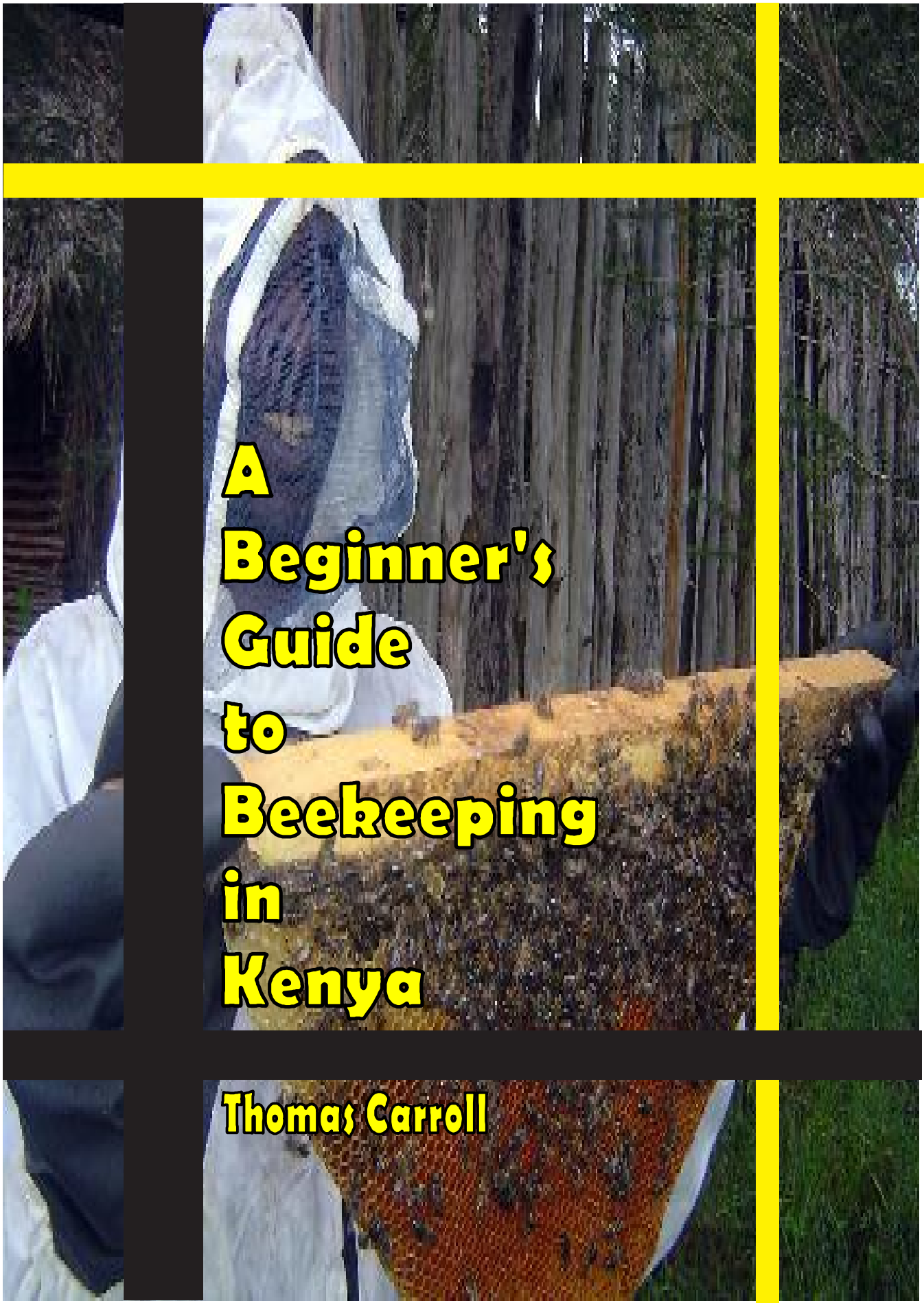
A
Beginner's
Guide
to
Beekeeping
in
Kenya
Thomas Carroll

A Beginner's Guide to Beekeeping in Kenya

Thomas Carroll

LegacyBooks

Nairobi, Kenya

Editing, design, and layout by Legacy Books Press
P.O. Box 68077-00200
Argwings Kodhek Road
Nairobi, Kenya

ISBN: 9966-7078-6-7

Printed in Kenya.

A percentage of royalties from the sale of this book will go to Baraka Agricultural College to support beekeeping development in Kenya.

For further information on how to purchase additional copies of this book, please go to the Apiconsult website:

www.apiconsult.com/beekeeping-beginner's-guide.htm.

Cover and book design by Agatha Verdadero

Foreword

In the context of the social, economic, and environmental realities of Kenya, Africa, and humanity, Baraka Agricultural College believes passionately that sustainable agriculture and rural development (SARD) is an appropriate development strategy. Now more than ever, humans have the potential to create a world in which every person has the opportunity to live life with dignity. This does not happen if economics alone dictates development policies.

Baraka promotes SARD as a livelihood strategy through dialogue, participatory education, training, and research. Through a participatory action research process (PAR), the SARD strategy aims to create learning individuals and communities. By doing so, it improves the capacity of rural people to create wealth, develop their social and natural capital, and empower them to influence policies that affect their livelihoods and those of future generations.

We do not need to have 60% of Africa's population in urban centres, with two-thirds living in slums, by 2050. Through modern technology and effective policies and processes, we can create a much more sustainable Africa that gives its people the opportunity of living life with dignity. This requires a greater emphasis on the development of human and natural resources in addition to environment-friendly foreign investments in our rural areas.

Bees are one of our most undeveloped natural resources on the continent; they also have huge potential. In many areas of Kenya but especially in arid and semi-arid regions, beekeeping has great promise. While there has been much emphasis on technology, there has also been a corresponding neglect of human capital. To address the disparity, this book aims at improving the capacity of beekeepers and promoters of beekeeping. It is a practical manual from an experienced, professional beekeeper that fills a big need for the beekeeper and student of beekeeping in Kenya and further afield. In doing so, the book also advances the mission of Baraka Agricultural College.

BR TONY DOLAN
Principal, Baraka Agricultural College
Molo, Kenya
November 2006

Acknowledgments

I would like to thank Jane, my wife, and my three children: Mick, Kieran, and James, for supporting me to write this beekeeping guide.

I would also like to thank Br Tony Dolan, principal, and all the staff of Baraka Agricultural College, Molo, as well as the Franciscan Brothers, for their help in getting this book printed and for giving me the opportunity to work on beekeeping development with them since 1994.

In addition, I would like to thank Self-Help Development International (SHDI) Ireland and the SHDI country office in Nakuru that support our beekeeping work at the college. Thanks also to Gorta, which currently supports beekeeping research work for my doctoral studies at University College Dublin. To my supervisors at UCD: Dr Jim Kinsella, Prof Jeremy Gray, and Dr Eamonn Brehony: thanks for always challenging my thinking on beekeeping and livelihood issues. My thanks also to IMRS and Irish Aid for their support over the years I have worked in Eastern Africa.

I hope the guide is useful to those who want to start beekeeping in Kenya and other African countries. Beekeeping has the potential to earn significant amounts of money if carried out well. Knowledge is the key to good beekeeping. The book reflects the reality of beekeeping on the ground as I have experienced it over the past 14 years of work in this sector.

I wrote this book to assist beekeepers in Kenya and other African countries to improve their beekeeping. Other beekeepers from around the world can learn simple and low-cost beekeeping methods, too. Top bar hives, including the Kenya Top Bar Hive, are now popular among beekeepers in the USA and other developed countries for their simplicity and excellent honey quality.

I have written the book in a simple language and intend it to be as practical as possible. Readers are welcome to send comments on how this book can be improved and made more relevant to enhance future editions. Write me at tcarroll@apiconsult.com or through P.O. Box 12173, 20100 Nakuru, Kenya.

Thank you.

TOM CARROLL
Nakuru, Kenya
November 2006

Contents

Illustrations

FIGURES

PHOTOS

TABLES

Preface

This book is about beekeeping as practised in Kenya. Wikipedia (a free online encyclopaedia) defines it as "the practice of intentional maintenance of honeybee colonies, commonly in hives, by humans. A beekeeper (or apiarist) may keep bees in order to collect honey and beeswax, or for the purpose of pollinating crops, or to produce bees for sale to other beekeepers. A location where bees are kept is called an apiary". We also know beekeeping as apiculture, from the Latin *apis* or bee.

The purpose of beekeeping is to produce and sell as much honey as possible. Beekeeping is a means to expand livelihoods and make the best use of available resources, in this case, floral nectar and pollen. A diversified livelihood is a more secure one. Beekeeping also has immense benefits in terms of provision of pollinators, which enhance crop yields. Scientists estimate that one in every three bites of food we eat is a result of active pollination of plants in which bees play a very important role. Bees are environment-friendly and so are beekeepers. Many beekeeping groups initiate tree nurseries as they realise the importance of enhancing the environment to improve honey yields. Beekeepers are also the most active in safeguarding natural environments, as they know honey crops are dependent on local vegetation, mostly trees, as their source of nectar. **Teach people to keep bees and they will plant trees themselves.**

Better beekeeping requires good management of bees and hives. Anyone—young or old, men or women—can keep bees. Beekeeping needs very little land, time, or equipment. It is an ideal activity for small-scale farmers in Kenya and other African countries.

Farmers who want to keep bees generally have two challenges: 

1. LACK OF INFORMATION ABOUT BEEKEEPING

This is a common problem: where can beekeepers in Kenya and other African countries get relevant information? Information from other continents such as Europe and America is useful but not always applicable. African bees and conditions are different and require appropriate information on local beekeeping constraints as well as opportunities.

2. A FEAR OF BEES

Many people start beekeeping only to run into problems with excessive stings that result in the farmer getting rid of the bees. This is also a common difficulty in Kenya as Kenyan bees are unpredictable and sometimes very aggressive. Knowledge on how to keep and handle bees properly can overcome a fear of bees.

This book assists with information on beekeeping, which helps overcome fears. It also directs to sources of further information. All beekeepers need to keep learning and improving their craft. Learn from bees themselves, neighbours and fellow beekeepers, the local beekeeping officer/extension worker, and all the books and other resources obtainable.

A Glossary is available after Part Six to assist you with definitions for the more important terms used in this guide.

(N. B. *On exchange rates: KSH refers to the Kenyan shilling. Exchange rates at the time of writing are USD1=KSH72; GBP1=KSH136; EUR1=KSH92.*)

Part One
INTRODUCTION TO BEEKEEPING

WHAT IS BEEKEEPING?

Beekeeping is the art of managing honeybees in order to obtain honey, beeswax, and other bee products for food, income, and sometimes, even medicine. Men and women of any age can carry out beekeeping, but there are taboos against women handling bees in some Kenyan communities.

It is an ideal income-generating activity for groups such as those for women, youth, men, church, etc. We have seen a number of very active youth groups involved in beekeeping. They can generate income without owning land, a major constraint to other lucrative endeavours. Beekeeping requires little space; it complements other farm activities. Beekeeping does not need good soil.

GETTING TO KNOW BEE SPECIES AND RACES 

A. HONEYBEES

There are many different species of bees in the world, most of them solitary. A few species of bees are kept to produce honey. In Africa, America, Australia, and Europe, we have *Apis mellifera*, which is a very important species for honey production. Recent research has shown that all races of *Apis mellifera* have origins in Africa. In Kenya, we also have Apis mellifera or the species most familiar to everyone: the honeybee. This book is mostly about the honeybee. Within this species, there are a number of bee races in Kenya that have their particular characteristics and adaptations to our environmental conditions: *Apis mellifera scutellata*, *Apis mellifera monticola*, *Apis mellifera yeminitica* (*nubica*), and *Apis mellifera littorea*.

1. *Apis mellifera scutellata*

These are small with relatively short tongues. The bee is highly aggressive and has great tendency to reproduce (swarm) and abscond (migrate). It is found in plains. Massive flowering attributes to their high reproductive rate, which occurs in plains just before rains. Scutellata is able to nest in a broad range of sites: from cavities to open nests.

2. *Apis mellifera monticola*

This bee is called the mountain bee. *Monticola* are a large dark gentle race with longer hairs than other African bees. The bee inhabits places where clouds, mist, and nocturnal ground frosts obscure the sun. It is the largest bee in Africa. It

has a tendency to reduce brood rearing at the first sign of forage decline and may not migrate. It is less productive and less vicious than other species. *Monticola* is found in Meru and Mt Elgon.

3. *Apis mellifera yemenitica* (formally, *Apis mellifera nubica*)

This is the smallest race in Africa. It has the most slender abdomen and the largest yellow abdominal colour band of all African races. It withstands and survives drought conditions by excessive migration. It is found mostly in the northern parts of Kenya.

4. *Apis mellifera littorea*

The bee inhabits lowlands of the Kenyan coast. It does not migrate as much as *scutellata*. It has a tendency to rear brood throughout the year due to availability of forage along the coast.

Bee races I am most familiar with are *A. m. monticola* and *A. m. scutellata*. *A. m. monticola* tend to be in the highlands and more docile. We probably have these around Molo. *A. m. scutellata* are smaller and more aggressive bees found in the lowlands of Kenya. In my immediate vicinity, we have them in Nakuru and Baringo Districts. We may also have hybrids of these two types. Much research has yet to be done in Kenya and Africa as a whole on mapping various bee races and their characteristics.

(Reference: *Beekeepers' Guide Book*, National Beekeeping Station, Nairobi)

B. STINGLESS BEES

There are also species of stingless bees in Kenya. Beekeeping with stingless bees is called meliponiculture. These bees produce honey prized as medicine. The honey is very sweet and liquid compared to *Apis mellifera* honey. Stingless bees may be kept in small hives but are not yet kept commercially in Kenya. There is renewed interest in these bees with the discovery of a new species in Kakamega by a scientist working for the National Museums of Kenya. Beekeepers in other African countries keep stingless bees. There is even a very fascinating webpage about someone in Moshi, Tanzania, who keeps them. Stingless bees are not, however, the main focus of this book; honeybees are.

(N. B. *See Annex 2 for more information on stingless bees in Kenya.*)

WHAT BEES DO 

- Bees forage on floral nectar and pollen. They don't compete with livestock for food such as grass.
- Bees help the pollination of flowers, plants, and crops.
- Bees increase the quantity and quality of flowering crops, e.g., coffee, papaw, banana, avocado, macadamia, mangoes, etc.
- Bees fly three to five kms from the hive to collect nectar, so you benefit from other people's flowers.

- Bees produce honey, beeswax, and propolis (used in medicines) as well as other products such as royal jelly, pollen, bee venom, and bee brood. Honey, beeswax, and propolis are the three products currently exploited in Kenya. They are discussed in this book because of their importance.

ALL ABOUT HONEY 

- Honey contains sugars (80-85%) that are easily absorbed by the body—good for young, old, and sick. It is made from nectar, a sugary secretion of flowers. Nectar contains 70-80% water. To make honey, bees add enzymes and reduce the water content to that of honey. (Good honey contains less than 19% water.)
- Honey is very good energy food. Use it as sweetener for food (cake, chapati, bread, etc.) and drink. Try some in your tea.
- Honey has medicinal properties. Use it for coughs, ulcers, wounds, and sore throats. (*See recipe for honey cough syrup in Annex 4.*)
- Honey has a high market value. It is used to make local beer and is also a food preservative.
- Honey is always in demand. It is a good source of cash.

INFORMATION ON BEESWAX

- Beeswax is the substance bees use to make their combs. Worker bees secrete it from special wax glands on the abdomen (underside).
- Beeswax is used in cosmetics, soaps, leather and wood preservation, candles, ointments, batik, shoe polish, and foundation sheets for Langstroth hives.
- You can turn honeycombs into wax. Simple instructions and recipes for using the wax are found in Annex 4.
- With a little training, you can make and sell candles, body cream, and shoe polish made with beeswax. Farmers trained by the Baraka Agricultural College/SHDI beekeeping outreach project sell homemade body creams and generate additional income for themselves.

WHAT IS PROPOLIS?

- Propolis is a resin that bees collect from plants. It is black and sticky.
- Bees use propolis to cover the inside of the hive and fill in the cracks.
- It has medicinal value, e.g., as an antibiotic.
- If you chew propolis, it tastes bitter but is good for the throat and chest.
- There is an export market for propolis. Annex 4 has a recipe for making propolis ointment.

