the queen has probably joined it. The boys in the picture are already searching for her.

8. Shake this cluster into your catching-box. If you can't shake smoke gently and brush the bees into the box. Try to catch the queen and put her in the match-box as described on page 25.

The queen and the surrounding bees will attract those bees still buzzing outside. Now shake or brush remaining clusters into your catching-box. Close it "bee tight" before taking it home. Make ventilation holes in the box and keep it shaded during the journey.



BC

9. At home open your hive and fix all capped brood combs to the top bars on the right. The boys in the picture are fixing a brood comb with strings and pieces of leaves. The leaves prevent the strings from cutting through the combs.

The combs must be fixed in the original position, not upside down. Attaching the combs to the top bars helps the colony settle down quickly. If the combs fall down they should be immediately reattached.

Use only natural strings, preferably cotton. Do not use synthetic strings, e.g. plastic, as they will stretch too much, and the combs may fall down. Also the bees can't shred and remove synthetic strings as they do with cotton.

Do not fix new white brood combs in this way as they are too fragile and can break easily.

Honey combs could be broken up and placed in a dish in the middle of the hive, providing their first food.

10. When the bees settle and start to crawl up to the fixed combs, release the queen from the match-box close to the bees on one of the combs. Fix queen excluders in front of the entrance holes only when you haven't got capped brood combs. Provided they make no attempt to abscond during the next 3 days, remove the queen excluders.
11. You may soon notice that the honey combs on the dish in the middle of the hive are being emptied. Accelerate this process by breaking these combs into pieces. Remove any loose and empty pieces from the hive so that they will not be attacked by the Wax Moth (see p.64). Render the wax as soon as possible (see p.52).
12. You will soon see that the combs have been attached to the top bars by the bees. The strings can be removed after about one week.
13. As the colony grows, the bees become more settled and confident, so never forget to use your smoke. Refer to the section "How to Handle Bees" (p.37-44).



8C

Has the comb been tied straight?
 Note the hive hanging from wires between a pole and a tree - this provides good protection against ants and the honey badger.

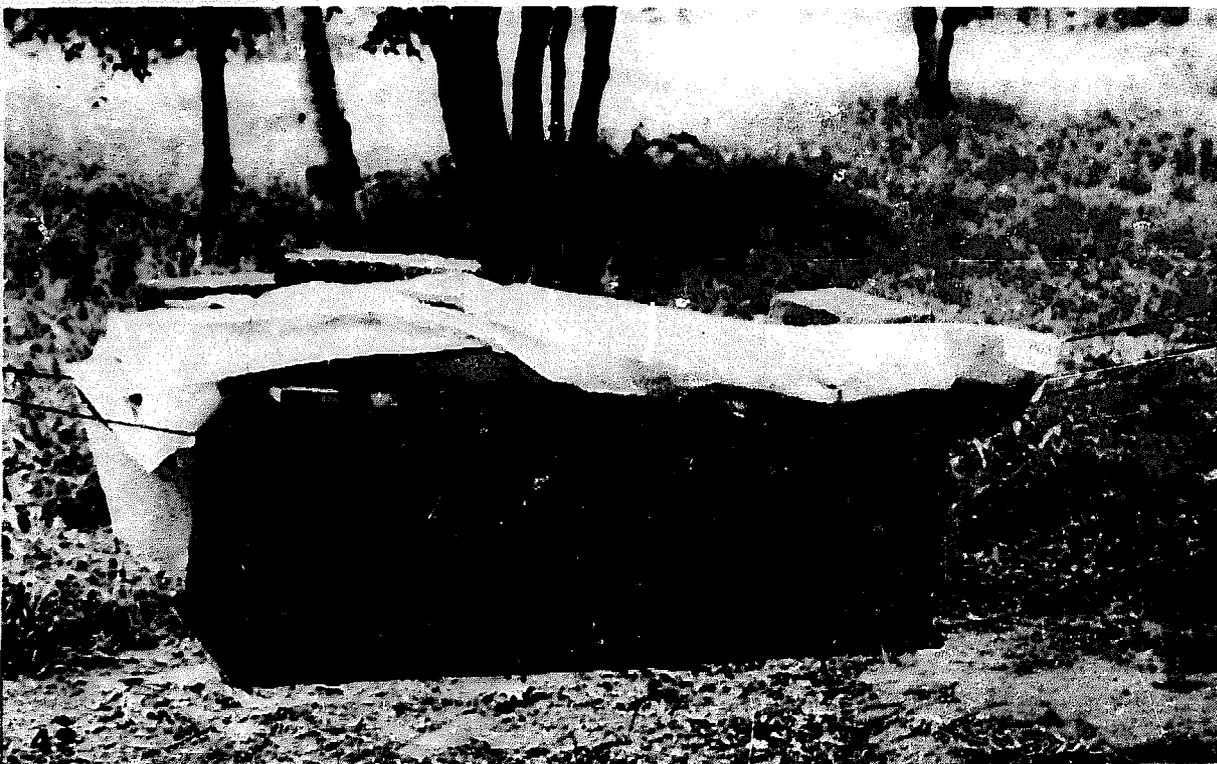
The Honey Cow

Now you must wait patiently for your first honey. The colony must become strong and have plenty of honey for itself. It may take up to one year before you can harvest your first honey from the hive.

When you look into your hive there will always be some honey in the combs. Why not take it out you may ask. Stop!! If you really want to benefit from your colony in the long run, you should always bear in mind that honey is foremost the food for the bees themselves and is stored by them for the dry season.

Beekeepers in East Africa compare a bee colony with a cow (a livestock unit!). Everybody accepts that a calf must get enough food and has to grow until it can be milked. And nobody would kill a cow in order to get milk.

This applies also to the bee colony. Your bees also need sufficient time and food to become a strong community of tens of thousands of industrious workers. They produce and store more honey than they normally need, and this surplus honey is yours. (see p.37-45). Only impatient beekeepers will rob and weaken their colonies, which can often cause the bees to leave the hive. Preserve your "honey cow"!



Here is novel way of supporting a Tshwaragano Hive. Its stability is maintained by a kind of wire frame suspended between two trees or poles.

How to handle Bees

The main reasons for opening your hives:

1. Honey harvest
2. Brood nest inspection

You will soon become familiar with your colony and find your bees easy to handle if you follow the rules in this chapter.

Honey Harvest

Harvests are normally possible during and shortly after the two main flowering seasons, namely October/November and February-June.

1. Watch out for good weather conditions. It must not be too hot, muggy or cold. At a temperature of 20°-24°C the bees tend to be the least aggressive. When the temperature is comfortable for you, it will be comfortable for the bees. Also there shouldn't be too much foraging activity by the bees.
2. Fill the smoker with smouldering pieces of dry cow- or donkey-dung. Do not let the dung burst into flames. Make sure there is no glowing dung on top and always plenty of cool white smoke. Have enough dung in reserve so that you do not run out of smoke. Never use strong, unpleasant smokes, e.g. from oil, rubber, textiles.



3. Blow a little smoke into the entrance holes, first on the right, then on the left. Smoke again after half a minute. Repeat five or six times or even more.
4. Move behind the hive before you open it and stay there whilst handling the bees. Bees dislike people standing in front of their entrance holes blocking their flight path.



5. When you lift the first top bar blow smoke inside immediately. Remove 5 top bars on the empty side of the hive. Shake the bees off the top bars back into the hive. Be careful not to knock the hive. Next, blow more smoke inside.



6. Gently move the empty top bars one by one to the empty side of the hive and push them together leaving no gaps. Try not to squash or kill any bees between the top bars as the smell of the dead bees will alarm the others. A squashed bee must be smoked immediately and should be put in the smoker afterwards.
7. When you get to the empty top bar just next to the first comb, blow a little smoke until you hear a buzzing sound, then stop. Too much smoke can make the bees irritable. Do not touch the comb with the smoker as this will also alarm the bees. Use smoke before inspecting each comb. Before you take a top bar with a comb out, push one end a little aside so that the following comb is visible in the gap. Blow some smoke into this gap.



LT

Smoke is necessary to calm the bees, but too much will only alarm them. If after using the smoke the bees are still aggressive, close the hive and try again the next day. Their behaviour could be due to other factors, e.g. bad weather. You will learn to distinguish between a friendly and an aggressive bee.

8. Never make sudden and wild movements when bees are buzzing around you, or if you get stung. Also never drop a top bar with a comb on it, as the bees may become very angry.

If you get stung, scratch the sting out with your finger-nail. If you pull it out, the pulsating sack filled with poison will empty its contents into your skin. Having lost her sting, the bee is severely wounded and dies. The alarming smell of the poison will irritate other bees, so you should quickly cover it with smoke.



LT

9. Blow smoke over your face and hands repeatedly during each step of the proceedings.
Remember: Vinegar rubbed on face and arms can also be a good protection against stings.