RESIDENTS OF THE BEEHIVE

In the beehive, there are three types or castes of bees. It is important for all beekeepers to recognise them. The first caste is called the Queen: a sexually mature female. The second caste is called the Drone: male bees. The third caste is the Worker: an immature female. Details of all three castes plus the brood are given below.

Figure 1: Types or Castes of Bees
Only the worker bee does all the work in the hive!

1. The Queen Bee

The queen is a sexually mature female. There is only one queen in the hive. Her job is to lay eggs that hatch into other bees. She can lay up to 2,000 eggs per day. Queens can live for up to five years, but the most productive period of their life is the first two years.

The queen may be hard to find in the hive, but you can recognise her by her length. She is long and slender and her wings reach only halfway down her back. She is far bigger than the numerous workers but must not be confused with drones, which have a square body and very large eyes.

2. The Drone

There can be several hundred drones in a hive depending on the time of year. In times of food shortage, workers throw drones out of the hive. When a new queen starts life, she mates only once with up to ten drones outside the hive, high up in the air.

Drones have very large eyes used to spot the queen during mating. Their major task is to mate. They have no sting. Drones look large and square. They make a loud buzzing noise when they fly.

3. The Worker

Most bees in the hive are worker bees. As their name suggests, they do all the work. Workers feed the young, feed the queen, guard the hive, and collect honey/pollen/ propolis and water. Workers undertake different tasks in the hive depending upon their age after hatching. Worker bees have a sting and use it to defend their nest. Workers can number up to 60,000 in a very strong colony of bees. The lifespan of a worker bee depends on colony activity: during times of high activity, e.g., when collecting nectar to make honey, they can wear out in a few weeks. In the dormant season when there isn't much work, they can live for up to six months.

4. The Young or Brood

The queen lays an egg that looks like a grain of rice. To see eggs, hold combs from the centre of the brood nest (centre of the hive) up to the light. Look carefully at seemingly empty cells; they usually have eggs at the bottom.

The eggs develop into larvae that look like white maggots. The larvae are fed on brood food (produced in glands on the head of nurse worker bees) and some pollen/

honey. (Pollen is the powdery substance produced by the anther of flowers and is rich in protein. It is the coloured substance seen on bees' legs and stored in combs.) Larvae are later sealed in the comb where they turn into adult bees. During the changing process, they are called pupae. Thus there are three stages to adulthood: egg, larva, and pupa.

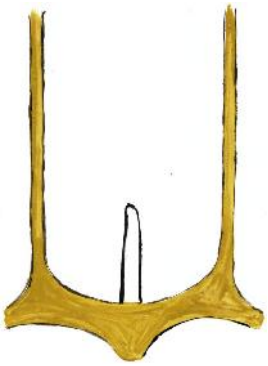

Figure 2: Bee Egg

Figure 3: Bee Larva

Figure 4: Bee Pupa

Bee Caste	Eggs-Larvae (# of days)	Larvae-Pupae (# of days)	Pupae-Adults (# of days)	Total Days (Egg to Adult)
Queen	3	4.5	7	14.5
Worker	3	4.25	11.25	18.5
Drone	3	6.5	14.5	24.0

Table 1: Duration of Development Stages
Table shows time spent in each stage of development for African bees, specifically *Apis mellifera scutellata.*
(Source: Kigatiira, K. I., *Beekeeping for Beginners.* See Annex 9 for more details.)

Part Two
GETTING STARTED: THE BASICS

TYPES OF HIVES

A hive is the box or some other container where bees live. Without a hive, you cannot be called a beekeeper!

Photo 1: Wild colony of bees
Wild colony of bees nests under a manhole cover.

Different types of hives are used in beekeeping. Some are:

- Pot hives or clay pots (See Photo 2.)
- Log hives (See Photo 3. They are made from hollowed-out tree trunks.
- Basket hives (See Photo 4. They are made from woven sticks smeared with mud.)
- Kenya Top Bar Hive or KTBH (See Photo 5.)
- Langstroth hives (See Photo 5. These use frames.)

Photo 2: The pot hive
The pot hive has a super or honey chamber on top.

Photo 3: Traditional log hive
A traditional log hive located in Koibatek District.

Photo 4: Ugandan basket hive
The lid is removed to harvest honey. Care in harvesting yields top quality honey.

Photo 5: Examples of KTBH (left) and Langstroth hive (right)
Hives in Turkana District. Beginners should go for the simpler and cheaper KTBH.

In this book we will give you measurements of the KTBH and a cheaper mud/ stick hive, which also has top bars. These two hives are relatively easy and inexpensive to make. They are very good hives to start with in beekeeping in Kenya. The Langstroth-type frame hive is more complicated and expensive to make/purchase. It has been promoted in Kenya the past few years. Each type of hive has advantages and disadvantages.

ADVANTAGES OF TRADITIONAL HIVES

(e.g., logs, pots, and baskets)

- They are relatively easy and inexpensive to make.
- You can use local materials and traditional knowledge for making them.
- Bees often prefer these hives to more 'modern' types.
- With care in harvesting and handling, honey quality can be very good.

Photo 6: Crudely constructed box hive
This box hive is located in Londiani, Kericho District.

DISADVANTAGES OF TRADITIONAL HIVES

- Bee management is difficult.
- Logs are no longer readily available to make hives in Kenya.
- They can be difficult to harvest.
- Yields and quality of honey can be lower than top bar and frame hives.

ADVANTAGES OF TOP BAR HIVES

- Bee management is possible, making it easy to harvest and manipulate colonies to maximise honey production.
- They are easier and cheaper to make/buy than frame hives.
- They are easier to harvest than traditional hives, creating the potential for better honey quality.
- Honey extraction is easy compared to frame hives, as there is no need for specialised equipment.

DISADVANTAGES OF TOP BAR HIVES

- Combs in the top bar hive are not supported. They can break if not handled carefully.
- Wax is harvested with honey forcing bees to build more wax to replace harvested combs, which results in lower honey yields but more harvested wax.
- The volume of the KTBH, like the traditional hive, is fixed, so the hive can fill very quickly in the honey season. An overcrowded hive can swarm leading to reduced honey crops.

ADVANTAGES OF FRAME HIVES

(e.g., Langstroth)

- It has frames that make the combs very strong especially when transported.
- The honey is extracted by centrifuge, returning wax to bees with potentially much greater honey yields.
- The space of the hive can be added to easily by adding more supers. Additional space is important during honey flow. Supers can be removed when the honey flow is over to contract hive size.
- Using a queen excluder between the bottom brood box and the honey supers means honey is separated completely from the brood and is of high quality.

Photo 7: The Langstroth frame hive

DISADVANTAGES OF FRAME HIVES

- Frame hives are more expensive to make than traditional or top bar hives.
- They are more complicated to make and manage, as they require more spare parts such as frames, foundation starter sheets, and supers, which are costly and not readily available to beekeepers in Kenya.
- Extracted/unextracted honey supers are prone to damage by wax moths, ants, and rodents.
- Frame hives need a centrifugal extractor to extract honey. Extractors are not readily available in Kenya and are expensive to purchase. Beekeepers are often forced to cut honey from frames just as in top bar hives.
- Frame hives require a greater level of investment (time and money) as well as beekeeping skills to make them pay off.

In recent years, Langstroth frame hives have been promoted in Kenya. There has been considerable hype around their use with many people automatically believing they are the best hives. Frame hives are not necessarily better than either traditional or top bar hives. Frame hives have the potential to be better in terms of higher yields and better quality honey **if** managed well! Unfortunately in many cases, too much emphasis is placed on the technology and not on building beekeeping skills and capacities.

Photo 8: Beekeeper in Kitui District
Beekeeper poses in front of Langstroth hives.
Donor support provides many such hives in Kenya.

As a beginner, you can easily start beekeeping in Kenya using the intermediate technology top bar hive such as the KTBH—unless someone donates a Langstroth to you! Once you have beekeeping experience, understand why you should purchase a frame hive, and have money to do so, and then use the frame hive by all means, but you should be aware that there are no automatic increased yields from having a Langstroth. The hive is only as good as you manage it. I have produced up to 40kgs per KTBH while many people who purchased Langstroths have produced little or nothing! So understand bees and bee management and you will produce good crops of honey no matter the type of hive you have. When you have better skills and knowledge, move to the more expensive hive, which can then give better yields.

This book deals primarily with top bar hives because they are the easiest for beginners in Kenya who often do not have a lot of money to spend for starting up. The principles of beekeeping are, however, the same for both top bar and frame hives and issues of bee management are very similar.

THE KENYA TOP BAR HIVE

Photo 9: The Kenya top bar hive
The Kenya top bar hive or KTBH was developed in Kenya and is now used around the world.

The Kenya Top Bar Hive (KTBH) was developed in Kenya and is a good option for many Kenyan beekeepers and other beekeepers from around the world. KTBH are also used outside Africa, e.g., the United States of America. Its big advantage is its simplicity and low cost. You also get to produce beautiful comb honey for home consumption or for sale. Figure 5 shows the construction drawing of a KTBH. Remember to follow the measurements—the top bars, in particular!

Very important: You must copy **exactly** the measurements we give you. When it comes to bee management, it is important that all your hives are the same size so you can move top bars from one hive to another. This allows better bee management. In particular, watch the dimensions of the top bar: 3.2cm wide and 48.3cm long. The ridge at the centre of the top bar is coated with beeswax to give bees a line to follow when they build their comb. The smell of beeswax also attracts bees to enter a new hive.

Photo 10: Top bar
There are two views provided for the top bar: top view (top) and side view (bottom). Notice the ridge protruding from centre in side view.

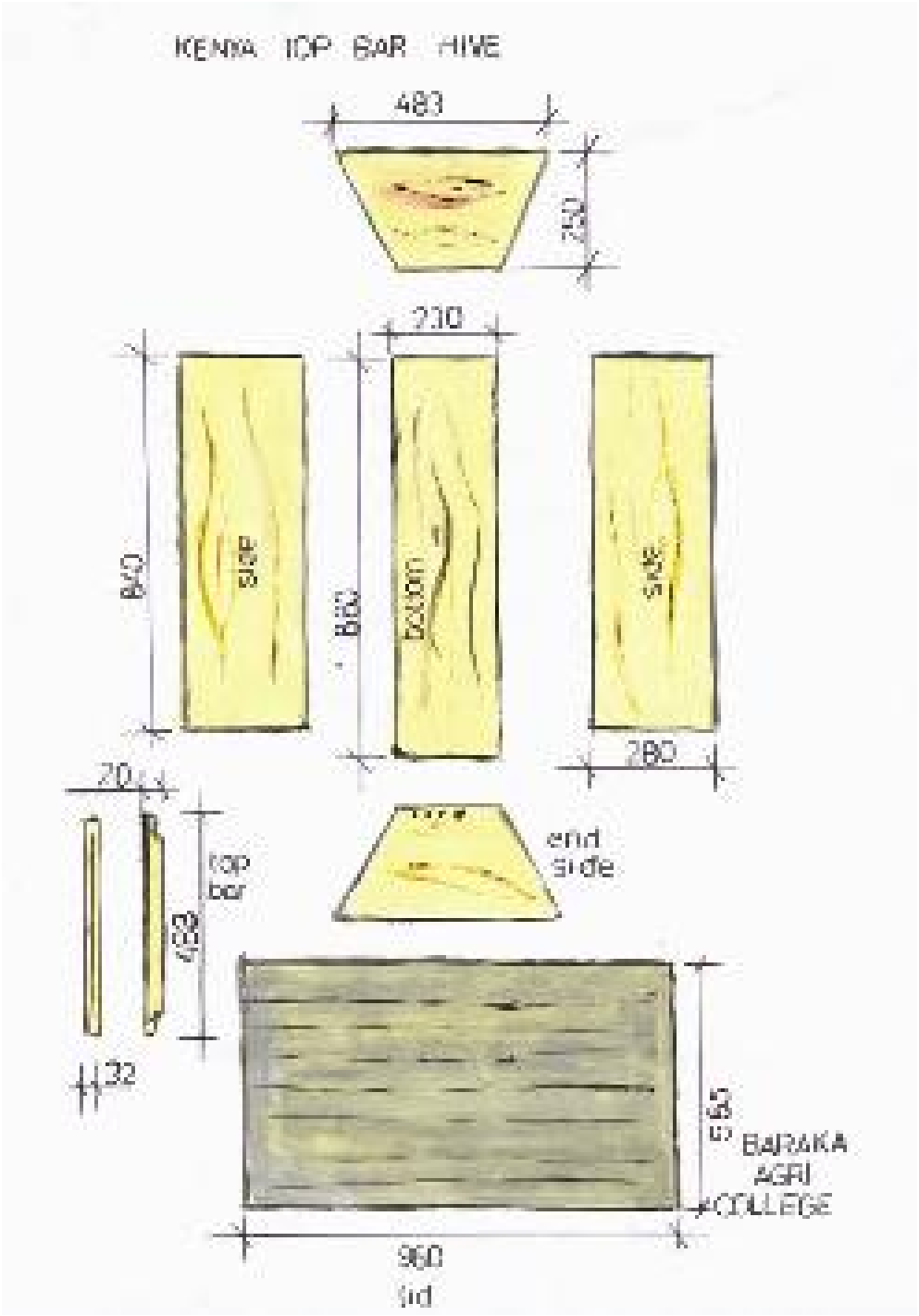

Figure 5: Construction Drawing of KTBH
Measurements are in millimetres.
(Source: Baraka Agricultural College Workshop)

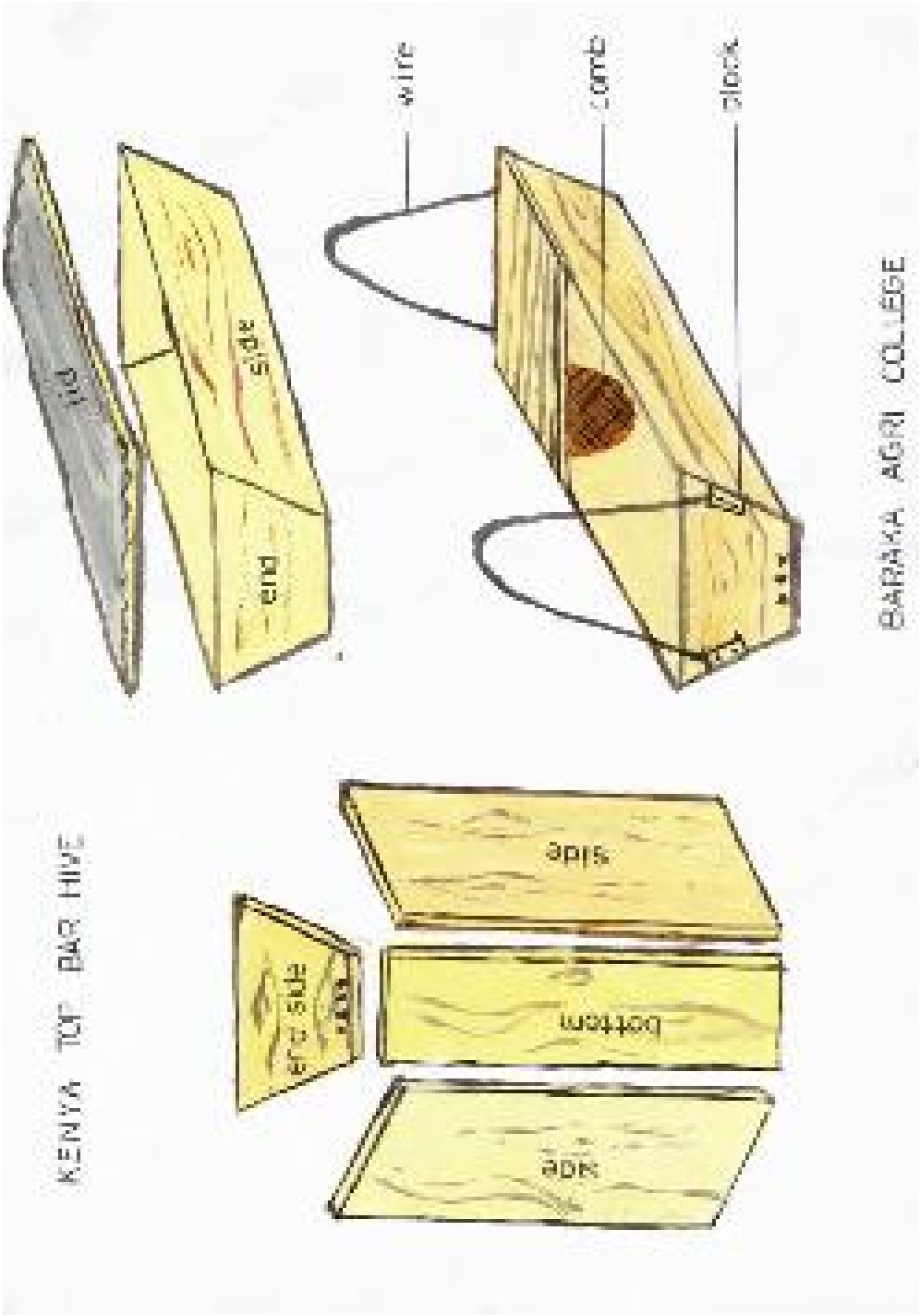

Figure 6: Assembly of KTBH
(Source: Baraka Agricultural College Workshop)

TIPS FOR MAKING A GOOD KTBH

- Use timber ¾ inch thick (19mm) to make the hive.
- Utilise dry timber to prevent cracking and warping.
- Make use of whatever timber is inexpensive and available locally. Pine, cypress, and *Grevillia robusta* are commonly used, but if you have your own wood, use it.
- Get the right size for the hive body of the KTBH though some drawings show a slightly longer hive. The measurements given are those used at Baraka Agricultural College.
- Follow the measurements of the top bars exactly. It is **very important**. Top bars are made a specific measurement to ensure that bees build one comb per top bar making combs easy to inspect.
- Top bars should be the right width and fit the hive body well.
- Don't forget to wax top bars to attract bees. Use a paintbrush to apply melted beeswax onto protruding ridge at the centre of the top bar. The strip of wax guides bees to build straight combs that are easy to inspect and harvest.
- All parts of the hive should fit together properly. There should be no holes.

Photo 11: Working with bees in a KTBH
Notice one comb per top bar, which allows modern bee management by the ability to move combs without breaking them.

THE MUD/STICK HIVE

A mud/stick hive is the answer to all of you who say you have no money to start beekeeping. No excuses allowed. Beekeeping is about skills and knowledge. Even with very little money, you can start beekeeping by making your own equipment.

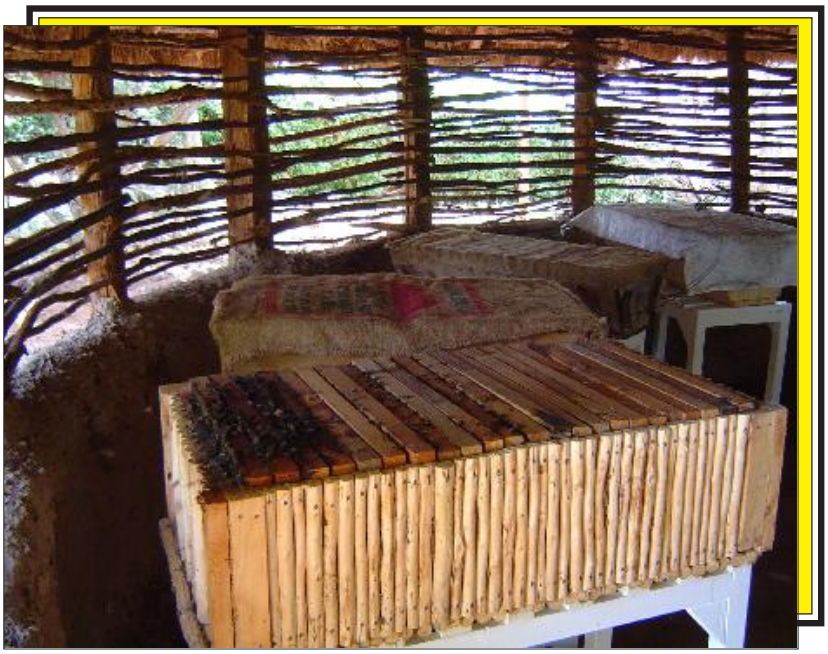

Photo 12: Mud/stick hive inside a bee house
The bee house is also made from mud and sticks.
The hive body is made from sticks with gaps between them filled with mud.

For the mud/stick hive, use the same dimensions (length, width, and height) as the body of the KTBH, but make the body square. For the body, use about 50 long and 30 short straight sticks. First, make a frame of sticks for the bottom. You can also make a timber frame and add sticks as shown in Photo 11. To this frame, tie/nail on other sticks. Use wires or nails to do this. If you bind them tightly, you can have a very strong frame. Plaster the inside of the hive with mud and cow dung and leave to dry. Top bars fit along the top of the hive just like the KTBH. Remember to make some small holes at one end of the hive as the entrance. As a roof, you can use *mabati* (tin). The mud/stick hive works best, however, under shelter, e.g., a bee house, because of potential damage from heavy rains. If inside one, just use a sack for a cover.

Photo 13: Bee house at Baraka Agricultural College
Baraka Agricultural College is in Molo.

TIPS FOR MAKING A GOOD MUD/STICK HIVE

- Shelter hive from heavy rains.
- **Important**: make top bars the same measurement as that of the KTBH, which allows transfers from one type of hive to the other.

The two hive designs mentioned are an improvement of the traditional log and basket hives because with top bars, combs are moveable, which allows management of bees. Top bar hives are not as expensive or difficult to manage as Langstroth hives making them more suitable for use by small-scale farmers.

You can also be innovative and use other materials to make the hive body. In Zambia, beekeepers use a concrete KTBH hive, which works very well. The body is made from concrete and set on a stand. Top bars are added on top of the hive and covered with sacking material. The Zambian concrete hive is placed under grass shade cover to keep out rains and the hot sun.

APIARY LOCATION

An apiary is a place where hives are kept. Keep a limit of not more than 20-25 hives per apiary depending on availability of bee forage. Bees forage in a radius of about three to five kilometres from the apiary, so if you want to keep more

than 20 hives, find another site three or more kilometres away from the existing one. Plant a good high hedge around your apiary using a shrub such as kei-apple. As you wait for the fence to grow, you can use off-cuts—waste timber from sawmill—to make a fence. The hedge separates bees from people and animals, which is important in Kenya as our bees can be aggressive. Apiary siting is very important on small farms to ensure safety and comfort living with bees.

Photo 14: Apiary fenced with off-cuts
The fence, made of waste timber, is to screen bees away from people and animals. (Nakuru)

- Choosing a good site to hang your hives is very important.
- If you choose a poor site, bees may sting people and animals.
- If the site is insecure, hives and honey may be stolen.
- If you live in a hot area, your hives will need shade as well as water.
- If you live in a cool area such as the highlands, only minimal shade is required or the bees will be cold and damp.
- Get a good balance between light and shade. A bright apiary without direct sunshine appears to be best. Bees are most active then.

An ideal site to establish an apiary would be:

- Away from humans and livestock, dwelling areas, roads, and public areas.
- Safe from strong direct sunshine, windy areas, and theft.
- Accessible to nearby water and bee plants, i.e., provide water and bee forage shrubs, trees and/or crops.

- Away from swampy areas and smelly places.
- Near a good source of nectar, e.g., forests, trees, or nectar-bearing crops.

So now you have made a hive or two. Did you follow instructions carefully? Are your top bars the right measurement? Have you chosen the site for the apiary? If you are still not sure, ask someone who knows. Remember: once bees enter hives, it will be more difficult to change things. The bees may become aggressive or the hive will be heavy with brood and honey. We now come to the procedure for putting hives in the apiary.

HIVE PLACEMENT

A. HANGING HIVES

(N. B. *Not recommended for mud/stick hive, as it is not strong enough. See below for placement.*)

Photo 15: KTBH hanging in foreground
Another one is on a stand, background left.

- Use two strong and heavy posts, each of about 2.5 to 3 metres long.
- Dig two holes about ¾ metre deep and 2 metres apart—or take two strides.
- Pack soil and stones around posts. Make sure posts are very firm. Think ahead to when the hive will be heavy with honey. If they are not firm, they will fall over later.
- **Remember**: once bees enter the hive, it will be difficult to make changes!
- Now that holes are dug and posts are in position, use wires to hang the hive between the two posts.
- **Remember**: put wire around the back of the posts as shown in Figure 7.
- **Remember**: hang the hive at waist height and keep it level to ease work and not strain your back.

Take time to do things properly and you will be happy later on!

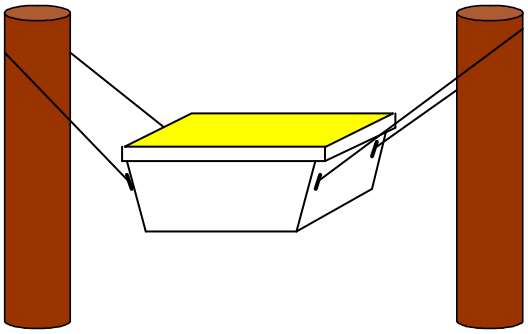

Figure 7: Hanging KTBH Posts
The posts are two metres apart and the hive about one metre from the ground.

You can also hang hives between two trees or a post and a tree. Follow the same instructions, but remember to use strong heavy nails. When hanging more than one hive, you can follow some of the patterns below:

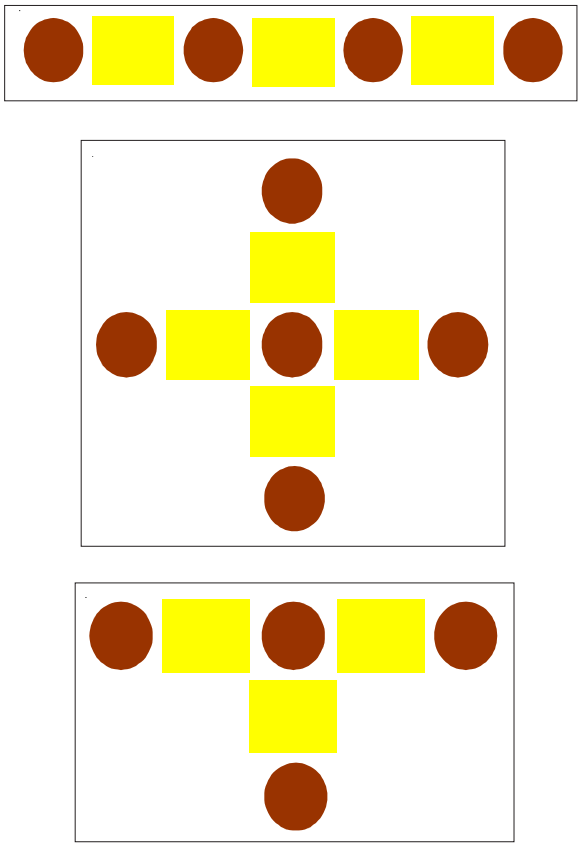

Figure 8: Hanging patterns for KTBH
Above are the line pattern (top), cross pattern (middle), and T-pattern (bottom).
(□ = hive, ○ = hanging post)

B. HIVE PLACEMENT

- If you don't want to hang hives, you can place them on stands. It is best to use this method for the mud hive, as it is not strong enough to hang.
- **Remember**: the stand should be sturdy and high enough for the hive to be at waist level.
- Put legs of the stand in cans of used engine oil to prevent pests from getting into the hive.
- Hives on stands are more prone to attack by the honey badger. (See list of pests and diseases in Part Three.)

(N. B. *Putting a number of hives under a shelter or into a bee house is also an option. Just make sure that bees have a way of getting in and out of their hives. A bee house is useful because you can lock it to prevent thieves from stealing honey or children from interfering with hives. A bee house can be a simple mud hut with holes in the walls for bees to come and go. From my experience with bee houses, get a balance between shade and light: no strong direct sunshine but also plenty of light. The balance of light and shade will depend where you are. In a cold highland area, you need less shade than in the hot lowlands.*)

Photo 16: Newly constructed bee house
Farmers in Koibatek and Ministry of Livestock staff inspect the structure.

GENERAL APIARY MANAGEMENT

- Keep apiary clean: cut grass short and trim branches that reach hives to prevent pests, e.g., ants, from crawling into hives and disturbing bees.
- Grease wires holding hives to keep off crawling pests, particularly ants.
- Do not make noise around the apiary as it can agitate bees.
- Supplement the bee's source of nectar by cultivating certain plants around the apiary, e.g., bananas, sunflower, mangoes, citrus, coffee, eucalyptus, pawpaws, passion fruits, croton, acacia, bottlebrush, *Calliandra*, etc. Trees will also give shade to bees and provide a screen between bees and nearby people and animals.
- Remove old combs from the hive to prevent wax moth damage.
- Do not spill honey near the apiary. It will attract pests and cause bees to fight with their neighbours, i.e., bees from adjacent hives.
- Inspect hives regularly to monitor bee progress and ensure no pests are attacking them. (See list of pests and diseases in Part Three.)
- When bees are making honey, inspect hives once a week by opening them up. This is important, so you ensure bees have enough space to store honey. With the KTBH hive, remove honey to make space; with the Langstroth, add an extra super. At other times, inspect hives once a month. You can also simply look at hives almost daily without opening them.
- Observing bees for a few minutes can tell you a lot. Are the bees collecting pollen? If they are, it indicates that bees are feeding the young. It also shows they are healthy and have a laying queen.
- Provide a permanent source of water for bees near the apiary. This is important as lack of water can contribute to absconding in the dry season.

Photo 17: Water for bees
Provide water slightly away from apiary and not in their flight path to avoid bees defecating in the water, which spreads disease. Place sticks for bees to stand.

BEEKEEPING EQUIPMENT AND HOW TO USE THEM

1. Hive

The hive is for housing bees. (KTBH and other types have already been mentioned.) It is the most important piece of beekeeping equipment. Without a hive, you cannot be a beekeeper!

2. Bee Suit

The bee suit consists of the following items that give protection from stings:

- Veil: for covering head and face
- Overall: for covering the rest of the body
- Gloves: for covering hands
- Gumboots: for covering feet

Photo 18: Good gloves
Good gloves are essential when working African bees.

(N. B. *Farmers are able to improvise their own bee suits and make them out of sacking material, which cost about KSH300 or US$4.17 to assemble.*)

Photo 19: Farmer in Nakuru wears an inexpensive bee suit
It is made from used sacks combined with rubber gloves.

3. Smoker

The smoker is a vital piece of equipment as smoke is used to control bees and keep them from becoming aggressive when handled. When lighting a smoker, use dried grass to light it. When burning well, put in some damp grass, so that it produces a thick cool smoke. Do not allow the smoker to spark or flame, which will burn bees. An alternative smoker fuel is dry cow dung. Be careful when extinguishing the smoker that you do not start a fire!

Photo 20: Smoker

(N. B. *A simple smoker can be made from a tin can punched with holes and with a wire handle attached. The beekeeper blows smoke onto bees with his/her breath.*)

Photo 21: Lighting the smoker
Use cool smoke from damp grass. Do not use toxic materials, e.g., rubber or plastics.

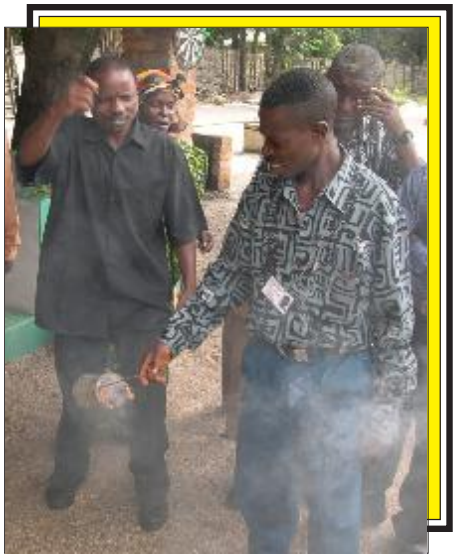

Photo 22: Lighting a tin can smoker
Beekeeping trainees in DR Congo light an alternative smoker. In beekeeping, all equipment can be improvised at low cost.

The hive, bee suit, and smoker are the most important pieces of equipment. The following items can also help:

4. Catcher Box

It is used for catching swarms and transferring bees from one place to another. It is a miniature hive.