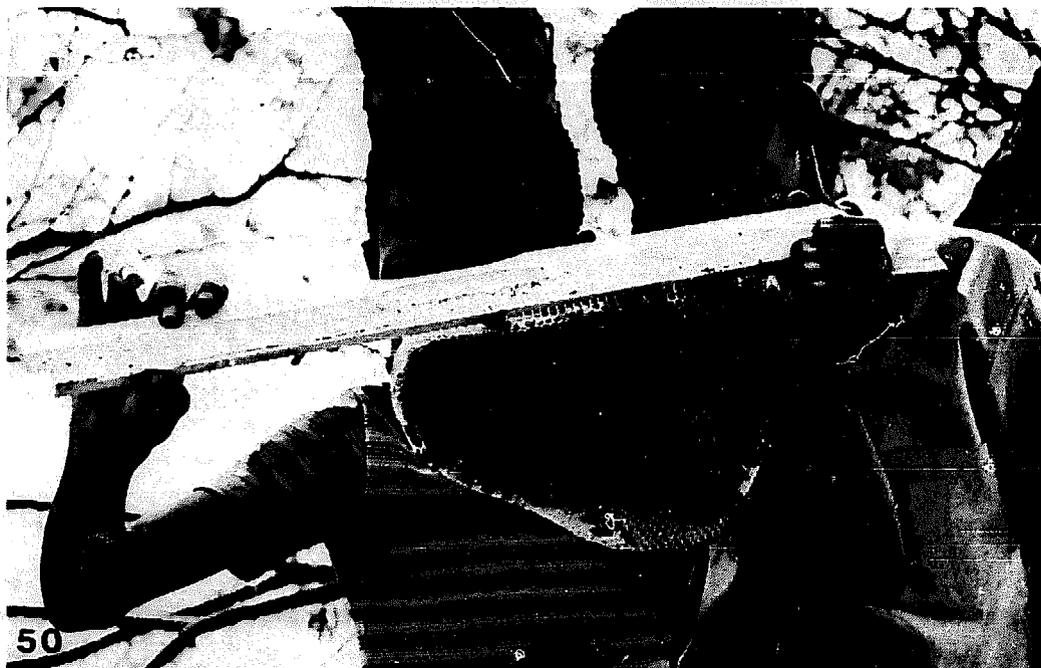


10. Sometimes a top bar is tight, this is because the bees have fixed it with propolis. Loosen the top bar gently at one end using both hands or even a knife. Scrape off the propolis and save it (see p.19).

Another possible reason for tight top bars: They can swell from either high humidity caused by the weather or when the bees reduce the moisture of the honey. In this case replace the last top bar with a thinner spacer bar.



11. When you have moved all empty top bars aside, take the first comb out together with the bees. You will notice that the honey cells are all open, containing unripe honey - put the comb back. This honey is only for the bees!
12. Check the next combs in the same way. It is not always necessary to take each one out, just move them slightly and look at them. If you find combs fixed to the bottom and walls of the hive as well as to the neighbouring top bars, cut them loose and carefully move the top bars, and now.....



The boys know: A comb must be kept always in a vertical position, otherwise it can break off!

13. here comes your honey comb. It is easy to distinguish. The comb is light in colour, is filled with honey (no brood), and more than half of the honey cells on both sides are sealed with wax. This is a ripe honey comb. Take it out and blow some smoke on both sides, then shake and sweep the bees into the hive with a feather. Hang the comb on a stand some distance away from the hive. Treat other ripe combs in the same manner. Do not waste any time, because of robber bees who may start to steal the harvested honey and may enter the open hive.



You think this is only a small honey comb? You are right - look at p.43!

14. Continue until you see the first brood comb (usually darker in the centre than on the outside) and then stop the inspection.
15. Carefully push the remaining combs with unsealed honey back towards the broodnest. If bees come out between the top bars, drive them back by blowing a little smoke on them.
16. Close the gap with sacking, or spare top bars and replace the lid.
17. Carry the honey combs home and cut off the honey. Then return the empty top bars to the hive and insert them next to the last new combs.

The boys are pushing top bars with the remaining combs back towards the brood nest. Bees between the top bars are driven back by smoke.



17

A Large Honey Comb



52

20



11 kg honey-harvest!

BC

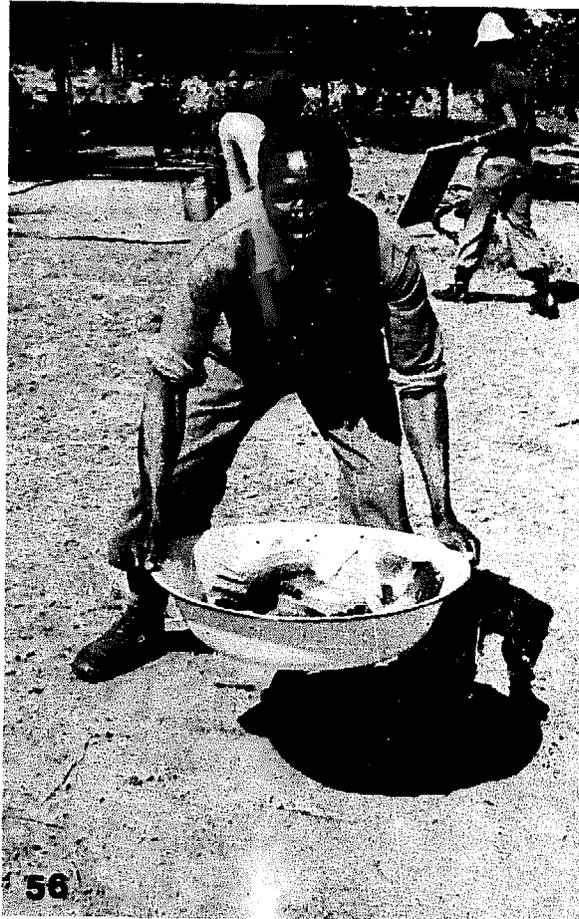
You can cut the honey combs off the top bars near the hive, but this may cause problems. If you do not act quickly, fights can be caused by robber bees from other colonies, and you might also be attacked.

To avoid robbing it is advisable not to inspect or harvest honey from more than two colonies, in one apiary per day.



55

BC



Sweet honey!

If you follow these rules of careful handling and management the advantages are that:

- (a) You will keep the colony under control from the start. Correct handling minimises the danger of viciousness!
- (b) You will harvest ripe honey combs only. (Sometimes a fine sealed honey comb, bordering the brood nest, contains a small section of brood on the inner side. This is no problem. Place an empty "buffer" top bar between this comb and the last brood comb. After some time the brood will emerge and the empty cells will be filled with sealed honey. Then you can harvest the comb. In the meantime a new comb grows on the "buffer" top bar).
- (c) Sufficient honey will be left for the bees. You will see that most brood combs contain quite a lot of honey, the outer ones having more than the inner ones. Mind you leave enough honey for your bees: Never harvest from the first 8 combs whether there is brood or not!
- (d) You will help to prevent your colony from absconding, which is a characteristic feature of the African Honey Bee.
- (e) You will be rewarded with a honey harvest from each hive of 10-30 kg per year, providing you check the honey section in your hive every fortnight during and after good flowering seasons.

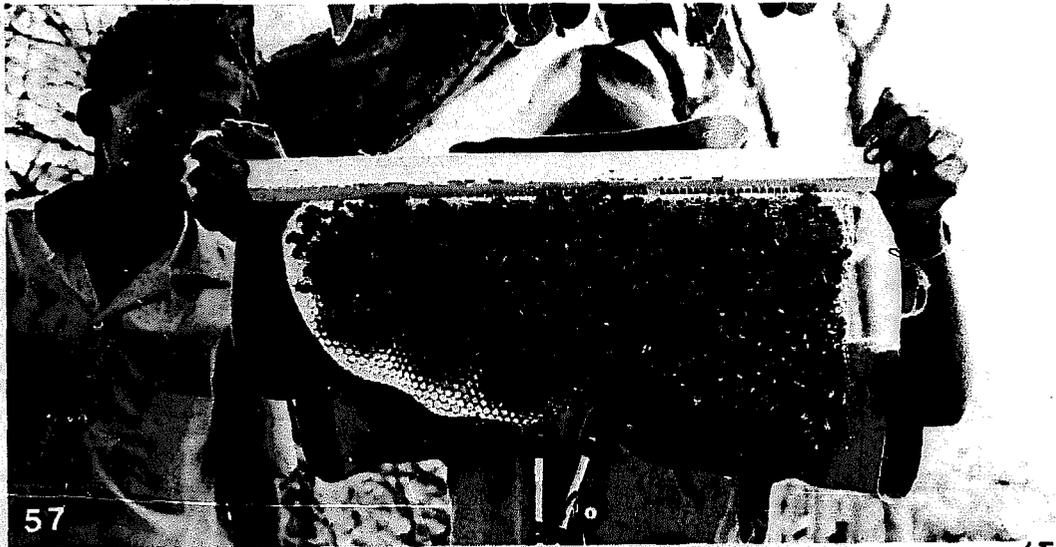
Brood Nest Management

It is advisable to inspect the brood nest 2 or 3 times a year, especially during the swarming seasons when the young queen might get lost on her mating flight (see pages 15, 63 and 65).

During winter the bees often close some of the entrance holes with propolis to protect themselves from the cold winds. Inspections should be as brief as possible to prevent chilling the brood and also because robber bees are a real threat during this season.

How to handle the bees is explained on pages 37-44.

After pushing the lighter honey combs to the empty side, take out the normally darker brood combs and examine them one by one. Then push them to the empty side. Do not expose them to the cold wind or direct sun.



If you see eggs (one per cell), larvae and pupae you can be sure that the Queen is alright, even if you do not see her. Do not worry if there is no brood in the winter as the Queen reduces or stops her egg laying at this time.

Important: The movable top bars make it possible to check each comb separately, but it is essential that they are replaced in the same order and position to maintain the structure of the nest.