5. Hive Tool

It is for lifting top bars. You can improvise the hive tool by using a strong knife.

6. Bee Brush

It is for brushing bees from combs when harvesting honey or at any other time you need to remove bees. You can use a feather as an alternative.

Photo 23: Bee brush (left) and hive tool (right)

A harvesting bucket is also essential as well as a knife for cutting combs when harvesting honey.

HANDLING BEES

Photo 24: Mick, my son

My eight-year-old son works African bees in Nakuru. He wears a full suit, gloves, and gumboots. If a young boy can handle bees without fear, adults should be able to do the same. When you understand bees, fear goes away!

Many people are afraid of bees because they sting. Many of us in Kenya hear of stories where bees attack and even kill people and livestock. (African bees can be very aggressive. Handle them carefully.) Like other forms of livestock, bees must be handled with respect and care. If managed properly, bees will not cause any problems.

Some bee types tend to sting less than others. A beekeeper who frequently inspects his/her hives can easily tell those bees, which are better and more docile. He/she can then eliminate more aggressive bees and breed from docile ones. (Not all African bees are aggressive. I have worked bees in Northern Somalia, which were very docile and didn't require a veil! Our bees in Molo are also generally docile.)

With frequent handling, bees appear "used" to inspection so less aggressive. A beekeeper will come to know the character of his bees. If you have many hives, number them and keep records of the bees' behaviour at each inspection. Eliminate aggressive colonies.

When handling bees: 

- Always wear a bee suit and take the time to put it on properly. Many people do not do this and get stung when hives are open. If you don't know how to put on a bee suit, get someone to help you—maybe your experienced friend.
- Avoid wearing woollen clothes as they agitate bees, which can be stuck in them.
- Avoid drinking alcohol and using strong smelling soaps or sprays all of which may aggravate bees.
- Always use a smoker when handling bees. Smoke makes bees suck honey from the combs. It calms them down and masks alarm smells the bees use for communication. Do not let the smoker go out during the operation or the bees can become aggressive. Keep plenty of smoker fuel handy as you work. It is always better to have two smokers alight in case one goes out.
- Start with the least aggressive colonies always. This allows you to work in peace with the pleasant colonies first.
- Work gently and quietly. Do not knock or bang the hive as this makes bees angry.
- Always handle bees in the evening between 5.30pm and darkness. (Be careful initially. Once you know your bees and their aggressive tendencies, you will know the best time to handle them.) If bees become aggressive during evening hours, they have a chance to cool down before the following morning. They seem to be less aggressive in the cool of evening. For bees you've never handled before or for very aggressive bees, take extra precaution in handling them at dusk. Use a torch to see them.
- When handling, avoid crushing bees or making sudden movements. Work carefully and with confidence. Remain calm even if bees become aggressive. If bees appear to be getting out of control, close up the hive and try another day. If bees get into your veil, remain calm. Walk to a safe distance before rectifying the problem.

- Work hives with two or more people at a time. One person can lift out combs while the other uses the smoker. This allows better control of bees.
- Do not stand in front of hive entrance when examining hive. Bees flying in and out may become agitated to find their way blocked. Always cut down disturbance to bees in every way you can.
- Advise any onlookers to move away quietly if stung, covering their eyes. No running about waving arms as this can annoy bees.
- Remove bee stings from skin as soon as possible using a hive tool or your nail to scrape it off. Trying to pull it out tends to squeeze in more venom. Use smoke to cover the scent of a sting. When a bee stings, the scent attracts other bees to sting you again if you do not use smoke.
- On finishing the job, close up the hives. **Do not go directly to where you are to remove your bee suit.** Take a route via bushes or tall maize, sugarcane, etc., if these are in the vicinity. Rub against leaves to rid yourself of bees, which might be following or on you.
- If you are with a fellow beekeeper, check each other and see that there are no bees on yourselves before removing bee suits.

As you gain beekeeper experience, you will be able to judge the mood of bees more accurately and handle them calmly. For the first few times, it is better to get a friend to help you. I have a short video online to demonstrate how I handle bees in Nakuru. You can view it from the following address: www.apiconsult.com/video.htm.

Warning: Some people get an allergic reaction to bee stings. The normal response in most people is localised swelling and pain. Bee sting allergy symptoms often begin with a dry cough. The eye area begins to itch and swell. As symptoms progress, the patient begins to sneeze and wheeze and develops itchy skin irritation. These symptoms are warning signs of a dangerous condition called anaphylaxis. Anaphylactic symptoms include sudden anxiety and weakness, breathing difficulty, chest tightness, very low blood pressure, loss of consciousness, and shock. Anaphylactic shock can occur within minutes and result in death. A patient in shock needs immediate medical treatment.

People who are allergic to bee stings should avoid situations in which they are likely to get stung. Anaphylactic shock is treated with an injection of epinephrine (also called adrenaline), a hormone that stimulates the heart and relaxes the airways. You may combine it with an injection of antihistamine, which counteracts the histamine produced by immune cells during an allergic reaction. Those known to have severe bee sting allergies should carry a self-injection kit, including antihistamine tablets, for emergency treatment; however, they should still seek medical care after self-medication.

For most people, a few stings may actually be beneficial. Bee venom is used to treat arthritis and can be extracted from bees commercially. Contact ICIPE Nairobi for further information on bee venom. (See address in Annex 6.)

(N. B. *The health information on bee sting allergies is intended to supplement the care provided by your doctor. It is not intended or implied to be a substitute for professional medical advice.*)

WHAT IF NO BEES ENTER THE HIVE?

It often happens that bees do not enter the hive for quite a while. The new hive you have worked so hard to build stays empty. An empty hive does not produce any honey! A survey of beehives in Kakamega and Kirinyaga revealed that hive occupation varied between 40 to 70%. A recent survey in Kitui by DANIDA (2005) showed occupation rates of between 30 to 75%. At a farmers' research meeting at Baraka Agricultural College in 2006, three different groups of farmers working separately said low hive occupation rates was their biggest threat to beekeeping.

When this occurs, check the following:

- Have you waxed your top bars?
- Is the hive clean and pest-free?
- Are there any ants or rats nesting in it? If so, clean it out and re-grease wires. Bees do not like a dirty hive.
- Is it the swarming season? Ask a friendly beekeeper in your area. Swarming occurs when bees reproduce themselves and fly out of the old hive looking for a new home. During the swarming season, it is easier for hives to be occupied quickly. In Kerugoya town in 1995, bees occupied two hives at our extension office before we even had time to hang them.
- Have you chosen a good site for hanging the hive?

What will happen if it were not the swarming season? If it was but bees still did not enter the hive, what could you do? The beekeeper can put bees into the hive. There are different ways to do this:

A. CATCH A WILD SWARM OF BEES

For this operation, it is best to seek help from an experienced friend. The swarm has a better chance of staying in its new hive during a nectar flow. Don't waste time with swarms smaller than a person's head as they are more trouble than they are worth.

1. First, prepare your hive by smearing it with some melted beeswax, so it smells nice for bees.
2. Use your smoker and bee suit. Some swarms may be hungry and difficult to manage. Always be careful with strange bees!
3. Look for a swarm of bees clustering on a branch where you can catch them. Wear your bee suit and smoke bees very gently so as not to disturb them. (Don't smoke if you can avoid it.) Shake bees into a catcher box or similar container, e.g., cardboard box. If the queen falls into the box, the rest of the bees will follow. Wait 20 minutes or so. If bees return to the original site, try again.
4. Once you have the bees, leave the box in a shady place until evening. Make sure they do not become hot in the container, so covering with a damp cloth helps.
5. When evening comes, take home the bees. Shake them into your empty hive.
6. If you have other hives, give bees a comb with some uncapped honey and a brood comb with eggs from another hive to encourage them to stay.

(N. B. *At any stage in this operation, the bees may decide they don't like being disturbed and fly away. African bees frequently abscond.*)

Photo 25: Catcher boxes for trapping passing bee swarms
This location trapped 17 swarms in 1 season alone. (Nakuru District)

B. TRANSFER BEES INTO YOUR HIVE

You can transfer bees into a top bar hive from a wild nest or from a traditional hive with fixed combs, which are not moveable. To do this, cut out combs one by one and tie them to the top bars of your hive. Get help on this one as it is not easy for the beginner.

C. MAKING A DIVISION OF AN EXISTING COLONY

You can make a division of an existing colony, explained later under the section, "The Beekeeping Year".

(N. B. *In many countries, you can purchase a starter bee colony called a nucleus or package of bees: a queen and worker bees with or without wax combs on frames. In the USA, you start most new beehives by ordering a package of live bees, usually in a three-pound size [1.3kgs]. Bee breeders supply these packages. In Kenya, we currently don't have bee breeders or suppliers of nucleus hives so the beekeeper is on his/her own at the moment in getting hives occupied.*)

CAUSES OF ABSCONDING AND ITS CONTROL

Absconding happens when bees leave the hive completely. It is very frustrating for the beekeeper that has done so much to get the hive occupied.

BELOW ARE SOME CAUSES OF ABSCONDING AND ITS PREVENTION

- Lack of food and water for bees. Leave food for bees when harvesting. If necessary, feed them with sugar syrup. Provide a source of water in the apiary.
- Frequent attacks by pests. Check hives frequently. Grease hanging wires to control ants.
- Unfavourable weather conditions, e.g., cold and rain. Make sure the bees have enough food.
- Careless handling by beekeeper, e.g., breaking combs, over-smoking, etc. Be more careful in handling them.
- Genetic character of bees. Some bees are prone to absconding, so don't breed those with this trait.
- Excessive heat on the hive—no shade in very hot sun. Put hives in a well-shaded place when in hot areas.
- Extreme cold and damp. Don't put hives under dense trees in high altitude areas. Give them a sunny place with minimal shade.

Part Three
THE BEEKEEPING YEAR

CONDITIONS FOR MAXIMUM HONEY PRODUCTION

We have seen how to get started in beekeeping: how to make the hive, choose the apiary site, hang the hive, and get bees. Now let's look at the bigger picture: how bees change throughout the year. You will get to know about the bee colony cycle. It is important for the beekeeper to understand this, so he/she can manipulate the bee colony to produce larger amounts of honey.

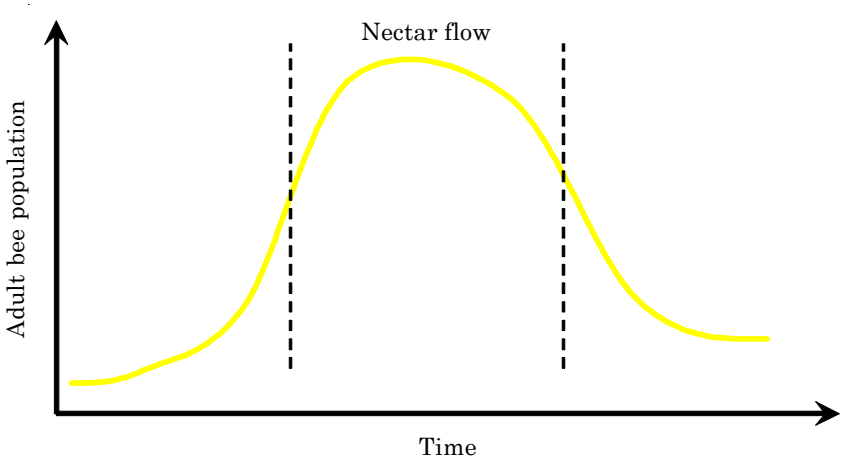

Figure 9: Conditions Required for Maximum Honey Yields

The chart shows that, if peak colony strength occurs at the time of nectar flow, a good honey crop results, providing nectar flow is good and weather conditions are right.

Your chief aim as a beekeeper is to get peak colony strength at the right time, i.e., during main nectar flow. Imagine this: peak strength of the colony comes when flowers are finished, which means bees will sit in the hive with little work to do. Manipulating the colony to be at peak strength at the right time is fundamental to good beekeeping. Good flying conditions, i.e., dry weather, for bees are also important during nectar flow to get maximum yields. This factor is, however, beyond your control as beekeeper.

Figure 9 also shows that colony size changes over time. When food is plentiful, there are more bees because workers feed the queen bee more food and she lays more eggs. When food is scarce, workers feed the queen less and the number of bees in the colony shrinks.

The bees' behaviour is very sensitive to their environment. When there is plenty of food, bees make more honey for eating when there is less food. The beekeeper shares in this stock of food. When harvesting, always remember to leave some for the bees. Don't be too greedy!

EXAMPLE ONE: KIRINYAGA

As with most parts of Kenya, Kirinyaga District has huge variation in climate. It stretches from the snow-capped peaks of Mt Kenya to the semi-arid Mwea Division. In between, there are tundra, bamboo, montane forest, tea, and coffee zones. Conditions for bees vary widely in all these areas. Things as climate and vegetation can change totally over a few kilometres. As with the changing environment, yield potentials and harvesting seasons for bees differ broadly. It is, therefore, very important for a beekeeper to be knowledgeable of the environment where he keeps bees because circumstances change dramatically over short distances.

In Kirinyaga, there are two harvesting seasons: March/April and September/ October. The yield of honey obtained in Kerugoya averaged 7.5kgs/hive per harvest or 15kgs/hive per year. The main nectar-bearing trees in the area are coffee (*Coffea spp*), bananas (*Musa spp*), *Grevillia robusta*, avocados (*Persea americana*), macadamia (*Macadamia tetraphylla*), mangoes (*Mangifera indica*), croton, pawpaw (*Carica papaya*), and beans (*Phaseolus vulgaris*). Flowering maize is an important source of pollen.

Hive occupation can vary depending on the time of year. Swarming season was observed to be in July. Bee swarms have been noted to migrate from Mwea Division to areas of higher altitude and vice versa, based on the annual period.

Mwea Division

Mr. Kariuki is new to Mwea Division and has bought three acres of land. He has never owned a beehive. At one of the beekeeping field days, Mr. Kariuki observed that most apiaries were sited under trees. He said he had no trees on his new farm but asked which tree species he should plant to act as bee forage. He was given the following advice:

Grevillia robusta: *mukima* (*Gikuyu*), silky oak (English). This is the most abundant tree in the district. It grows very fast and produces a lot of nectar. It flowers from March to April thus ensuring honey flow in May and June.

Photo 26: A tree in flower

It is also a source of fodder and timber as well as coffee shade, mulch and green manure. Wildings and seedlings propagate the tree.

Acacia mellifera: *muthigira* (*Gikuyu*), hook thorn (English). It is a low shrub propagated by direct sowing, seedlings, coppicing, and wilding. It flowers before the rains. The flowers produce quality honey. Other uses are as fodder (pods, twigs, leaves, and flowers), live fence, and fuel wood.

Others of the same genus are *A. lahai* (*Mugaa*), *A. seyal* (*Mugaa*), *A. abyssinica* (*Mugaa*), *A. brevispica* a.k.a. wait-a-bit-thorn (*Mwikunya*), and *A. Gerardo* (*Muthi*).

Eucalyptus saligna: *muringamu*, Sydney blue gum. The tree grows at an altitude of 1200 to 2400m except in arid areas and those infested with termites. Seedlings and direct sowing propagate it. It flowers in June and July. You should not plant the tree near crops but in a woodlot.

Other useful trees and shrubs are: 

- *Croton megalocarpus* (*mukinduri*): flowers in March to April, useful for boundary marking, timber, and shade.
- *Azadirachta indica* (*mwarubaini*): flowers in March to April with seeds in June; useful as medicine, insecticide, shade, fertiliser, and de-wormer.
- *Calliandra calothyrsus* (*calliandra*): used for shade, windbreaks, and fodder. The shrub flowers in February to March.
- *Callistemon citrinus* (bottlebrush): very fast growing; both useful and ornamental.
- *Cajanus cajan* (njugu): drought-resistant food crop with other uses as nitrogen fixation agent and fodder (leaves and pods).
- *Kigelia africana* (*muratina* or sausage tree): flowers in January to February. The unripe fruit is poisonous. It does well in arid areas. The Kikuyu do not plant it near homesteads as they used it to mark gravesites. It is a slow-growing tree, a non-prolific seeder with poor germination rate.

Cultivated bee-forage trees include:

- Papaw (*Carica papaya*)
- Bananas (*Musa sp*)
- Beans (*Phaseolus sp*)
- *Muembe* (*Mangifera indica*)
- *Mubera* (*Psidium guajava*)
- *Mukandamia* (*Macadamia tetraphylla*)

EXAMPLE TWO: KAKAMEGA

The following is a brief description of beekeeping practices, potential yields, flowering trees, and seasonality of honey production around Kakamega.

There are three different types of hives used in the area, namely:

- Traditional log hives
- Kenya top bar hives (KTBH)
- Basket hives

Log hives are made from trees species such as *munga*, *likoro*, *munuku*, and *mukomari* (Luhya terms).

KTBH are reputed to be very productive if managed well, but they may get too hot in the dry season and too cold in the wet season, so you need to insulate them. Using grass for heat retention in the wet season works well.

Basket hives are least favoured by beekeepers.

Factors	Basket	KTBH	Log
Quantity Harvested	3	2	1
Ease of Harvest	3	1	2
Heat Properties	2	3	1
Least Expensive	1	3	2
Rain Resistance	3	1	2
Durability	3	2	1
Total Score	**15**	**12**	**9**

Table 2: Beekeepers' Preferences for Different Hive Types
(The ranking was as follows: 1 = best, 2 = second best, 3 = last.)

(N. B. *Table 2 shows a good lesson for those of us who promote improved hive designs. The log hive comes out the best with the KTBH second and the basket hive last. If the KTBH is not managed to maximise its advantages [e.g., moveable combs], it can be outperformed by the log hive. Advantages of the KTBH are many, e.g., ability to manipulate bees for increased honey production and ease of harvesting that allows collection of comb honey, which obtains a significantly higher price in the market. But if you don't manage a KTBH or Langstroth and it produces crude honey, it is actually worse than a log hive because of its higher purchase cost.*)

The swarming season in Kakamega is reported to be in November.

Hives are normally harvested only once a year. Bees produce honey from November to April, but production is highest between December and March. (See Figure 10.) You can get 30 to 40kg/hive of crude honey harvesting in February/March. Harvesting can take place more than once during this period. As the weather becomes cooler when rains start in March/April, bees become net consumers of honey. If you don't harvest before the rains, yields will go down.

Honey production is reliant on the flowering of forest trees and other plants, including *Leucaena leucocephala*, bananas, *isungusa* (Luhya), *isirimoi* (Luhya), and *iludolio* (Luhya). The flowering of *Croton megalocarpus* (*musine*, Luhya) is an indicator of when to harvest.

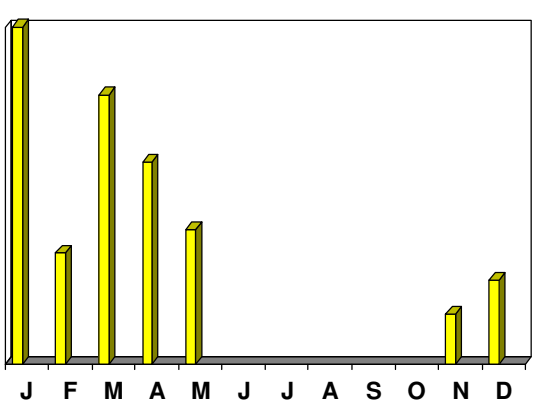

Figure 10: Seasonality of Honey Production in Kakamega

(Reference for Kakamega section: *Beekeeping in Kakamega Core Target Area*, ABLH Report No.15 of 1996.)

EXAMPLE THREE: MOLO

Molo is an example of beekeeping in a highland area where potential is lower than other areas due to high altitude. With good management of bees combined with good weather conditions, however, yields of up to 20kg/hive are achievable—very good yield for this area. In poor seasons and under poor management, 3kg/hive yields have been obtained.

Beekeeping in the area has lagged behind for many years. The following are major problems:

- There are few flowering plants and shrubs to produce nectar.
- Vast acreages have been turned into large-scale farming, thus reducing natural flowering vegetation.
- There is lack of knowledge on the management of beehives.
- Cold climate in the area makes bees abscond the hives.
- Farmers are reluctant to get into beekeeping probably because of the above factors.

Plant Name	Flowering Time
Dombeya goetzentii	September/October
Bottle brush (*Callistemon citrinus*)	June/July/August
Sagebrush	August/September/October
Dahlia	February to April
Maize	August to September (pollen only)
Eucalyptus saligna	February to April
Vernonia	July/August/September
Pawpaw	August/September
Wild rape	July/August
Croton megalocarpus	March/April
Fuchsia (ladies' eardrop)	year-round except April/May and June
Daisy	February/March and August/September

Table 3: Plants Suitable for Bees in Molo

Please note that the above table is only a guide. Depending on the season, plants may flower late or not at all. The honey harvest season in Molo is towards end of September/October from the *dombeya* tree, which flowers around this time. Beekeeping at Baraka Agricultural College in Molo has improved since I came in 1994. We planted extensively a fuchsia hedge known as ladies' eardrop around the college grounds. Over the years, the problem of absconding bees has dropped as bees now have forage all year round. Honey yields from Baraka hives have also increased. This proves that planting bee forage has a very positive impact on beekeeping. In particular, if communities can come together and plant collectively, the impact can be much greater.

EXAMPLE 4: TRANSMARA

This is a good beekeeping area. There are many trees and shrubs, which have not been cultivated, that grow in the district. Natural vegetation remains relatively undisturbed. Farmers are organised into groups and they own most of the hives, not individuals. An umbrella body called Transmara Association of Beekeepers coordinates them.

Beekeepers usually harvest three times a year: March, July, and November. From each harvest, about 10kgs/hive of honey is expected. The main honey flow is in November. Apart from these times, you may also harvest honey in other months.

Plant Name	Flowering Time
Oskett	May to September
Ogilai	May to September
Olmolongina	May to September
Oltorioi	June to August
Orkikeorgos	June to August
Olkinyei	November to February
Okilenyai	November to February
Olkel	November to February
Olchartuyian	June to August/November to February
Olmesuli	June to August/November to February
Olea africana (wild olive)	June to August/November to February
Thurnbegia atela	June to August/November to February
Scutia myrtina	June to August/November to February
Cardia moncica	June to August/November to February
Acacia seiberiana	June to August/November to February

Table 4: Plants Suitable for Bees in Transmara
Maasai names may not be spelled correctly.

Thanks to Baraka Agricultural College for the Molo and Transmara sections.

EXAMPLE 5: NANDI HILLS

Some of the major flowering/honey-producing trees and plants in Nandi Hills are:

- Avocado: March/April
- *Dombeya*: April, September to December
- *Grevillia robusta*
- Banana: all year round
- Pawpaw: all year round
- Beans: April/May and September/October
- Weeds: always
- Coffee
- Sydney blue gum
- *Tebesuet* (Nandi)
- *Croton macrostachyus*: November to February

Honey Harvesting

April to June is the best season. It is also possible to harvest honey from October to February.

A Sample Harvest Season
(*J. Muemah*, beekeeper)

"In April, I harvested 33kgs of crude honey from one hive. After two months, in June, I harvested a further 15kgs of crude honey from the same hive, which gave a total of 48kgs of crude honey. After refining the honeycombs, I got 24kgs refined honey and 1.5kgs of beeswax. From the 24kgs of honey, I filled 48 500g jars for sale. I sold each of the 48 jars at KSH120, which gave me revenue of KSH5,760 (US$80) from just one hive. This yield per hive is, however, not always obtained.

"Another time, I harvested 16 colonies and only got 67kgs of crude honey. Eight of the colonies were strong and eight were weak. This is why it is very important to manage bees properly. With proper knowledge and management of all colonies, it is possible to have them give maximum yield".

(N. B. *The above example is an interesting one. Eight colonies in the apiary were strong and eight were weak. This situation is common. In many apiaries, only a few colonies out of many give significant yields. Beekeepers should aim to ensure that all colonies are strong and producing honey if the enterprise is to maximise profits. Get rid of weak and unproductive colonies and divide productive colonies to replace them. Combine this selection of the best bees with good bee management.*)

For more information on beekeeping in Nakuru District, see www.apiconsult.com, our website where you can find regular updates on what is happening in my apiary through past editions of the Apiconsult e-newsletter. Click on the news and articles section.

BEEKEEPING MANAGEMENT DURING THE YEAR

From the above examples, we realise that conditions for bees vary widely throughout the country. You can also see that management of bees depends on where you find them. It is very important that the beekeeper gets to know the area in which he/she lives. What plants and trees do bees use? When do they flower? When are the swarming seasons? Which trees/plants give the best honey and which give bitter honey? When are the correct times of year to expect honey? Which are signs of harvesting? What factors such as rainfall and temperature affect plant flowering and nectar secretion?

Collect and write down information. It is very important in helping you become a good beekeeper. Be observant always of your bees and the environment in which you live. Such knowledge will allow you to make timely and sound decisions on bee management. In essence, all beekeepers in Kenya must become their own researchers! Research (systematic investigation to establish facts) should not only be seen as the preserve of academics but also that of ordinary people,

including beekeepers. See Annex 5 for more information on Participatory Action Research.

Most beekeepers in Kenya do not manage their bees at all. Every time a beekeeper is seen to go near a hive with a bee suit, he/she is said to be going for harvest. "*Unakwenda kuvuna?*" (Are you going to harvest?)

In this book are highlighted simple and achievable management practices. If you have invested money in more expensive equipment, e.g., Langstroth, then you also need to manage bees better to get good returns on your investment.

Traditional hives with a fixed comb make management very difficult. A top bar hive makes management far easier as does the frame hive Langstroth. Seek further advice on management of bees and read as much as you can on the subject. Outlined below are some simple practices that you can carry out to help you improve your honey yield.

SWARM PREVENTION AND CONTROL

Swarming is what happens when bees divide themselves to reproduce. If swarming occurs when bees are building up in numbers or during nectar flow (when there is an abundance of flowers around), the beekeeper will not get much honey because the bee population in the hive will have reduced dramatically when they are required to collect nectar to make honey. (Look again at Figure 9). The beekeeper should try, therefore, to keep his/her bees from swarming. It is impossible to prevent all swarming, but with proper management of bees, it can be minimised and controlled.

You can take some simple steps to help stop swarming:

If possible examine the bees every 7 to 10 days during the honey period, when flowering season is about to start, until after harvest. Make sure that the queen has enough room to lay eggs by making extra space around the brood nest. If the queen runs out of cells to lay eggs in, the bees will want to swarm. Make extra space by exchanging empty combs with those filled with honey around the brood nest. This is important as African bees build up quickly and can easily become crowded in the hive and want to swarm. Give the queen plenty of space to lay eggs and space for bees to store honey.

If the bees are building queen cells (long thumb-shaped cells protruding from the edge of combs) to make a new queen then you know they are going to swarm. To prevent swarming you can do one of the following:

- Destroy all queen cells in the colony wanting to swarm and switch hive locations with a weaker colony. Foraging bees of the strong colony will return to the original site of the hive and strengthen the weaker colony. As the weaker colony becomes stronger, the strong colony becomes weaker. This may control the swarming urge of the strong colony.

- Destroy all queen cells and give brood combs without bees to the weak colony. This may get rid of the swarming urge in the strong colony.
- Artificially swarm the bees. (See "Making a Division" below.)

MAKING A DIVISION 

Break down all queen cells except one.

Transfer comb with the queen cell, one other comb of brood, and two combs of food (honey and pollen) into a catcher box/new hive. Include bees on all combs. Shake in bees from other combs as well. Remember to put brood combs in the middle and honeycombs on either side to insulate the brood nest.

If possible move the catcher box/new hive to a new site at least two kilometres from the old site. (It is not always practical to move the new colony two kilometres away. The division can still work if you move it a short distance, but you can expect adult foragers to return to the old site and weaken the new colony. Give extra bees to compensate for those that will return to the old site.) These bees will become a new colony. The rest of the bees will continue working and a new queen will hatch out in the new colony.

Most of the adult bees will remain in the old hive and continue making honey; however, avoid making divisions during honey season because it reduces honey production. Make divisions after honey flow to increase colony numbers. You can make a division without queen cells as long as the new colony has eggs in the combs transferred. They will be able then to make a queen cell and raise a new queen. Bees can make a queen from worker eggs or worker larvae less than three days old (i.e., very small larvae).

FEEDING

Feeding bees is not recommended in Kenya unless you are sure as to why you are feeding them and the benefits you are likely to get. You waste money to buy sugar for feeding bees when you need it for yourself and your family. People often feed when it is unnecessary and they get no return for their money. Bees can also abscond and your money is wasted.

If want to feed bees, however, the best time to do so is:

- Before nectar flow (stimulatory feeding) when the queen bee will lay eggs and the colony will build up in numbers before honey flow. Start six to eight weeks before the date of flowering because it takes about 40 days from egg to adult foraging bee.
- In times of food shortage, e.g., drought or an excessively wet and cold period.

Feeding at such times may prevent bee migration and keep bees alive.

To feed bees, dissolve white sugar in water by heating gently in a *sufuria* or pot, stirring all the time.

To stimulate bees: use 1:1 solution by volume of sugar and water.
To feed bees to store: use 2:1 solution by volume of sugar and water.

Place the sugar syrup in a feeder box in the hive when it cools. Place some twigs/ grass on the surface of the floating syrup to prevent bees from drowning.

Warning: Never spill sugar syrup or honey around the apiary as it can start robbing: bees attacking each other to raid stores of honey. Weak colonies are prone to robbing by strong ones.

PESTS AND DISEASES AND THEIR CONTROL

For the most part, beekeepers in Kenya need only worry about the following major pests:

- Wax moths
- Safari and other ants
- Honey badgers
- Human beings

(N. B. *Other pests such as birds and wasps can be problematic in some areas of Kenya.*)

Wax Moth

- Destroys wax comb and damages hive parts.
- Control by having a strong colony.
- Remove old combs that bees are unable to cover in time of food scarcity when colony size shrinks.
- Avoid holes and cracks in top bars and hive body where wax moths can lay eggs.

The wax moth is a very difficult and destructive pest to control particularly with frame hives when supers have to be stored after honey extraction.

Photo 27: Hive infested with wax moths
Wax moths infested this hive after bees absconded during the dry season.

Safari and Other Ants

- Hang hives and grease hanging wires regularly.
- Spread ashes around posts holding hives.
- Keep grass short and branches from touching hives.
- Make hive parts fit together without gaps.
- If hives are on stands, place legs of stands in tins of old engine oil.

Termites

- Treat posts used for hanging.

Hive Beetles

- Use holes instead of slits for the entrance.
- Keep strong colonies.
- Hand pick or destroy them if found in hive. African hive beetles, particularly the small hive beetle (*Aethina tumida*), are not serious pests in Kenya but are now causing problems for beekeepers in the USA, Europe, and other parts of the world where they have been introduced accidentally.

Birds (Honey Guides)

- Don't leave brood combs exposed. Scare birds away.

Honey Badger

- Hang hives securely to prevent the badger from knocking them down. Hives placed on stands are prone to attack by the honey badger.
- In Transmara, log hives are suspended two metres from the ground by means of a twisted bark rope to prevent damage from the honey badger.
- In Kitui, beekeepers put *mabati* around tree trunks bearing hives to prevent the badger from climbing them.

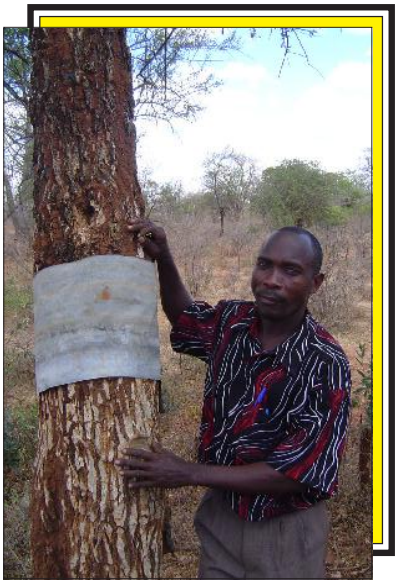

Photo 28: Tree encircled by *mabati*

The *mabati* is to prevent honey badgers from climbing and attacking bee colonies. When the badger encounters the tin, he cannot grip and falls down!

Pirate Wasp

- Attacks and eats bees.
- Place a dish of water below hive entrance, which has a mirror in the bottom. Wasps fly in and drown.

Bee Louse 

- Negligible damage.