Possible exceptions:

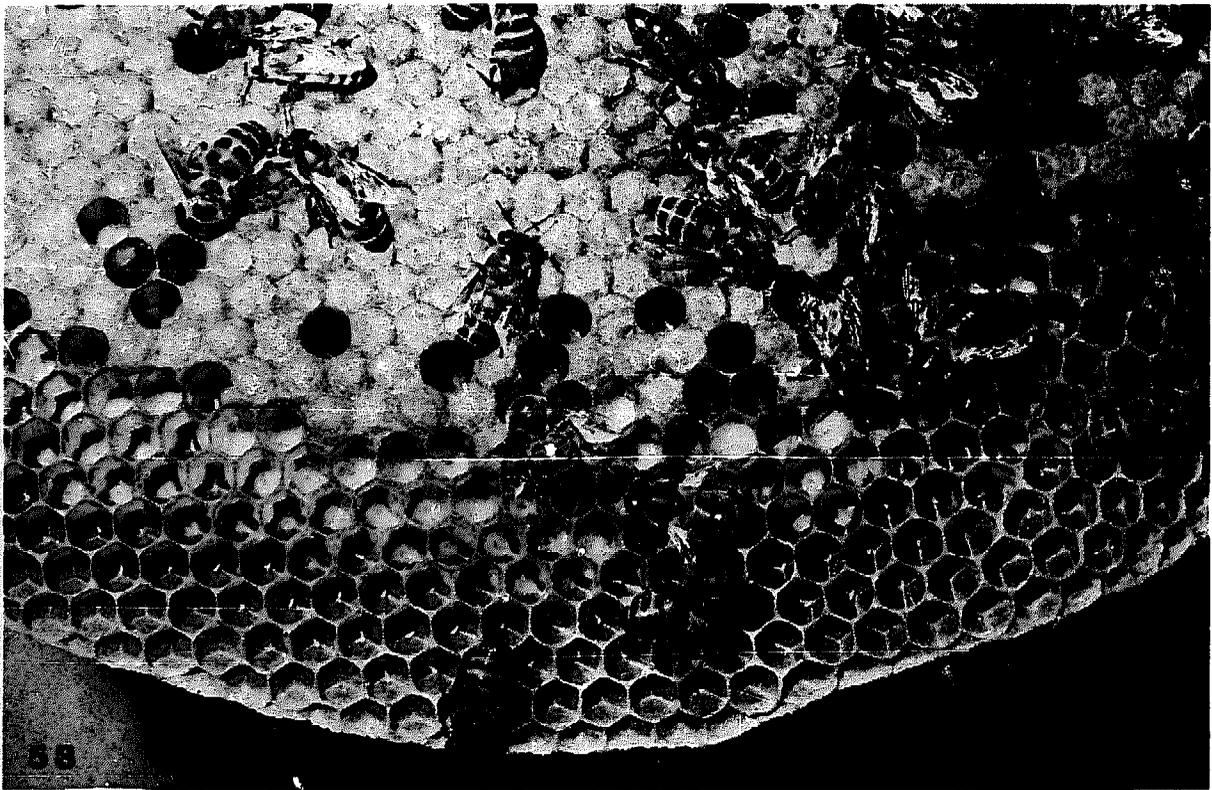
1. If you see a brood comb in the middle of the brood nest which has a large section of drone cells, you should transfer it to the edge of the brood nest on the empty side of the hive, pushing the other brood combs together to close the gap. You should secure the valuable space of the brood nest (especially combs 1-8) mainly for new workers instead of unproductive drones.

If a colony feels strong enough to rear drones the drone cell sections further outside will be used.

2. In case you find a crooked comb, a very black one, or a comb with a large patch of drone brood remove it also from the brood nest.

If such a comb contains worker brood, move it out of the brood nest beyond the first honey comb. After all the brood has emerged the comb can be cut off.

Render wax from these combs. (See page 52).



A large section of a worker brood comb. BC
The different stages of brood are in a certain order, as you can see from bottom to top: eggs, larvae, capped brood.

Starting a Colony **by Dividing an Established Colony**

At the beginning of the flowering seasons (August-September and February-March) strong colonies build up to 60 000 workers, some hundred drones, and between 9 and 15 brood combs with brood of all stages.

Such a colony might produce many queen cells and try to split up in order to swarm. But before this happens, you can split off part of the colony, forming an "artificial swarm", a "nucleus". This is the third method of starting a new colony. Preferably do this in September/October or February/March. (See "Bee Pirates" page 63).

1. Take out 2 or 3 brood combs (including eggs, young and older larvae, capped brood and possibly queen cells) together with all the bees which cover the combs (except the Queen) and hang them into a prepared hive. These brood combs must be framed by two honey combs, which should also contain some pollen if possible.



59



60



LT

2. The framing combs help the covering bees to keep the brood warm. Make sure that plenty of bees will remain in your nucleus to warm and feed the brood properly, all the older workers ("field bees") will leave the nucleus quickly and return to their old hive (see page 51, Relocation of Hives). Therefore it is important to add all bees from several other brood combs by shaking and brushing them off into your new hive (see above picture). Return these brood combs. Make sure that the Queen remains in the original hive.
3. Close up the new hive and carry it to another place.
4. The nucleus without a queen does not need a queen excluder. As the bees miss the Queen they soon start to rear new queens, from young worker larvae, less than $2\frac{1}{2}$ days old (see page 15), or they will look after queen cells which have been given to them. After the first queen has emerged from her cell the young queens still in their cells are killed by the workers. Five days after emerging the young queen will go on her mating flight. Two days later she will start laying eggs.
Make sure you see the Queen or brood after 4 weeks (see page 63). The nucleus will now have become an established colony.

Dividing is a kind of "SWARM CONTROL."

Now you know how to increase the number of your colonies. There is, however, a limit somewhere and this depends entirely on the environmental circumstances of your beekeeping area, e.g. density and variety of flowering plants.

As a "rule of thumb", a beekeeping site (apiary) should not contain more than eight to ten hives otherwise the area may become overstocked.

Another apiary can be made 4 km away from the first one.



You want to increase the number of your colonies
but you don't have a hive?
No problem - do it yourself!
Make a cheap hive - see page 53-61.

BC

Miscellaneous

1. Relocation of a hive over a long distance (more than 2 km)

First of all plug up the entrance holes at night when all the foraging bees are in the hive. Make sure there is no other escape for the bees. Transport it carefully to a well shaded and protected place.

2. Relocation of a hive over a short distance (less than 2 km)

- (a) If you simply move the hive directly to a place which is less than 2 km away from your original site, (that is 100 m or more), the "field bees" would return to the original place because of their sense of orientation. As a result you would lose them all. Therefore you have to follow this laborious procedure:

- First close the hive as mentioned above.
- Take the hive to a place which is 3 km away from both the old and the new proposed site.
- Leave it there for at least 2 weeks.
- Then transport it to the new site. During the 14 days at the temporary site the "field bees" will have forgotten the old site.

- (b) If the hive is to be moved between 20 and 100 m you may also carry the hive to the new site straight away, but then you have to collect clusters of stray older bees at the original site repeatedly (during several nights) which are then shaken into the hive.

- (c) If you want to relocate your hive less than 20 m away you can move it in steps of 2 m every third day until you have reached the new site.

Whenever you transport your hives, drive with the utmost care (this applies to a donkey cart as well). Avoid bumps, otherwise your combs may fall down which will be a major set-back. Also the Queen could be killed. If some combs do fall down reattach them with strings as described on page 34.

3. If you want to change hives (e.g. for repairs), move the old hive down from its stand and place the new hive there. Transfer the top bars with the combs and the covering bees. Take the empty old hive away, after having smoked and brushed the remaining bees out.
4. Maintenance of the Hive: The white paint, which is heat repellent should be renewed before it flakes off. If the hive is looked after well it should last for 10-15 years.
You should only paint the hive in the late evening and during the dry season, so that you do not disturb the colony. Cracks should be closed with putty, cowdung, or glue and screws.

5. Always keep some beeswax: You may need it, either for preparing new hives (see page 19) or for fixing wax ridges on simple top bars (see page 56).

If you only have a few pieces of brown comb then it is important to keep them in a closed container, exposed to the sun. The heat will kill any wax moth larva which would eat the comb pieces.

If you have bigger quantities of old combs proceed as follows: (This is essentially the method described by P. Papadopoulo, a former Senior Apiculturist in Zimbabwe).

- Take a large milk powder tin, or an aluminium pot.
- Fill it partly with rain water. If rain water is not available use normal water, but add one teaspoonful of vinegar to each litre.
- Put a flat stone on the bottom of the container.
- Place and press the comb pieces in a 12.5 kg mealie meal sack (no holes!) and tie it well.
- Put this bag of wax in the container.
- Place the container on the fire, but don't allow the water to boil because this will spoil the colour and the aroma of the wax. Keep the water just below boiling point and press the sack frequently with a strong stick to squeeze the wax out of the combs.
- The flat stone in your container prevents the sack from touching the hot base of the tin.
- As the wax melts it will seep through the sack and float to the surface of the water.
- After half an hour carefully place a heavy stone on top of the sack to keep it well below level of the water. Make sure that the water remains just below boiling point for another 10 minutes.
- Take the bucket from the fire and put it in a shady place. Cover it well with sacks or blankets so that the wax floating on the surface cools as slowly as possible. This allows dirt to settle on the bottom of the wax.
- After about 8 hours when it is cool remove the wax "cake". Scrape the dirt off the bottom with a knife. The remaining yellow or orange wax is fairly pure and will not be spoilt by wax moths.

When the number of beekeepers increases we can think about selling wax cakes, as wax is a valuable raw material for many products (e.g. cosmetic creams, polishes, candles etc.).

6. Some points about honey production as a source of income.

Your harvested honey is Comb Honey. Not only is it preferred traditionally by Batswana, it is also tastier than extracted honey. Sealed honey which has been neatly cut and packaged is worth more money than extracted honey. A big honey comb from a top bar hive holds about 25 to 3 kg of honey and 100 g of wax. A strong colony may produce 20 kg of comb honey, if not more per year, with reasonable rains. If you want to sell comb honey, you can be sure that there is a demand everywhere - firstly in your village!

If you want to strain and bottle honey you can mash the honey comb pieces in a kitchen sieve:

Let the honey strain into a bowl and then bottle it. Afterwards put the mashed comb on a dish and give it to the bees to remove the remaining honey. Finally render the wax.

You can sell 1 kg of honey for P3.00.

Home-Made Hives

This chapter describes methods for making simple hives using cheap or free materials. However, you may have much better ideas of your own.