Man

In parts of Kenya, people cause a lot of damage to hives. They often steal hives and honey, making it difficult to keep hives in areas where security is poor. Children often antagonise bees by throwing stones at beehives, which often results in bees stinging people and livestock. Always keep your hives where you can supervise them. The problem is worse with modern hives kept close to the ground.

Note on Varroa Mites (*Varroa destructor*)

Varroa is a parasitic mite, which causes bee colonies to die out. This pest causes havoc to bee populations in many parts of the world, including Africa. Varroa mites are now in many southern African countries and may spread to Kenya in the future. Kenya currently is varroa-free and we should try to keep it that way. Bee importations into Kenya are prohibited and should never happen to prevent the accidental introduction of this destructive mite or other bee pests and diseases into our country.

MAJOR NECTAR-BEARING PLANTS IN KENYA

I have written about many trees, shrubs, and crops useful for bees in Kenya elsewhere in this guide, but below is a consolidation of the major ones. Planting multipurpose bee forage trees is a good idea for farmers as you can benefit from bee forage plants in other ways such as fencing posts and firewood. Suitability of tree species for planting varies widely in Kenya due to variation in climate. To find out which are the best species to plant, seek advice from your local Beekeeping Officer or Forest Officer.

Major nectar-bearing plants in Kenya: acacia spp, banana, citrus, dombeya, eucalyptus (gum), croton spp, jacaranda, kei-apple (*Albera caffra*), sunflower, vetch, rape, and coffee.

It helps if you have what people call a flowering calendar for the area. Make one by noting the major nectar-bearing trees in your area and the times they flower. Record this information carefully. It is then easy to predict the flowering of trees and the dates. (They may vary from year to year.)

Photo 29: Citrus fruit in bloom

Photo 30: Banana in flower
It is a good source of nectar in banana-growing areas.

Photo 31: Acacia *senegal* in bloom
Acacia species are very important nectar sources in arid areas of the country.

Photo 32: Acacia *persiciflora* in flower
This is in Nakuru.

Photo 33: Kei-apple
It makes a great fence and is a good forage plant for bees.

Photo 34: *Cordia africana.*
It is very attractive to bees.

Part Four
THE HONEY HARVEST

TIME OF HARVESTING

Harvest honey during dry spells, i.e., January, February, March, July, August, September, November, and December. The harvest time in each area differs, so check the right time in your area. In areas where there are dominant bee plants like coffee, sunflower, etc., you should harvest after the flowers wither.

Regular inspection of hives during nectar flow will ensure that the beekeeper harvests as soon as honey is ready. Do not harvest unripe honey. (See below.)

Ideal harvesting time of the day is from 5.30pm to 7.30pm.

HARVESTING PROCEDURE

- Ensure you are sting-proof by putting on protective clothing.
- You will need a smoker in good working condition and a plastic bucket with lid—must be clean and dry—for storing honey.
- Smoke the entrance of the hive with about eight to 10 puffs and then gently lift the lid and smoke again. Leave hive for a minute or two before opening lid to allow smoke to affect bees. Smoke causes bees to engorge themselves with honey making it difficult for them to bend and sting. (They become too full!)
- Very gently tap top bars with a hive tool. A hollow sound will indicate where there is no comb.
- Remove top bar from the hive that has no comb attached, so you can examine the rest of bars in the hive. Honeycombs are usually at the end of the hive opposite the entrance. Select combs that are ¾ or more sealed or capped full of honey. (These combs are said to be ripe or have a low moisture content, <19%, which ensures that honey will not ferment later when bottled. Leave combs with brood and pollen for future production of honey.)

Photo 35: Harvesting white combs
Harvest white combs that are at least ¾ capped, as shown above, for the best honey.

When harvesting a comb:

- Brush bees gently from the comb using a bee brush. You can cut the harvested comb from the top bar to fall into the bucket.
- Replace lid of bucket to prevent bees from entering with the honey.
- Return top bar, minus comb, to the hive.
- As an alternative, place the whole comb and top bar (after brushing bees off) in another empty hive or catcher box where you can take it away later for comb honey. Fix spare top bar in place of the one removed.

Gentle smoking is a continuous process during harvest time to control bees. It is important to avoid smoking the honey directly or excessively because it can damage honey flavour. After harvesting, replace the first bar and cover hive with the lid. Make a final smoke before you leave to keep bees away from the harvester and to prevent them from following him/her all the way home. Remember to move through a bushy area first to get rid of bees.

Photo 36: Harvesting traditional log hive in Tabora, Tanzania
The hive is lowered to the ground for harvest and the two halves of the log separated.

(N. B. *Two people are better than one when harvesting or carrying out any bee operations. Two smokers in operation are also better than one to ensure a continuous supply of smoke for subduing bees. Sufficient smoke is very important when working aggressive bees.*)

Photo 37: Harvested honey
Honey harvested from the log hive is placed in clean bucket to ensure its high quality.

HONEY REFINING

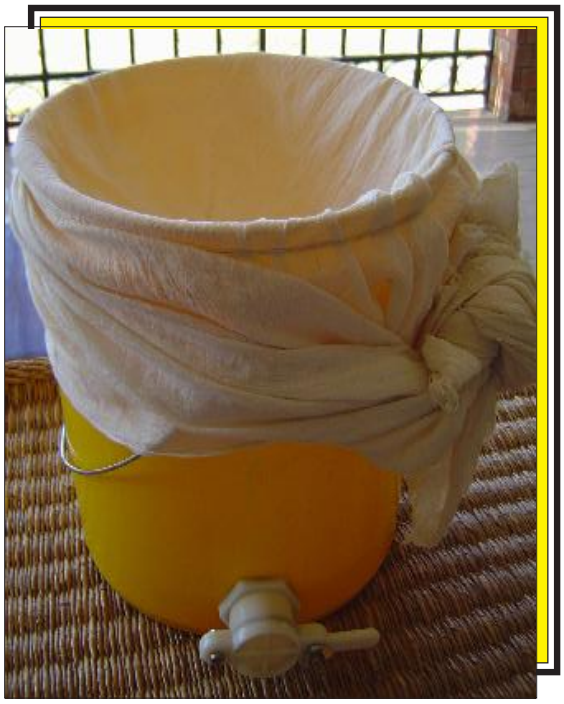

Photo 38: Simple honey refining method for small-scale beekeeper

STEPS

1. Remove wax capping from combs using a knife to cut off the capping.
2. Break combs into smaller particles and sieve them through a net or nylon fabric into a plastic container (See Photo 36.) The sieving process can take a few days. Cover sieved honey with a lid and keep in a dry room away from bees.
3. You can place the bucket in sunshine for two or three hours to heat honey gently so it flows freely.

A word of warning: **NEVER** boil honey as this destroys its flavour and medicinal characteristics!

Once honey has drained through the cloth and settled at the bottom of the bucket (usually after 2 days or so), use a jug to pour it into honey jars for sale. For wax remaining behind on the straining cloth, squeeze out any remaining honey and process leftover wax. (See below.)

Photo 39: Centrifuge
Centrifuge that handles honey from the KTBH (in wire baskets) as well as frames from the Langstroth hive.

Photo 40: Uncapping frame full of honey
It is done with an uncapping knife in preparation for extraction with a centrifugal extractor.

EXTRACTION OF BEESWAX

Beeswax is a product of the beehive. (For every 100kgs of honeycomb, you can get about eight to 10kgs of beeswax.) Honeybees secrete beeswax in the form of thin scales. 12- to 17-day-old worker bees produce them through glands on their ventral (stomach) surface. Honeybees use beeswax to build honeycomb cells in which they raise their young and store honey and pollen.

To produce wax, bees must consume about eight times as much honey by mass. Estimates are that bees fly 150,000 miles to yield one pound of beeswax or 530,000 km/kg.

PROCEDURE TO EXTRACT WAX FROM COMBS

1. Mix combs and water in a *sufuria* (aluminium pot) and heat. Wax melts at about 62 to 64° Celsius, so there is no need to boil. Boiling damages the wax and can be dangerous. Overheated wax can burst into flames. Do not use iron, brass, zinc, or copper containers for heating wax as it can discolour the finished product.
2. Pour melted combs and water into an extraction bag. You can use cotton for sieving. (You can also use the small bags maize seeds come in after you clean thoroughly.)
3. Smear sides of a second *sufuria* with soapy water to prevent wax from sticking to its sides.
4. Filter wax into the second *sufuria*. Use two sticks (such as two top bars) to squeeze the bag containing melted combs to extract wax. The yellow wax will come out along with water; waste will remain in the filter bag. If the combs contained bee brood, you can feed these to poultry as they would be cooked by then.
5. After filtering, wax separates from water and floats to the top.
6. Remove wax after leaving it to cool in the *sufuria*, with lid on to keep away dust, for 12 hours.
7. Scrape dirt from the bottom of wax cake when cooled.
8. Store wax blocks in a cool dry place. Never store near pesticides/chemicals as it may absorb them.

Your wax block is now ready for sale or for further use. Wax currently sells in Kenya at a price of about KSH100 to 150 per kilogramme or more depending on the demand.

Photo 41: Solar wax melter used to extract beeswax
It is most efficient for use with new combs/cappings instead of brood comb.

Part Five
THE MARKET FOR BEE PRODUCTS

Photo 42: A sampling of honey products.
Most people enjoy honey!

HONEY

There is currently a very high demand for honey both in Kenya and overseas. Kenya is now licensed to export honey to the European Union. Market opportunity exists for beekeepers but lack of production is at present the main constraint in Kenyan beekeeping. Good quality honey can fetch a high price. Any farmer who has the good fortune and skill to obtain honey should have no trouble selling it. In general, if you present honey to the consumer in a clean, unspoiled condition, the price will be higher. Beekeepers should aim for the highest grade of honey to maximise returns from beekeeping. Honey in Kenya is sold in the following grades:

CRUDE HONEY

This is a mixture of ripe and unripe honey. At harvesting time, the wax, honeycomb, and bee-and-brood comb are all mixed into one container. This container is often an old tin. Crude honey is used mainly for brewing local beer because quality requirements are not very strict. The demand for this type of honey is high.

SEMI-REFINED HONEY

Semi-refined honey is generally the liquid honey that remains when you skim wax off the top of crude honey. Honey sinks to the bottom as it is heavier. Semi-refined honey still contains particles of wax and other debris such as bees' legs. It can be stored for the beekeeper's own use or it can be refined further and packed for sale. It gains a higher price than crude honey.

REFINED HONEY

Refined honey is clean. You strain it to remove all particles of beeswax and other materials. Remember: refined honey is unchanged, it is only strained. Nothing else is added so it is still the pure honey that bees made in the hive.

CHUNK HONEY

Whole combs of capped honey can be harvested carefully from the beehive. You can cut up pieces of the comb and put them into jars of liquid honey. This gives the consumer a feeling that the honey is real and not adulterated with sugar. Chunk honey can fetch a higher price than refined honey.

COMB HONEY

Honeycombs of capped honey that have a nice white capping can be cut up, placed on small trays, and covered with cling film. These are very marketable in Kenya and command a very high price in the market, particularly in affluent Nairobi suburbs and other towns. This product should be the ultimate aim of all beekeepers with access to these markets. This product is priced per gram.

PACKAGING AND LABELLING

Package honey in either plastic or glass jars, which should be clean and dry. 454g jars are available in Kenya from Nairobi suppliers as are plastic trays for selling comb honey. (See Annex 6 for contacts of suppliers.)

Labelling of honey must include:

- net weight of honey,
- name and address of producer,
- country of origin (Kenya), and
- description of contents, e.g., "pure honey"

Initially you can make a simple label by hand or on a computer, which you can then photocopy. You can have a more attractive label printed later, but this is costly and requires many jars to spread the cost.

Some people use Kasuku/Kimbo plastic containers or tree top bottles (700ml) to sell honey. Metal paint tins (*mikebe ya rangi*) are not good. Honey is acidic and can eat the metal and spoil the honey.

WHERE TO SELL HONEY

You can sell your bottled and labelled honey directly to shops. Build up a name for supplying the right quality, in the right quantity, at the right price, on time. Many beekeepers develop a reputation for beekeeping and people flock to their homes to buy honey directly. If you are enterprising, you can even set up a shop of your own selling bee products. You could also buy and sell honey from other beekeepers.

A shop or kiosk located in the right place such as the market or along a busy route can attract many customers.

You can also consider the option of forming a beekeeping association to market products of farmers in your area. Examples are the Kakamega Forest Beekeepers Association and the Transmara Association of Beekeepers. You can also consider the option of starting a cooperative. An example of a successful beekeeping cooperative is Ruai Beekeeping Cooperative Society in Naru Moru, which markets eight tonnes of honey per annum collectively. (See Annex 6.)

The advantage of farmers marketing together is fixed costs, e.g., transport, can be spread over a larger quantity of honey reducing cost. Collective selling gives farmers access to higher priced markets such as Nairobi.

Whatever type of honey you produce, you can easily find a market for it in Kenya and the price you receive will compare favourably with that available elsewhere in the world.

BEESWAX

Most people in Kenya throw away wax combs upon harvesting or after honey extraction. Beekeepers do not know its value. Local villages use beeswax in very limited ways, e.g., for shoe repairs by cobblers. Some companies such as Bata (shoe company) and Kiwi (shoe polish company) purchase beeswax, which they often obtain from *miti ni dawa* (honey beer) brewers. You leave the wax after brewing beer from crude honey, which contains honeycombs.

Baraka Agricultural College buys clean beeswax cakes from other buyers. (See Annex 6 for college contacts.) You can also use your beeswax to make some of the recipes in Annex 4.

PROPOLIS 

Export markets for propolis exist. People use it as medicine, selling it as capsule, ointment, or tincture (dissolved). You can chew propolis raw as medicine for the throat. It is on sale in this form in very limited quantities in Nairobi. When harvesting, simply scrape off propolis and store in an airtight container. You can also try making medicine from propolis, e.g., propolis ointment. Try the recipe in Annex 4.

Part Six
STARTING A BEEKEEPING ENTERPRISE: COSTS & PROFITS

I have based these figures on 20 KTBH hives per farmer. On the other hand, I have calculated equipment costs from the Baraka Agricultural College Workshop bee equipment price list. All figures are valid for 2007.

The farmer can add significant value if he/she sells honey in jars or bottles. This is realistic in many parts of Kenya where there is a very strong local demand for honey with high prices. In other parts of Kenya where local production is high, bulk sale of semi-refined honey at a lower price to middlemen is the norm. In remote areas of the country, honey prices tend to be low but hive numbers are much higher, particularly in semi-arid areas where individuals can own hundreds of traditional fixed comb hives. An average production figure of 20kgs per occupied hive is achievable for most farmers; however, this can increase to 30kgs or more depending on the area and the management of bees, especially if you control swarming and maximise honey production. An occupation rate of 80% means 16 hives out of 20 are in production, which is a good occupation rate by Kenyan standards. That said, there is no reason why the farmer cannot achieve 100% occupation rates with some effort.

In this example, we take an average farmer with 20 KTBH hives, with an 80% occupation rate, producing an average of 20kgs per occupied hive. The farmer harvests and sells honey in bulk at a price of KSH100/kg with no value addition. This example is not the best or worst but an average situation.

Expenditure	Cost (KSH)
20 Kenya top bar hives @ 2,000/hive	40,000
Bee suit @ 3,270	3,270
Smoker @ 800	800
25 Hanging posts @ 150/post	3,750
Grease and miscellaneous items	500
Total	**48,320**

Table 5: Costs of Starting a Beekeeping Business

Estimated honey production from one colony = 20kgs
Total honey production from 16 occupied hives = 320kgs
Estimated price of 1kg honey in 2007 = KSH100/kg
Estimated income from 16 occupied hives = KSH32,000
Net income year one = KSH32,000 – 48,320 = (16,320)

A negative of KSH16,320.

Equipment will have a lifespan of up to ten years or more depending on how one cares for them, so in subsequent years, capital costs will be paid off and net income will be much higher. The question is how do poor farmers finance capital costs to get started? The important thing in beekeeping is that a farmer can start by using simple hives made from local materials. It is not necessary or advisable for you to take a loan to get started unless you are absolutely sure you can make the hives produce. This certainty comes from experience. Start slowly. Learn as you go along. Once you understand what you are doing, expand. Many farmers in Kenya who purchased expensive frame hives on loan had ended up repaying through other means as the hives failed to produce anything—very demoralising. In particular, with the recent promotion of the Langstroth hive, people are misled by the belief that it will automatically produce honey and lots of it. **Be warned: this is not the case!** It will only yield well with good management.

GROSS MARGIN ANALYSIS

The following is an analysis of beekeeping versus a major source of livelihood in Kenya: maize production. The table below looks at the same beekeeping enterprise above minus capital costs. It also looks at the enterprise at different production levels: low, medium, and high. Low is 10kgs per occupied hive/annum. Medium is 20kgs per occupied hive/annum. High is 30kgs per occupied hive/annum. The sale price of honey is estimated at KSH100/kg. Through packaging, one can easily add value and increase the price of honey. Many farmers in Kenya can sell honey in raw form for KSH150/kg or more to their neighbours, e.g., beekeepers in the Lare area of Nakuru District.

Description	Production Level		
Production	Low (10kgs)	Medium(20kgs)	High(30kgs)
Yield per hive x 16	160	320	480
Price per kg honey	100	100	100
Gross Output (a x b)	16,000	32,000	48,000
Variable Costs			
Grease and miscellaneous	500	500	500
Total Variable Costs	**500**	**500**	**500**
Gross margin/16 occupied hives	15,500	31,500	47,500

Table 6: Gross Margin Analysis of Beekeeping

Description	Production Level		
Production	Low	Medium	High
Yield of maize (90kg-bag)	20	50	87
Price of maize	1,300	1,300	1,300
Gross Output (a x b)	26,000	65,000	113,100
Variable Costs			
Total variable costs	18,000	32,500	60,714
Gross margin/hectare	8,000	32,500	52,386

Table 7: Gross Margin for Hectare of Maize

(Source: Baraka Agricultural College)

From the above comparison, a beekeeping enterprise of 20 KTBH compares very favourably with returns from a hectare of maize, particularly at low levels of efficiency in maize production. In addition, a beekeeper has the option of adding value to his/her honey to increase returns while a maize farmer is more at the mercy of market forces where gluts in production frequently depress prices. The bee enterprise takes up very little space in comparison to maize and the time input is much less. The most important but often overlooked inputs for successful beekeeping are skills and knowledge, so develop them very well.

GLOSSARY OF TERMS

Abdomen - third posterior section of a bee's body.

Absconding - when a colony of bees abandons the hive or nest site due to infestation of pests or lack of food. (It happens with African bees).

Allergic - in beekeeping, refers to the severe bodily reaction to bee venom following a sting.

Anther - the part of a flower's stamen that produces pollen. The male part of the flower.

Apiary - bee hives grouped together.

Bee space - gap large enough for bees to walk and work, e.g., the space between two parallel combs or between a comb and the wall of the hive.

Beeswax - material produced by honeybees for building combs.

Brood nest - the centre area of the combs of a colony where brood is reared.

Capped honey - ripe honey in the comb, sealed with a wax capping.

Cappings - thin wax covers of cells full of honey, particularly after they have been removed from the surface of the comb prior to honey extraction.

Caste - different types of mature honeybees (and other social insects).

Comb - beeswax structure of two plates of cells arranged back to back on a midrib and used to rear brood or store honey and pollen.

Drone - male honeybee. Drones undertake no work within the hive. Their sole function is to fertilise the queen.

Feeder box - box used to feed bees artificially with sugar syrup.

Foundation - thin sheet of beeswax usually embossed with a hexagonal pattern of cells placed in each wooden frame that serves as a base upon which honeybees build their comb.

Frame hive - hive containing frames. The honeybees are encouraged to build their combs within these frames. The frames enable combs to be lifted from the hive for examination.

Gland - an organ that produces and releases one or more substances.

Hive - artificial structure for housing a colony of bees. It is also a verb to denote the process of introducing a swarm into a hive to house it permanently.

Langstroth hive - a design of frame hive. The inventor, Rev L. Langstroth, recognised the importance of bee space and this allowed him to design the movable frame hive.

Larva - an insect in the first stage of development after hatching from the egg. (plural: larvae)

Migration - seasonal movements of whole honeybee colonies, leaving no brood behind in the nest.

Nectar - Sweet liquid secreted by flowers. Watery solution of various sugars.

Participatory Action Research - PAR has emerged in recent years as a significant methodology for intervention, development, and change within communities and groups. It is now promoted and implemented by many international development agencies and university programmes as well as countless local community organisations around the world. PAR involves people working together to solve their problems through learning in a systematic way. As the name implies, the output of the research is action.

Pollen - fine dust-like substances, which are the male reproductive cells of flowering plants collected by bees as a source of protein.

Propolis - an aromatic, resinous, antibiotic plant material collected by bees for blocking holes, waterproofing, and generally protecting the hive from intruders and diseases.

Pupa - final stage of development of the bee in which it is sealed into its cell and from which it will emerge it as an adult. (plural: pupae)

Queen - female parent of the colony. The only sexually developed female.

Race - biological definition of race is a categorisation of organisms with differing characteristics while maintaining enough similarities to be a part of a common genus and species. In this context, it is synonymous with subspecies.

Ripe honey - capped honey in the comb, i.e., bees have added enzymes and dehydrated it to an acceptable moisture level below 19% before sealing.

Species - in biology, a species is a group of related organisms that, more or less, share a distinctive form and are capable of interbreeding.

Stamen - male reproductive organ of a flower. It consists of a stalk on the end of which is the anther.

Starter - narrow strip of wax foundation fastened in a frame or under a top bar for the bees to start building comb in the desired position.

Super - any hive box placed above the brood nest or chamber. Usually contains combs in which bees will store honey.

Sustainable livelihood - occupation or employment enabling someone to provide for his/her basic needs and to be secure in its continuation in the future.

Swarming - when a honeybee colony becomes large enough to divide into two.

Top bar hive - intermediate technology hive in which bees are encouraged to build their combs suspended from bars placed across the top of the hive.

Unripe honey - honey in cells not fully processed by hive bees, i.e., when still thin and not capped.

Worker bee - female honeybees that make up the bulk of the colony and undertake all the work of the colony except for mating and egg laying. Workers are sterile females.

ANNEX 1
Current Status of the Kenyan Beekeeping Industry

BRIEF HISTORY OF BEEKEEPING IN KENYA

In the late 1960s, the Kenyan Ministry of Agriculture, the International Bee Research Association (IBRA), and Oxfam collaborated on the development of an appropriate hive for Kenya. The result of this joint effort is the Kenyan Top Bar Hive (KTBH). In the 1970s, the Ministry of Agriculture began introducing the KTBH to Kenyan farmers supported by the Canadian International Development Agency (CIDA). Beekeeping cooperatives were set up in many parts of Kenya to facilitate marketing of bee products. All of these marketing structures collapsed later. Many have made numerous attempts to develop beekeeping in the country since the 1960s, but production of honey is still very low in relation to its potential. In recent years, people have promoted Langstroth frame hives as the answer to Kenya's beekeeping problems but with limited success. Neither the Langstroth frame hive nor KTBH have had much impact on Kenyan beekeeping, as about 80% of all beehives in Kenya are still traditional type hives. In spite of the production potential, Kenya does not export honey. The European Union has licensed Kenya to export to their region.

BACKGROUND TO THE KENYAN BEEKEEPING INDUSTRY

Kenya relies heavily on agriculture like other East African countries. 75% of its people live in rural areas and 60% of these live in absolute poverty. Kenya is a nation of small holders with over five million small-scale farmers and pastoralists. Cutbacks in public services and the free market philosophy of recent years have hit rural communities very hard. As this is unlikely to change, the future of such rural communities will depend on developing their capacities from within to meet the challenge. Beekeeping is an opportunity to harvest and add value to a local resource (floral nectar) to generate wealth and employment and beat poverty.

80% of Kenya's land area is either semi-arid or arid land. Beekeeping is suitable for these areas due to prevalent plant species, e.g., acacia trees, and also due to limited livelihood options available in these areas. About 80% of Kenyan honey is produced in arid and semi-arid areas. (Muya 2004)

Majority of Kenyan beekeepers still use traditional systems of beekeeping: simple fixed combs, mostly hollow log hives, in spite of over 30 years of beekeeping extension carried out by the government and non-governmental organisations (NGOs) to promote improved hives, e.g., the Kenya Top Bar Hive, which is an intermediate technology hive.

In the last five years, there has been a major push by some NGOs and private companies, supported by major donors, to introduce the Langstroth frame hive used in Europe and America. There is conflicting information between the actual impact of these hives and the claim of success by its promoters. Information collected in a number of recent beekeeping studies indicates limited impact on enhanced production of bee products and on improvement of livelihoods. Conflicting information on different production technologies results in confused farmers who receive different messages from different extension agents.

In relation to bee product marketing, research indicates that the Kenyan honey market is underdeveloped due to low volumes. Volumes and quality have not yet been reached for export though Kenya has been licensed to export honey to the European Union since 2003. The shortage of bee product production also means that local demands are not met sufficiently. Significant quantities of imported honey, mostly from Tanzania, abound in the Kenyan market, but some people repackage them as Kenyan honey. Opportunities exist for the development of fair trade and organic honey export markets due to Kenya's largely pollution-free environment and disease-free bees.

Some quarters report that local production of honey has improved in recent years due to reduced official honey imports; however, one can explain it by an increased cross-border trade in honey marketed as Kenyan honey in local markets.

Other issues of importance affecting the Kenyan beekeeping industry include:

- Lack of a clear government beekeeping policy but which is now under development. Different agencies take different approaches to beekeeping with no national coordinating body resulting in a disorganised and fragmented industry.

- Environmental degradation, mostly forest destruction/charcoal burning that results in reduced beekeeping potential in Kenya.

- Little or no beekeeping research in Kenya.

- Fragmentation and disorganisation of beekeepers. Beekeepers are difficult to reach due to poor infrastructure resulting in difficulties in bulking honey for marketing.

OPPORTUNITIES IN KENYAN BEEKEEPING

- There is a strong local demand for honey with current production unable to meet local demand.
- There is a ready export market with a strong international demand for honey and bee products. The European Union allows Kenya to export to their region.
- The bee population is relatively disease-free.
- There are considerable existing skills and knowledge in beekeeping.
- Kenya is a big country with space for a much larger beekeeping industry.

ANNEX 2
More Information on Stingless Bees

Apart from honeybees (*Apis mellifera*), there are other types of bees in Kenya that collect nectar and make honey. These are stingless bees, which usually live in holes in the ground. There are many species of stingless bees (*Meliponinae*) in Kenya and these are yet unexploited on a commercial basis. In Brazil and India, these bees are utilised because of their ability to make good quality medicinal honey. People prize this honey as a cure for baldness and impotence. These bees can yield up to five kgs per season. Stingless bees are the best pollinators as they penetrate deeper into the flower. Baraka Agricultural College in Molo and the National Beekeeping Station at Lenana in Nairobi have started keeping stingless bees. Beekeepers can keep them in small hives. They store honey in small pots that you can harvest daily with a clean syringe!

Photo 43: Simple box hive for stingless bees.
(Baraka Agricultural College, Molo)

Photo 44: Hive with shaded glass cover.
Bees require darkness.

ANNEX 3
Hive Recordkeeping

Hive No.	Occupation Date	Date of Inspection and Comments	Harvesting Date	Amount Crude Honey (kgs)	Amount Refined Honey (kgs)	Amount Beeswax (kgs)	Remarks

Table 8: Hive Recordkeeping

You can copy the previous table in a hardback notebook, which you should fill out after each hive inspection. You can also photocopy it. In the remarks section, you can specify the inspection date and any information of use such as the temperament of the bees, i.e., if they are docile or difficult to handle. This information is useful when selecting bees in the future. You can record any management activities here such as: (a) amount of food fed to bees (if any), (b) the cost, (c) action taken to control swarming, etc.

Below is a table for marketing records.

Date	Amount of Honey Sold (kgs)	Price per kg of Honey	Total Revenue

Table 9: Marketing Recordkeeping

ANNEX 4
Recipes/Uses for Beeswax, Propolis, and Honey

Photo 45: Kenyan National Beekeeping Station exhibition stand
The stall displayed many excellent bee products.

BEESWAX FURNITURE/WOOD POLISH

Ingredients
200g Beeswax
100g Turpentine
50g Baby oil

Procedure
Grate beeswax into flakes. Gradually add turpentine to soften wax. Add oil and mix. Store in a tin with a tight-fitting top or in a jar.

Tip for sewing shoes, leather, and other thick materials:

Pull thread through small block of beeswax. The wax stiffens and smoothes the thread making it easier to sew.

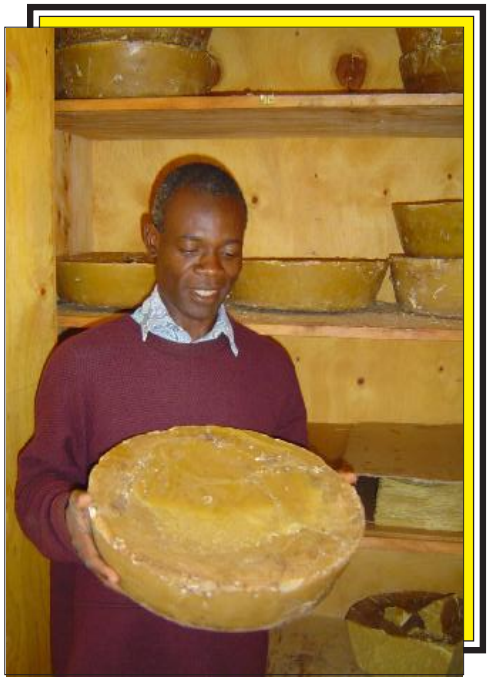

Photo 46: Cake of beeswax for making candles
(Baraka Agricultural College, Molo)

BEESWAX CANDLES

Requirements
Beeswax
Wick (use cotton thread)
Bottle top
Plastic pipe that fits into bottle top
Cooking oil

Procedure
Smear inside of plastic pipe with soapy water or cooking oil. Thread wick through pipe. Punch hole in the middle of the bottle top. Thread wick through hole and knot it.

Melt beeswax indirectly, i.e., use a double pan (one *sufuria* sitting in hot water inside another *sufuria*). Do not boil the wax.

Cover bottom end of pipe to prevent wax flowing away by pushing it down into bottle top. You can also stick end of pipe in the ground. Tie wick to suspension wire. Pour melted wax into mould making sure wick is in the middle of the candle. Wait for wax to cool before filling the rest of the mould with molten wax. Leave candle to solidify. (It should come out easily from mould because you had greased it with cooking oil.)

Candle is now ready for use. Vary wick to get a good candle that burns well. Use many plastic pipes to make many candles at the same time.

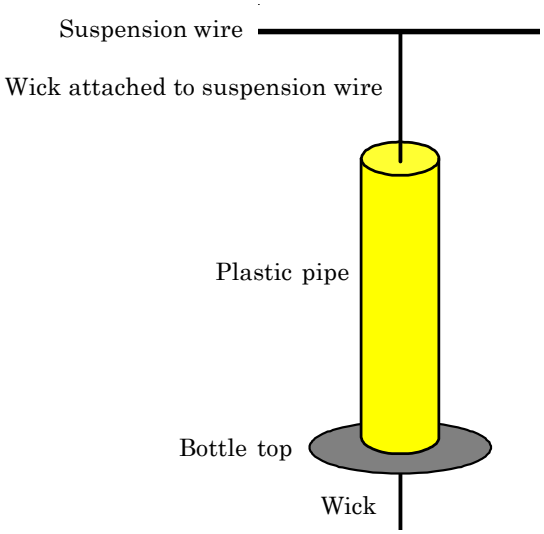

Figure 11: Candle Making

Photo 47: Beautiful beeswax candles made using plastic pipe mould

PROPOLIS HEALING OINTMENT

The first stage is to make propolis granules:

Step 1
1. Scrape off the propolis from hives putting scrapings in a tin.
2. Add enough water to cover scrapings and heat.
3. Wax will melt and float to surface.
4. Propolis will stick to bottom of can.
5. Stir often to help release wax.
6. Remove from heat and let cool.

Step 2
1. Remove waxy layer formed on water surface.
2. Pour off water and save coloured mass beneath.

Step 3
1. Place can in cool place to harden propolis andmake it brittle. Freezer is best.
2. Dry and store in sealed container.