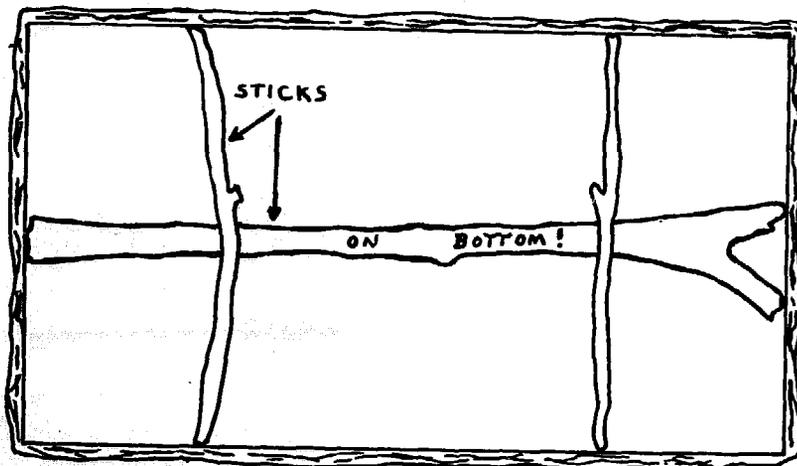
Cow-Dung Hive



63

LT

1. Have an apple card-board box, fresh cow-dung, clay or mud, and a bucket of water ready.
2. Mix fresh cow-dung, clay or mud, and water and knead it well.
3. Insert sticks inside the box to keep it in shape.
4. Smear fresh cow-dung into cracks inside the box.



COW DUNG HIVE

FROM ABOVE

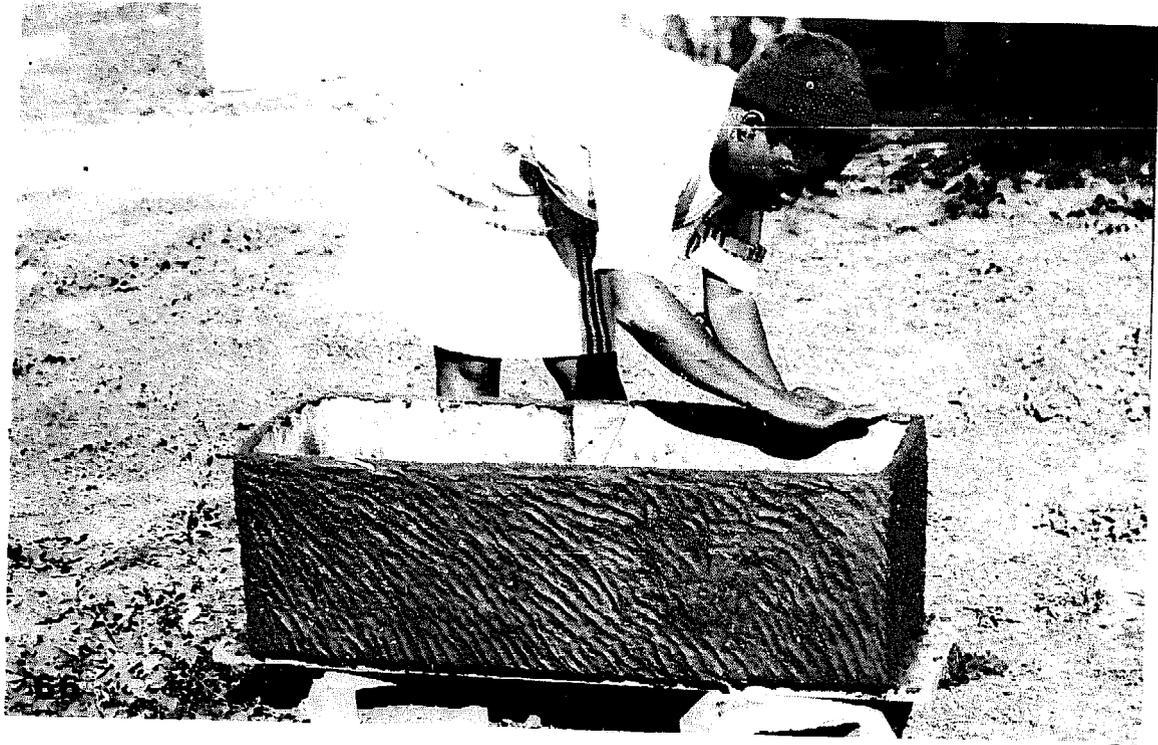


5. Turn the box upside down and smear a thin layer of the cowdung-clay mixture on all the sides.

6. Wait 2 days for it to dry and then apply the second layer of the mixture, much thicker than the first one.

7. Wait 3 days for it to dry and then smear a thin layer of fresh, green cow-dung for finishing off.





8. Put the box upright again.

9. Take out the sticks and smooth the upper edge of the box with a knife.

10. Bore entrance holes (about 7 to 10) in the lower part of the front wall.





11. Cut sufficient top bars to cover the box (15 for a normal apple cardboard box). They should be 40 cm long, 3.3.cm wide exactly and 1-1.5 cm thick.
12. Warm the wax in the sun and fix a wax ridge to 14 of these top bars, not exceeding the width of the box.

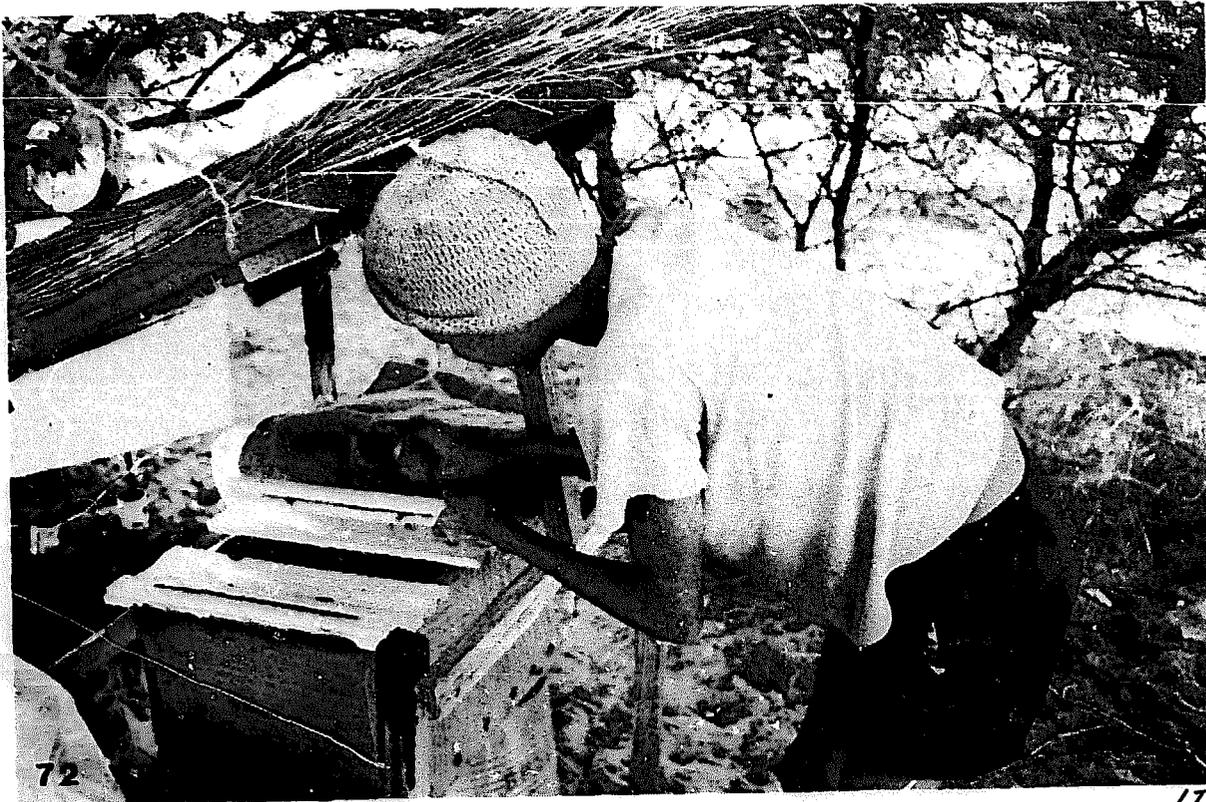




Do not forget to take out the supporting sticks from the box when the cowdung-clay mixture is completely dry. 27

13. The cow-dung hive can now be placed either on bricks, a trestle, or on a swing hung up with strong wires (see p.63).
Don't forget: It must be in a shady place.
14. Now you can introduce a colony or a swarm using the same methods that are described earlier in the book.
15. Cover the top bars with several sacks, to provide good insulation. Put a plastic sheet between the layers of sacking to prevent any water getting into the hive.
Don't put the plastic sheet directly onto the topbars.



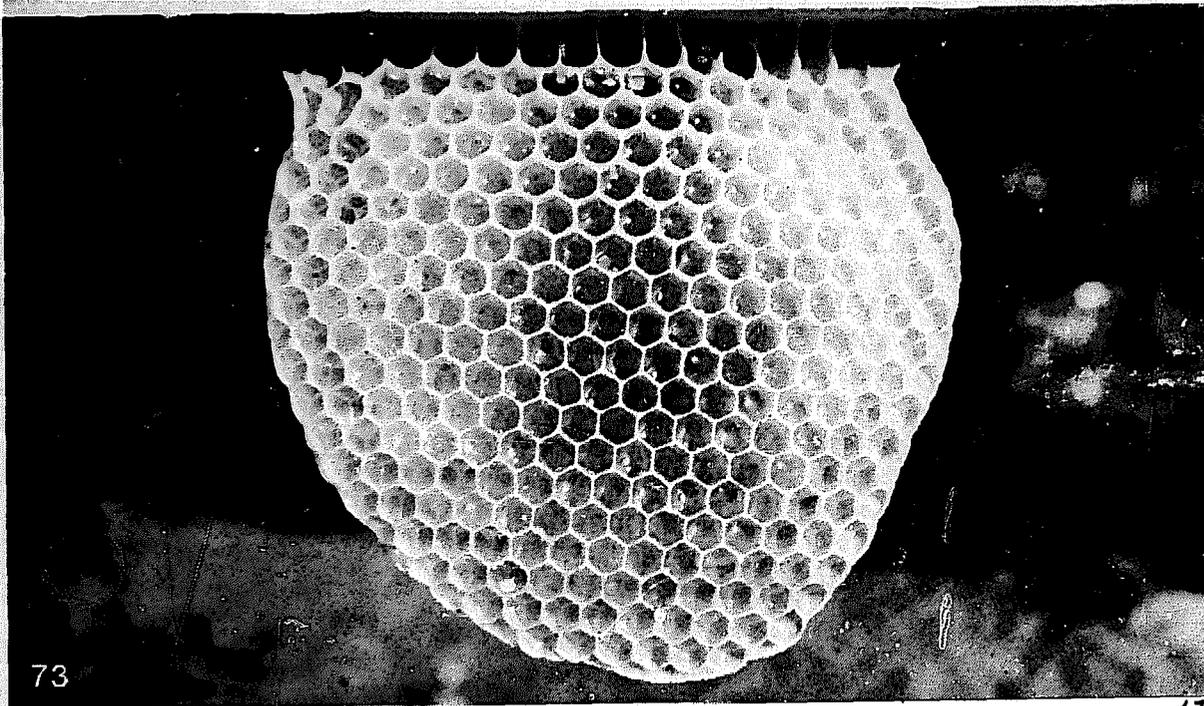


72

LT

A beekeeper checking the bees in his cow-dung hive.

A new comb has been started, straight along the wax ridge of a top bar.



73

LT

The hive described above is very much liked by the bees, but it can quickly become overcrowded as it is rather short (see p.66). However, it provides a good temporary home for a period of about half a year.

Here are some more ideas for home-made "Long Hives". These are longer than the Cow-Dung Hive and as they provide more space, can be used permanently.

A "Long Hive" should be approx. 1 m in length and should have between 26 to 30 top bars.

Tshwaragano Hive

(See picture below and pages 36, 55, 57)

This hive is made like the above described Cow-Dung Hive, but 2 apple cardboard-boxes are bound together into a long body. This long box is placed on a supporting board. Both the box and the board are plastered with the traditional cowdung-clay-mixture as described above, but without turning the box upside down.



MW

Noah's Hive

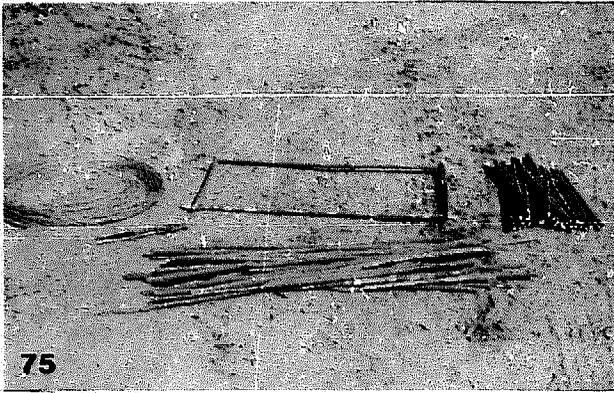
(see next page and also on page 50)

This home-made hive is highly recommended!

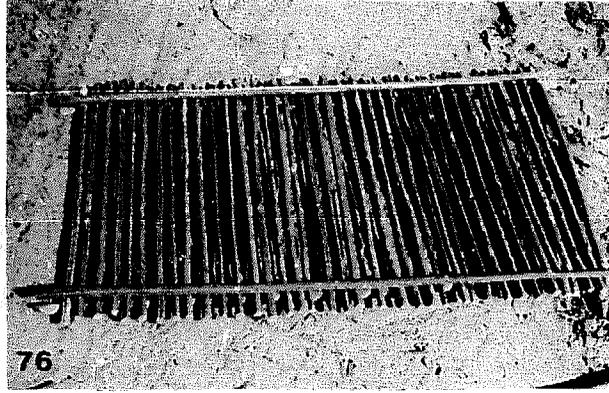
A frame is made out of 50 short and 30 long straight sticks from the bush, strongly tied together with wire as the pictures show on the next page.

It should be made approximately 1 m long and 45 cm wide. The frame is plastered with a thick cow-dung-clay mixture, starting with a thick layer, filling all the gaps between the sticks, and finished off with a thin layer of green cowdung.

Entrance holes and topbars as described above.



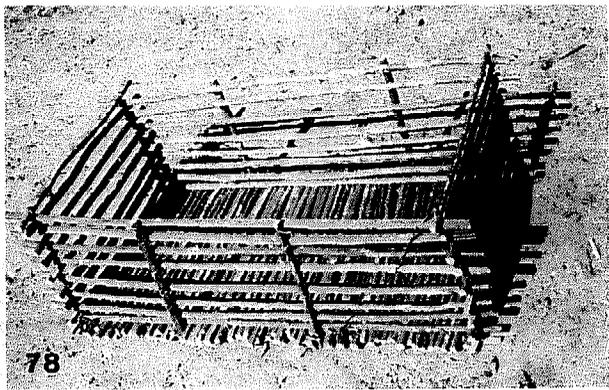
1. The material for Noah's hive



2. The bottom is tied together first



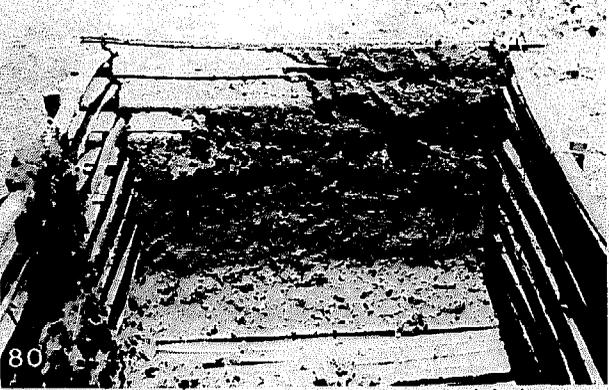
3. All sides are built up at the same time



4. The frame is ready



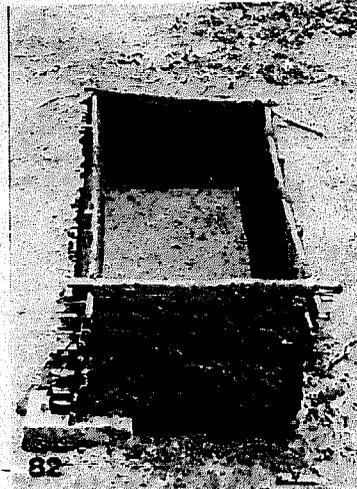
5. Thick cowdung-clay-mixture



6.+7. The gaps between the sticks are filled with the thick mixture



81



82

30

8. The hive is almost ready

9. Let it dry and finish off with fresh cow-dung!

10. Bore entrance holes!

11. Prepare top bars!

12. Put the hive on a trestle and protect it from rain!

Tea Box Hive

Plywood tea boxes stood on their side (this will involve removing one side wall which can then be used for closing the original opening), can be used provided that the thin walls are insulated in some way. Sacking material can be wrapped around the box and then stuffed with dry grass or saw dust. Alternatively the box can be smeared with the cowdung clay mixture.

The tops and sides of the above mentioned home-made hives must all be carefully protected from the rain. This can be done using materials such as wood, grass, plastic or metal sheets.



83



84

Wooden Hives

Any wooden box can be used provided that it is longer than the apple cardboard boxes. Pieces of scrap wood can also be used to make hives. These boxes should be painted.

The measurements of long home-made hives can vary, but it is essential that the dimensions of the entrance holes and the width of the top bars are always as follows:

width of top bars = 3.3 cm, exactly
diameter of entrance holes = 1 cm

If a beekeeper makes more than one hive it is preferable to have them all at least with the same width, so that combs can be easily transferred from one hive to another.

Pests and Problems and their control

People

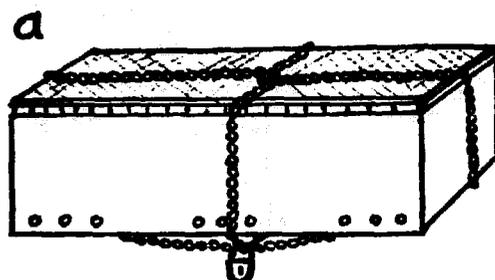
Unfortunately experience has shown that more and more people burgle hives to steal honey.

This problem can be tackled from different sides. But this book can only offer one possibility:

Locking the hives! This costs some money, but a stolen harvest and a destroyed colony mean a bigger loss...

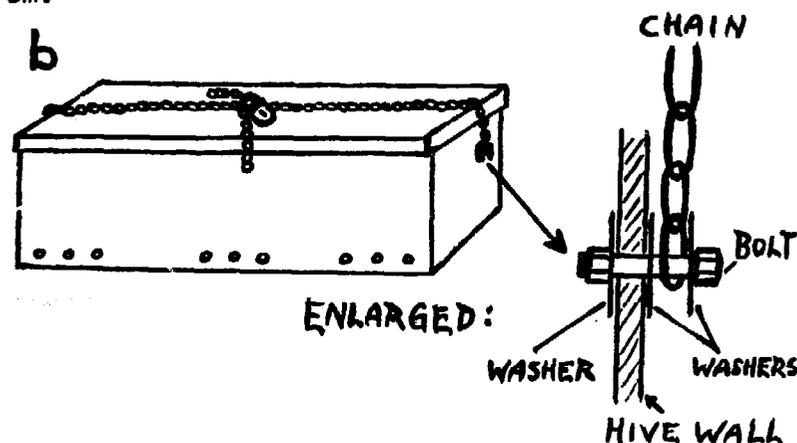
Here are two suggestions:

- (a) A donkey chain can be wrapped around the hive, and can be secured with a padlock (approx. costs: chain P5.00 or P6.00 ; lock: P2.00 or P3.00). You can see on the drawing that a hive with any simple and flat cover can be secured as well as one with a more costly metal lid.



- (b) A possibly cheaper method (for wooden hives):

The ends of two short chains are fixed to the two narrow sides of the hive, by using 2 bolts. A padlock connects the ends of the chains. This method, however, requires a lid with all four edges bent down, about 4 cm.



Ants

After people ANTS are the worst enemies of bees. They are very persistent in finding their way into a hive, especially when they are attracted by pieces of honey comb or spilled sugar water on the bottom of the hive. Strong colonies can resist ants, mainly during wintertime. In summer, however, massive and permanent ant invasions may occur. The bees will stop breeding, they will panic, and will finally abscond. A small colony can even be wiped out by ants in a few days.

If your hive is supported by a stand, the legs should be placed in tins filled with old engine oil or paraffin (landing board can prevent bees from falling into the tins), or a ring of grease/creosote mixture could be smeared around them.

Alternatively, hang the hive between trees/poles and smear a small part of the suspending wire with the grease/creosote mixture. This also prevents TERMITES from gnawing the hives.

Wood ash or dry cowdung dust spread on the ground around the legs of a stand is likely to keep ants away, too.

Have always a close look at your protective measures to keep out the ants. Like wood ash and cowdung dust, the grease - creosote mixture must be renewed time and again before an ant invasion as it may get covered with dust after a while, paving the way for the ants. An overhanging branch or even a single blade of grass can allow the ants to enter!

If the feeding bottle has attracted ants, take the bottle out. Instead insert a honey comb from a stronger colony or pour sugar water into an empty comb. However, be careful to avoid spilling drops of sugar water on the bottom of the hive. So shake drops off before inserting the comb.

Should you see bees absconding because of a poorly shaded site, because of wax moth and/or ants, capture them again. Try moving the hive to a more protected place. This can be nearby, because after swarming or absconding, bees will have forgotten their previous site.

Bee Pirates

(see picture on page 65)

Between October and May, you may see "BEE PIRATES" (BEE WOLVES). These are slender wasps which molest the bee colony by capturing worker bees on their return flights before they re-enter the hive. From the end of November to the end of February they seem to be most troublesome and they may even catch young queens returning from mating flights. In general they don't seem to cause serious losses to strong colonies because of the immense breeding rate of bees.

Wax-Moth

(see picture next page)

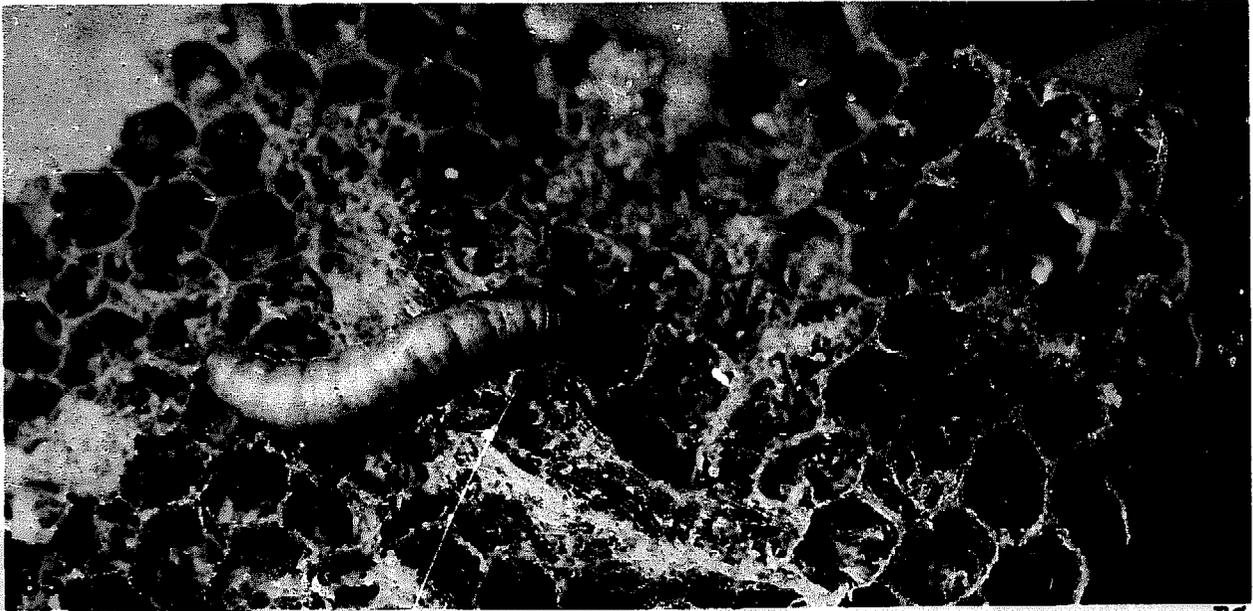
WAX MOTHS often sneak into hives to lay eggs here. The larvae feed mainly on brown combs.

A strong colony can cover all its combs, and is able to kill and to remove most of the larvae. However, a colony weakened by frequent swarming may not be able to cover all the combs, thus possibly allowing penetration by wax moth larvae.

Whenever you inspect your colony, remove all damaged combs, any wax moth larvae and cocoons. Keep the bottom and corners of the hive clean and free from any old bits of comb and close all cracks in the hive, e.g. with fresh cow-dung.

Should a colony abscond, remove all combs immediately.

Wax moth larvae can even destroy top bars by gnawing holes!



Piece of comb destroyed by Wax Moth larvae

BC

Honey Badger

The HONEY BADGER is a powerful mammal. It can break into hives to get honey. Hives which are far from houses should therefore be hung up or stood on strong trestles which are more than $1\frac{1}{2}$ metres above the ground with an overlapping platform.

Spiders

Their webs near hives should be removed.

NOTE: Small lizards and cockroaches sitting under the lids of hives are no threat to the bees at all, lizards can even help to control intruders. Large lizards like Agamas eat bees, but there is little danger if the hive is standing high enough. A tiny, reddish brown "Pseudo Scorpion" which has no tail, is often found in hives. This is a "bees' friend", as it eats mites.

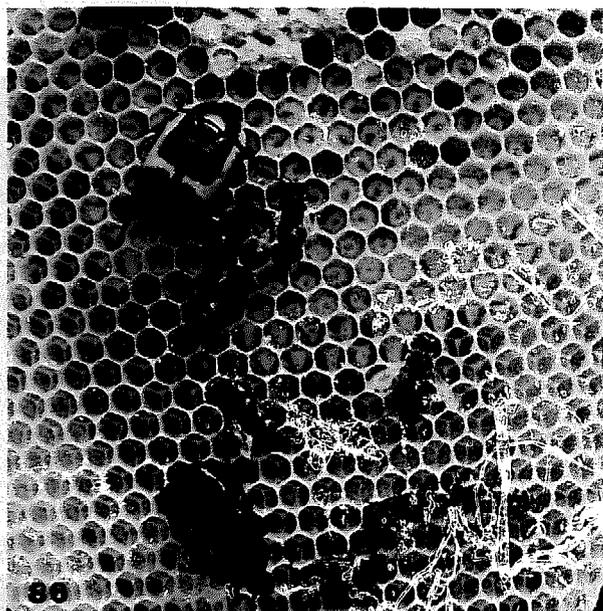
Large Hive Beetle

BIGGEST ENEMY OF THE BROOD

If a hive is not properly closed or if the bees enlarge their entrance holes the LARGE HIVE BEETLE may enter the hive. It feeds on the brood and may even eat large holes into the brood combs.

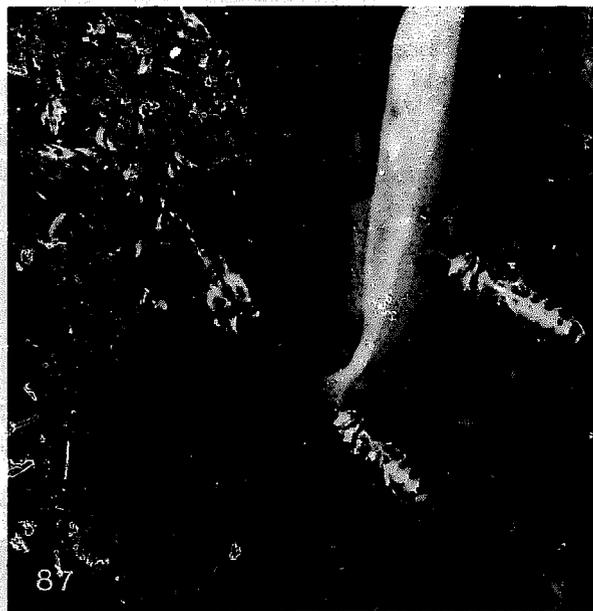
The bees can't defend themselves against these armoured creatures. So remove and kill them and try to make the entrance holes smaller again (1cm wide). There are two species of Hive Beetles, a black one which is more common, and another species with black and yellow markings.

Large Hive Beetles are most numerous during the hottest time of the year (November-February).



Large Hive Beetles

BC



Bee Pirates

BC



Wax-Moth

BC



Pseudo Scorpion
(the "bees' friend")

BC

Colony with laying Workers

If a colony appears to have become "lazy" whilst all the other colonies are busy, here is a possible reason. The queen may have died or got lost on her mating flight, there is no young brood to raise a new queen, and after some time a number of workers have started to lay unfertilized eggs. You may notice that many of the brood cells (drone cells in particular) contain more than one egg and are even crammed with eggs. Worker cells have dome shaped cappings as well as drone cells.

At this stage it is sometimes still possible to get the bees to rear a new queen by inserting a brood comb with eggs and young larvae from another colony. If the workers are however too old to produce bee milk they will fail to raise queens and the colony is doomed.

In this case smoke the bees in intervals so that they gorge themselves with honey. Now remove the combs, brush the bees away and add these combs to a healthy colony. Now smoke the bees out of the old hive and carry it away.

Many of the homeless bees may be welcomed by other colonies as they have honey to offer.

Overcrowding

If you don't bother to open your hive for quite a long time, you may find a hopelessly overcrowded situation with combs on every single top bar.

You may find the bees aggressive, in which case you will have to smoke more heavily than usual.

Smoke this colony many times at intervals before commencing work and anticipate a difficult job! Harvest as much honey as possible, and if there are many brood combs you can give some to a weaker colony or even divide this overcrowded colony. (see p.48).

Drought Problem

When there are not many flowers because of long periods of drought, the bees may use up their supply of honey completely. In this case you must either feed the bees with a sugar water solution, or let the bees abscond (the "hunger swarm"). You can start afresh when the drought is over. However, we recommend feeding them, as after a drought it is difficult to find wild colonies.

Glossary of Beekeeping Terms

- Apiary - A site with several hives ("Bee yard").
- Bee Bread - This is a pollen and honey mixture which is important in the bees' diet, i.e. providing protein for the production of bee milk by "nurse bees".
- Bee Milk - Special secretion produced by young bees ("nurse bees"), rich in protein, fed to young larvae, the queen larvae and the queen (also called "royal jelly").
- Bee Wolves/Pirates - A kind of wasp which captures bees in order to feed its own larvae.
- Brood - Collective name for the eggs, larvae and pupae.
- Brood Comb - A comb containing cells mainly filled with brood.
- Capped Brood - Cells closed by a thin layer of wax and pollen under which mature larvae change into pupae.
- Cells - The little hexagonal sections on both sides of the comb containing either brood, pollen or honey.
- Cocoon - A self spun case, to protect the larva and later the pupa during its transition into a fully developed bee.
- Colony - The whole family of bees with combs and brood, living in a hive or similar place.
- Comb - A hanging sheet of wax with cells on both sides.
- Drones - The male bees, which develop from unfertilized eggs.
- Drone Brood - Eggs, larvae and pupae of drones.
- Foraging - The collecting of nectar, pollen and water by the bees.
- Hive - An artificial shelter for a colony of bees.
- Honey - Important part of the bees' diet. Made from nectar, which is split up into more palatable sugars within the "honey stomach" of the worker, and is further processed in the cells.
- Honey Comb - A comb containing only honey.

Honey Stomach

- The front part of a bee's stomach, used to transport nectar and to change the nectar partially into honey.

House Bees

- The young bees in a colony, which have not yet started foraging.

Hunger Swarm

- A swarm which has absconded its hive after the food store is exhausted.

Larva

- In the life cycle of insects generally an egg hatches into a larva, then changes into a pupa from which the adult insect emerges. Larvae (plural) of bees are legless and white, looking like fat curled worms.

Nectar

- The sweet juice which is produced by flowers to attract insects in order to get pollinated.

Nucleus

- A colony split off by the bee keeper in order to increase the number of colonies.

Pollen

- The brightly coloured powder produced abundantly by flowers, rich in protein, fat, minerals, vitamins. Essential for rearing brood. Also important part of the diet for adult bees.

Pollination

- The transfer of pollen from the male parts of a flower to the female parts of another flower (of the same species). Pollination is essential for the development of fruit and seeds. Bees pollinate flowers whilst searching for food.

Propolis

- Sealing material manufactured by the bees mainly out of plant gums and old wax. Also used to make entrances smaller for the protection of the colony. The plant gums are collected from sticky flower buds, resin drops on tree trunks and branches etc. and are transported to the hive on the hind legs.

Prime Swarm

- The first swarm to leave a strong or overcrowded colony, together with the old queen.

Pseudo Scorpion

- A tiny brown creature with two pincers, but without a scorpion's tail, which is a friend of the bees as it eats mites in the hive.

Pupa

- A stage in the development of the bee between the larva and the mature insect. Pupae (plural) don't eat. They change into adult bees within the silky cocoons spun by the larvae.
(See larva).

Queen

- The mother of the colony and the only female capable of laying fertilised eggs.

Queen Cell

- The special large cell, shaped like a peanut pod, in which the queen larva develops.

Queen Excluder

- Metal grating through which only the workers can pass, the queen and drones being too big.

Reserves

- Bees ready to cope with any urgent or unexpected task, in and outside the hive.

Rest Colony

- The colony remaining in a hive with a young queen, after the prime swarm (or secondary swarm), has left.

Robber Bees

- Bees from other colonies, which try to intrude into the hive to steal the honey.

Sealed Honey

- This is ripe honey which has been thickened by the bees (moisture removed) and capped with wax.

Secondary Swarm

- All swarms which leave the hive after the prime swarm has left.

Swarm Control

- Methods to delay swarming.

Wax

- The building material for the combs, produced in special glands of young workers.

Worker

- Underdeveloped female. Smallest and most numerous bee in the colony, responsible for organisation and all the work.

Summary

Members of the Colony

BEE	NUMBER PER HIVE	DUTIES
<u>Queen</u> (female)	Usually only one, unless the colony prepares to swarm	Lays up to 3,000 eggs each day in the brood rearing season.
<u>Workers</u> (underdeveloped females which normally do not lay eggs)	Generally up to 60,000 in a strong colony	<p><u>House Bees</u> (first 3 weeks) As nurse bees they clean the cells, keep the brood warm, and feed the queen and the larvae. Their next duties are:</p> <ul style="list-style-type: none"> - Producing wax and building combs, - Fanning air in and out of the hive, thereby regulating the temperature - Keeping the hive clean - Turning nectar into honey - Finally becoming guards and defending the entrance against enemies. <p><u>Field Bees</u> (Foraging Bees) These collect nectar, pollen, water and propolis.</p> <p>Scouts locate new sources of food and water.</p>
<u>Drones</u> (males)	Up to 200, but only in certain seasons	Only duty is to mate with the Queen (most never get the opportunity), after which they die. At the end of the flowering season they are thrown out of the hive.
<u>Brood</u> (eggs, larvae, pupae)	Varies according to condition of colony and the abundance of flowers	Brood develops into young bees.

Summary

How to Handle Bees

1. Do's and Dont's	Reasons
Do work together with a partner	It is easier
DON'T open the hive when the weather is not favourable i.e. very cold, very hot, muggy, and windy.	Otherwise the bees may become irritated and aggressive.
DO have smoke available at all times and use a little at regular intervals and before each step.	Helps to keep the bees quiet.
DON'T use synthetic materials i.e. rubber to make smoke	Bees dislike very strong smelling smokes and can become aggressive.
DO move quietly and talk calmly	Bees will get used to you and will remain quiet whilst you work with them.
DON'T knock the hive	This can upset the bees.
DO wear a hat and blow smoke over your face at regular intervals	Helps to prevent you from being stung in the face by occasional attackers.
DON'T stand in front of the entrance holes	Bees get irritated by unexpected obstacles standing in front of the hive.
DON'T squash bees if at all possible	The smell of dead bees will alarm the other bees.
DO cover stings and accidentally squashed bees with smoke immediately	As above, the smell of stings and dead bees can aggravate the other bees.
DON'T pull out stings; scratch them out with your finger nail	Pulling out the sting will inject more poison into your body.
DON'T ever wave your hands around your head or run away if the bees start to trouble you. Instead bend your head down, cover your face with your hands and walk away slowly	Sudden movements attract and annoy bees. You will be amazed to discover that bees can differentiate between calm and nervous people! Calm people rarely have any problems providing they follow the rules given on this page.
DON'T continue your inspection if the bees appear to be aggressive. Close the hive (<u>never</u> leave it partially open) and try again another day	There is no point continuing as the bees will only become more upset and then you may get stung. But <u>ALWAYS</u> try and consider why they might have been upset. Usually you will find that it was your fault, not the bees'!
DON'T inspect or harvest honey from more than two colonies in the same apiary, on the same day. Smoke all the colonies in your apiary a few times before you work with one of them	The smell of open hives and honey can attract robber bees.
DON'T harvest from the first 8 combs	The colony needs a good food store.

2. Procedure for Opening the Hive

- (a) Blow smoke through the entrance holes. Wait $\frac{1}{2}$ minute. Repeat (up to eight times). Unlock the hive.
- (b) Remove the lid and stay behind the hive. Open the hive on the empty side taking out five top bars to give room to work. (Smoke immediately). If there are bees on these bars, shake them back into the hive.
- (c) Move the empty top bars to the side, close to each other, using a little smoke as you get closer to the bees.
- (d) Lift the combs out one by one for inspection and then insert them again carefully. If the top bars are stuck together with propolis, loosen them with a knife. Blow a little smoke onto each comb before lifting it out. At the same time also blow smoke onto the comb which will be inspected next.
- (e) If you are checking the brood nest, continue the inspection until you reach the first top bar. Do not disturb the brood nest for longer than is absolutely necessary.

If you are harvesting, it is only necessary to proceed until you see the first brood comb. Before harvesting blow smoke on both sides of the honey comb, then shake and brush the covering bees off into the hive with a feather. Only harvest combs which are at least half sealed on both sides.

- (f) When the inspection/harvest is completed, push the top bars back into their original position. As you push them together, drive the bees back using smoke. Always close the hive carefully so there are no gaps between the top bars.
- (g) Replace the lid and lock the hive. Locking the hive has, unfortunately, become necessary in many places in order to deter thieves.

3. Beekeepers Duties

This provides guidelines only which can be followed with flexibility

<p><u>Newly hived swarm</u> (procedure for the first 3 months)</p>	<p>every day</p> <p>once a week</p> <p>after 3 weeks</p> <p>once a month</p>	<ul style="list-style-type: none"> - check hive from outside to see that the shade is alright, no ants or other pests etc. - feed with sugar water for two months if it is winter, less if it is summer. - check the build up of new combs - check that there is brood to ensure that the queen is laying eggs satisfactorily. - check all combs including the brood combs. Rearrange the brood nest when necessary (see p.46.).
<p><u>Newly hived colony</u> i.e. with combs (procedure for the first 2 months)</p>	<p>every day</p> <p>once a week</p> <p>once a month</p>	<ul style="list-style-type: none"> - check the hive from the outside as with a new swarm. - check to ensure that the combs which were tied up are still in position. If they have fallen down, reattach them. - feed with sugar water for a week or so to help them settle down (actual length of time somewhat dependent upon the amount of honey in the combs and the number of flowers around). - check the build up of new combs - check all combs including brood combs. Rearrange the brood nest when necessary.

CONTINUED OVERLEAF

Beekeepers Duties, cont.

<p><u>Nucleus colony</u> obtained by dividing a colony</p> <p>(procedure for the first 2 months)</p>	<p>every day</p> <p>once a week</p> <p>after 4 weeks</p> <p>once a month</p>	<ul style="list-style-type: none"> - check the hive from the outside as with a newly hived swarm - check the build up of new combs - check that there is a queen - check all combs including brood combs. Rearrange the brood nest when necessary.
<p><u>Established Colony</u></p>	<p>twice a month</p> <p>every 6 weeks</p> <p>every 4 months</p> <p>yearly</p> <p>every 2 weeks</p>	<ul style="list-style-type: none"> - check the hive from the outside to see that the shade, kraal, stands etc. are alright, and watch out for ants. - check all honey combs. Watch expansion of brood nest, avoid overcrowding (see p.65) - make sure that the inside of the hive is clean and that there are no wax moth larvae. - ensure that there are no cracks; if there are, fill them with cow-dung or putty and then paint over the top (just cow-dung with cow-dung hives) - check the brood nest - repair and paint hive where necessary and also repair kraal - check the honey combs and harvest when they are more than half sealed on both sides. If you don't harvest regularly you may lose "your honey" due to swarming (see p.22). Regular harvesting may discourage colonies from swarming.

! During the Harvesting Seasons

APPENDIXCosts of Hives(1) Tanzanian Top Bar Hive
(made by a carpenter)

If you give them the measurements, most Brigades/Prisons etc. will make hives for you. Prices nowadays seem to vary from about P45.00 to P55.00 (lid included).

For repair you will need every 3 years about P5.00 (for glue, screws, paint and brush).

(2) Home-made chipboard Top Bar Hive

Chipboard as available in Botswana (size: 244 cm x 122 cm x 1.5 cm) costs P15.00 at the time of printing. If you follow the cutting pattern on the next page, this board will serve for 2 hive bodies. You will need corner brackets, wood glue, screws, paint for about P15.00 and 60 Top bars for about P10.00.

Total costs for 2 hives: P40.00, but this doesn't include a lid. For repair P5.00 as above.

(3) Different Cow-Dung Hives
(Tshwaragano, Noah's)

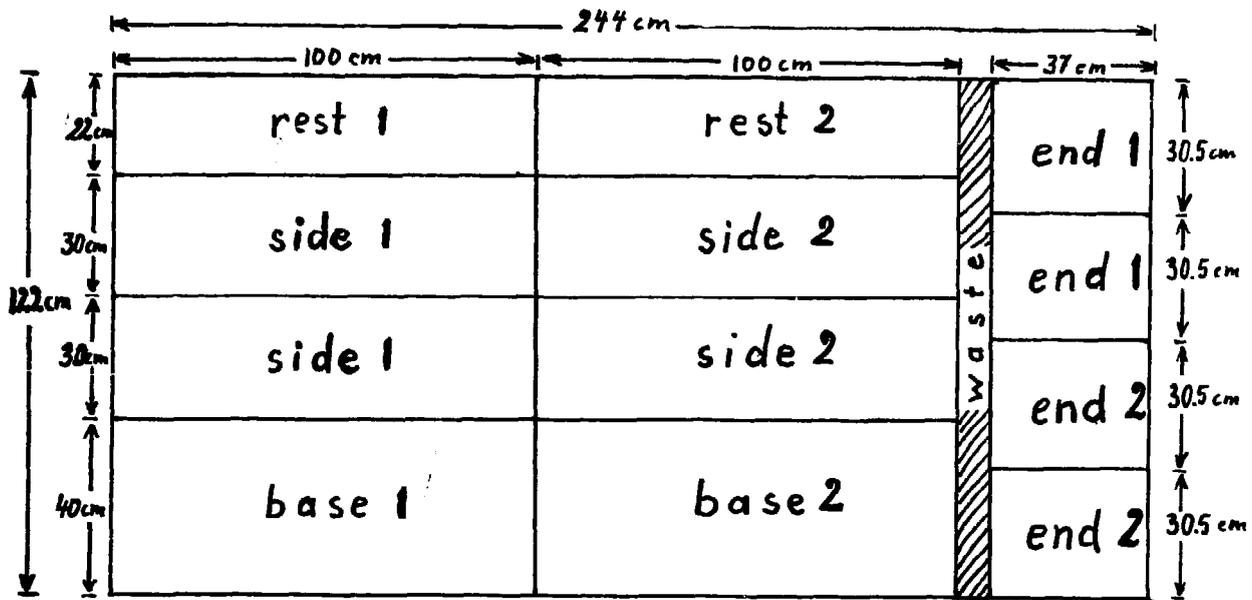
The only inevitable costs are caused by the purchase of 30 top bars, approx. P5.00.

Roofing and rain protection (as for the chipboard-hive) must be made out of scrap materials. Pieces of metal sheets, plastic and sacking, grass, flattened 20 litre Paraffin containers, etc. (See pictures on page 61).

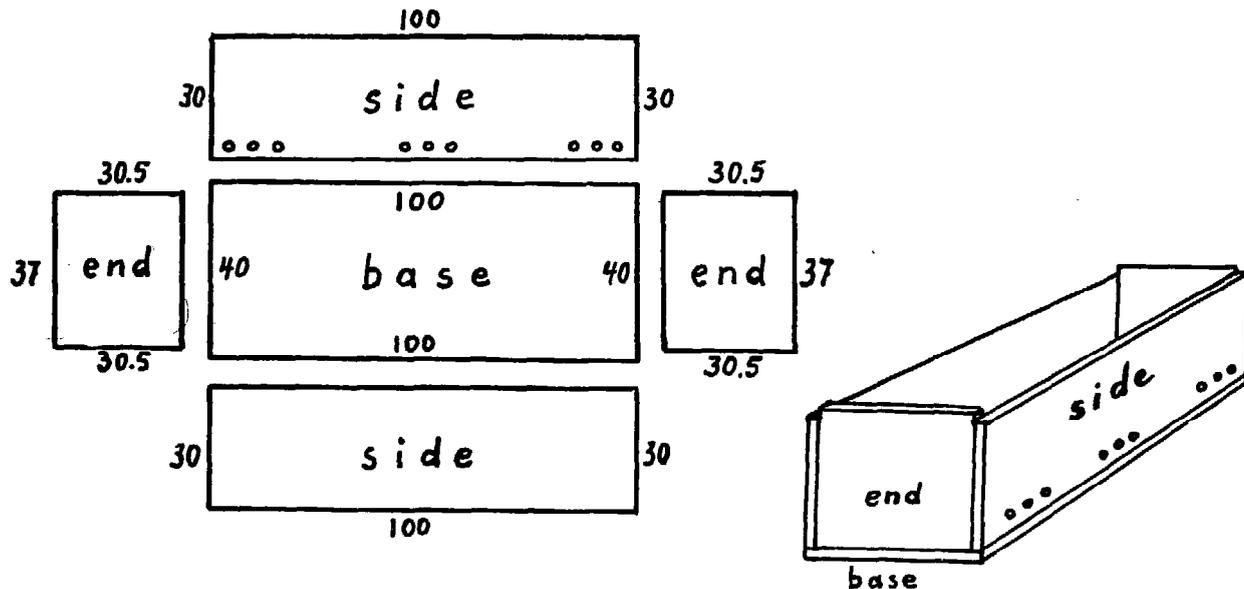
Additional Costs for All Hives

- (a) A queen excluder grating sheet costs about P5.00. It can be cut into small pieces and this may serve about 20 beekeepers. Ask for pieces at the Ministry of Agriculture or at the Rural Training Centres. Paper clips with the inner measurement of exactly 4 mm will serve the same purpose!
- (b) Further costs depend on the availability of planks, poles, nails, wire and strong branches as materials for stands or for hanging the hives up.

Cutting pattern for chipboard:



The 2 rest pieces of the chipboard you could use as top above the top bars to secure the hive. Fix one end with 2 T-hinges and the other end with hasp and staple for the padlock.



The end is half a centimetre higher than the long sides so that the top bars can't be pushed down by accident.

All sides must be glued and additionally screwed together with corner brackets. You can't put screws into the cutting edge of a chipboard, it will split.

The top bars must be exactly 3.3 cm wide, 1.5 cm thick and as long as the width of the hive.

They must get wax ridges as described on page 56, otherwise the bees start to build the combs across several top bars and the beekeeper can't lift the combs out separately.

for further information

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Protect your bees - prevent veld fires !



Beekeeper's Notes