Ingredients
1 tablespoon Beeswax
4 tablespoons Mineral oil (e.g., baby oil)
1 tablespoon Propolis granules
1 tablespoon Honey

Procedure
Melt ingredients in double boiler. Stir until it cools. It should have the consistency of cream. You can pack in small containers and sell. Use cream as a skin ointment for sores, rashes, blisters, etc. Many farmers' groups we work with are now making and selling beeswax and propolis creams and making good money from this activity. For more information, contact Baraka Agricultural College. (See contacts in Annex 5.)

HONEY COUGH SYRUP 

Ingredients
6 tablespoons Pure honey
Juice of 2 Lemons

Mix ingredients together well before taking in spoonfuls for coughs.

Warning: Be careful when working with hot wax and other ingredients used to make these recipes. I cannot be held responsible for adverse effects resulting from the use of methods or ingredients mentioned in this publication.

ANNEX 5
Approaches to Beekeeping Extension

In this section, we outline experiences of Baraka Agricultural College that has been involved in beekeeping extension services to farmers since 2002. An Irish development agency, Self-Help Development International (SHDI) funded the extension project. Since 2002, the college has been working with beekeeping groups to develop beekeeping mostly in Rift Valley Province but also in other parts of Kenya/Eastern Africa.

INNOVATIVE ASPECTS OF THE BAC/SHDI PROGRAMME

1. Participatory Action Research (PAR) Approach to Beekeeping

As a country, Kenya covers a very large area presenting a huge diversity of climates and vegetation within its borders. Beekeeping extension workers can only make general recommendations. There is enormous need for beekeepers to adapt and try out ideas for themselves at local level. The basis of the PAR approach is the importance of learning from what we do in a systematic way. Every aspect of life can benefit from this kind of approach. The Baraka/SHDI project encourages farmers to innovate/solve their own problems in beekeeping. This approach comes in light of an inadequate government beekeeping extension service as well as little or no formal research in Kenya beekeeping. In November 2006, farmers researched reasons why they have low hive occupation rates, so they can make decisions on what to do about their problem.

The PAR approach to beekeeping development takes into account and builds on farmers' indigenous technical knowledge.

Photo 48: Bee forage tree seeds
BAC/SHDI farmer researchers collected and documented these seeds.

2. Bee Multiplication

There is considerable shortage of bees and many hives are unoccupied. The project works with farmers to ensure bees occupy hives. This is done through training and support in colony division and swarm trapping. The project has started training farmers in queen rearing in response to one of Kenya's biggest beekeeping problems: low hive occupation rates.

3. Farmer-to-Farmer Trainers

The project works with beekeeping groups in different geographic areas. A cluster of groups has a farmer beekeeping extension worker that the project trained and supported. In turn, he/she trains other farmers in beekeeping. This has proved a very effective beekeeping promotion method and builds local capacity in beekeeping.

4. Artisan Training

The Baraka Agricultural College/SHDI project trains local carpenters and tailors in making beekeeping equipment. This has assisted beekeeping development as beekeepers can access beekeeping equipment at affordable prices. This approach also encourages self-reliance amongst local communities.

(N. B. *For further information on the Baraka Agricultural College/SHDI project, please contact the college. See Annex 6.*)

ANNEX 6
Sources of Further Information

KENYA

You can contact the following organisations as a starting point for further information on beekeeping in Kenya. Many others are involved in beekeeping; the number changes all the time. This list is not exhaustive and is just to establish a place for further networking.

Apiculture Division
Ministry of Livestock and Fisheries Development, Hill Plaza Building
P.O. Box 34188–00100
Nairobi
Telephone: (254) (0)20 2722601/2722637
Fax: (254) (0)20 2728609
Remarks: Contact for information and advice or get in touch with your local District Beekeeping Officer. There's one in every district.

Baraka Agricultural College
P.O. Box 52
Molo
Telephone: (254) (0)51 721091
Email: baraka@sustainableag.org
Website: www.sustainableag.org
Remarks: Contact for bee equipment, advice, training courses, honey, and beeswax marketing

The Kenya Honey Council
P.O. Box 271-00606
Sarit Centre, Nairobi
Telephone: (254) (0)20 4183120
Email: info@kenyahoneycouncil.org
Website: www.kenyahoneycouncil.org
Remarks: An umbrella body representing different stakeholders in the Kenya beekeeping sector.

National Beekeeping Station
Apiculture and Emerging Livestock Division
Ministry of Livestock and Fisheries Development Lenana
P.O. Box 34188-00100
Nairobi
Telephone: (254) (0)20 564302
Remarks: Check out for its library, bee equipment, and advice.

The Kenya Beekeepers Association
c/o The National Beekeeping Station
P.O. Box 34188-00100
Nairobi

Self-Help Development International Kenya
2nd Floor, Catholic Diocese of Nakuru Building
Stadium Road off Kenyatta Avenue
Telephone: (254) (0)51 2212291
Email: kenya@shdi.org
Remarks: The agency currently promotes beekeeping in the Gilgil area.

Ruai Beekeeping Cooperative Society
P.O. Box 8
Naru Moru
Remarks: This is a great example of collective marketing of bee products in Kenya. It markets up to 8 tonnes of honey per annum.

ICIPE (International Centre for Insect Physiology and Ecology)
P.O. Box 30772-00100
Nairobi
Telephone: (254) (0)20 8632000
Fax: (254) (0)20 8632001/8632002
Remarks: It has a commercial insect section dealing with beekeeping
E-mail: dg@icipe.org

African Union
Maendeleo Ya Wanawake House
Nairobi
Remarks: It has an interesting collection of beekeeping books in its library.

General Plastics Limited
P.O. Box 10032
Nairobi
Enterprise Road off Mombasa Road
Industrial Area near Hillock Inn
Telephone: (254) (0)20 530032/3/4/5
Remarks: It supplies plastic jars and lids for packing honey.

Honey Care Africa Limited
Muringa Avenue, Jamhuri Park
Nairobi
Telephone: (254) (0)20 574448
Remarks: It promotes Langstroth hives. It also buys and markets honey.

African Beekeepers Limited
Industrial Area
P.O. Box 3752-00506
Nairobi
Mobile: (254) (0)722 700226
Remarks: It manufactures equipment and markets honey.

Kerio Valley Development Authority
KVDA Plaza
P.O. Box 2660
Eldoret
Telephone: (254) (0)53 2063361
Email: kvda@kenyaweb.com

Strengthening Informal Sector Training and Enterprise (SITE)
Telephone: (254) (0)20 2718155
Jabavu Road, Nairobi
Remarks: It deals in training and support to beekeeping and bee equipment.

REST OF AFRICA

Bee Natural Products Ltd
PO Box 5318
Pan Africa House
Plot 3 Kimathi Avenue
Kampala, Uganda
Telephone: (256) (0)41 234676/ 253844
Mobile: (256) (0)77 907045
Fax: (256) (0)41 259052
Website: www.beenaturalproducts.com

Tanzanian Ministry of Natural Resources and Tourism
P.O. Box 9372
Dar-es-Salaam, Tanzania
Telephone: (255) (0)22 130091
Email: fordev@africaonline.co.tz
Remarks: It has very good publications on beekeeping in English and Swahili.

The National Honey Show Limited
P.O. Box 71326
Dar-es-Salaam, Tanzania
Telephone: (255) (0)22 2126280
Email: epictanzania@email.com
Remarks: It organised the first Tanzanian honey show in Dodoma in 2006.

Tawiri Njiro Wildlife Research Centre
Ministry of Natural Resources and Tourism, Forestry and Beekeeping Division
c/o P.O. Box 246
Dar-es-Salaam, Tanzania
Email: fordev@africaonline.co.tz
Remarks: Tawiri runs beekeeping courses and carries out beekeeping research.

Alternative Contacts:
P.O. Box 661
Arusha, Tanzania
Telephone: (255) (0)27 7677
Telefax: (255) (0)27 2548240
E-mail: tawiri@habari.co.tz or info@tawiri.org

Plant Protection Research Institute South Africa
Private Bag x134
0001 Pretoria, South Africa
Website: www.arc.agric.za
Remarks: It has a very good book, *Beekeeping in South Africa*.

TUNADO (The Ugandan National Apiculture Development Organisation)
c/o Bee Natural Products Limited (See above.)

INTERNATIONAL

Bees for Development
Troy, Monmouth NP25 4AB
United Kingdom
Telephone: (44) 016007 13648
Fax: (44) 016007 16167
Website: www.beesfordevelopment.com
Remarks: It produces a very nice magazine. People may pay for subscriptions with beeswax. It also sells beekeeping books.

Bee Support
Email: micha_el@dds.nl
Remarks: It undertakes promotion of beekeeping for development.

Hives Save Lives
Saltdean, Brighton BN51 9AB
United Kingdom
Website: www.hivessavelives.com
Remarks: This organization has current projects on Uganda.

Bees Abroad UK
Website: www.beesabroad.org.uk
Remarks: A UK-based charity supporting beekeeping development. Bees Abroad also has projects in Kenya.

International Bee Research Association (IBRA)
18 North Road, Cardiff CF1 3DY
United Kingdom
Website: www.ibra.org.uk
Remarks: It has a good library on beekeeping around the world and publishes the *Journal of Apicultural Research* and *Bee World*.

CTA/Agromisa
P.O. Box 41
Wageningen, The Netherlands
Remarks: It has booklets on agriculture and bees.

Bee Vital 
Website: www.BeeVitalPropolis.com
Remarks: A UK-based company that purchases propolis.

ANNEX 7
Baraka Agricultural College Short Courses on Beekeeping

The following one-week short courses in beekeeping are currently on offer from Baraka Agricultural College. It offers courses both in Swahili and English, depending on the needs of the group. For further information on course timings and costs, please get in touch with the Short Courses Coordinator at Baraka Agricultural College. See contact details below.

An Introduction to Beekeeping (Establishing a Beekeeping Enterprise)
This course is about starting a beekeeping enterprise in Kenya. The college aims the course at beekeeping beginners, but experienced beekeepers can also benefit by attending. The course covers an introduction to bee biology and behaviour (African bees, *Apis mellifera scutellata*), beekeeping equipment, apiary establishment, bee and hive management, harvesting, and handling and marketing honey.

Processing of Bee Products
This course covers in detail how to process and add value to bee products, including honey, beeswax, propolis, bee brood, and pollen. Local and international markets/ marketing for these products is also covered. One spends much time in practical lessons, i.e., making a variety of value-added recipes, which one can market and sell in Kenya and overseas. Recipes include a variety of candles and creams, polishes, and medicinal/nutritional products from the beehive.

Making Bee Equipment
Making bee equipment is a specialised course aimed at artisans and those interested in making their own beekeeping equipment to quality standards. Both beekeeping staff and Baraka Agricultural College workshop staff, who manufacture beekeeping equipment, facilitate the course. The course covers making a Kenya Top Bar Hive, Langstroth hive, smoker, bee suits, hive tools, and bee brushes. They also give details on how to make a simple honey extractor. Much of the course held at Baraka Agricultural College workshop is actually making the equipment.

Bee Breeding and Multiplication
This is a new course on offer for 2007. The course is designed to assist beekeepers/ beekeeping extension workers occupy the many empty beehives in Kenya. Research shows hive occupation rates as low as 30% in some areas of the country. The course covers details of bee genetics, selection, and breeding. Simple methods of bee multiplication such as swarm attractants, making divisions, and queen rearing are covered in detail, including the Demaree, Miller, Jenter, and Grafting methods of rearing queens.

Further details of Baraka Agricultural College beekeeping courses are available from the college website: www.sustainableag.org. You can also contact the Short Courses Coordinator at telephone number: (254) (0)51 721091; or send email to shortcourses@sustainableag.org.

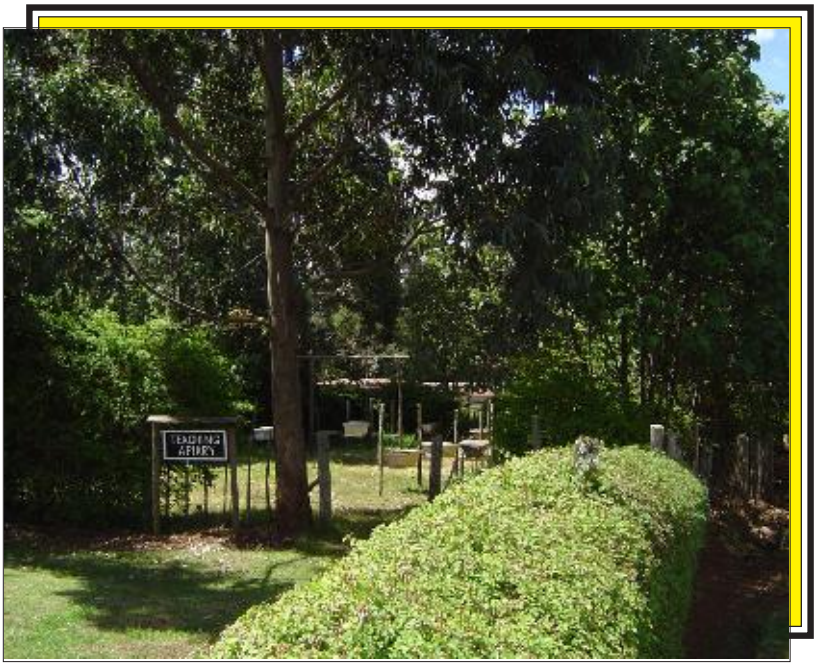

Photo 49: The teaching apiary at Baraka Agricultural College

ANNEX 8
Beekeeping Resources on the Internet

There are a number of websites, which are of interest to beekeeping in Kenya and Africa. They offer a large variety of resources and information. It is well worth checking out internet resources. There is a list of beekeeping resources suitable for Africa on the links page of Apiconsult. See www.apiconsult.com/beekeeping-links.htm. This page is updated regularly.

In addition, the Apiconsult website has a discussion forum on African beekeeping where beekeepers on the African continent share information. Please join the discussion and share your experiences.

As of November 2006, I consider the following websites useful:

www.apiconsult.com

www.apiservices.com (loads of information on world beekeeping)

www.beesfordevelopment.org (UK-based site promoting beekeeping in development)

www.gsu.edu/~biojdsx/main.htm (beekeeping in top bar hives)

www.honeybadger.co.za (South African site on beekeeping)

www.honeycareafrica.com (beekeeping with Langstroth hives in Kenya)

www.topbarhive.com (information on top bar hives in the USA)

en.wikipedia.org/wiki/Top-bar_hive (online encyclopaedia with information on top bar hives and general beekeeping to which you can edit and add your own ideas and information to the articles presented)

There are many more.

A good way to generate more beekeeping links is to search with a search engine such as Google (www.google.co.ke) on “beekeeping Africa” or “top bar hives”, etc.

Happy surfing!

ANNEX 9
Recommended Reading/References

The following books and publications give useful information for beekeepers in East Africa. I have also used them as reference for this guide.

Adjare, S. The Golden Insect: a handbook on beekeeping for beginners. Ghana, 1984.

Beekeepers' Guide Book. Nairobi: National Beekeeping Station, 2005.

"Beekeeping in Kakamega Core Target Area." ABLH Report 15 (1996)

Beekeeping in Tanzania. Dar-es-Salaam: Ministry of Natural Resources and Tourism, 2001.

Bradbear, N., E. Fisher, and H. Jackson. Strengthening Livelihoods: exploring the role of beekeeping in development. United Kingdom: Bees for Development, 2002.

Canadian Agriculture Team. Beekeeping in Kenya. Nairobi: Ministry of Agriculture, 1974.

CTA/Agromisa. Beekeeping in the Tropics. The Netherlands: Agrodok 32, 1991.

Dharani, Najma. Field Guide to Common Trees and Shrubs of East Africa. South Africa: Struik Publishers, 2002.

Gentry, C. Small-scale beekeeping. USA: Peace Corps, 1982.

Hepburn & Radloff. Honeybees of Africa. Berlin: Springer-Verlag, 1998.

Johannsmeier, M. F. Beekeeping in South Africa. 3rd ed rev. Pretoria: Plant Protection Research Institute, 2001.

Jones, Richard. Beekeeping as a Business. International Bee Research Association, 1999.

Kigatiira, K. I. Beekeeping for Beginners. Nairobi, 1982.

Mann, I. Bees are Wealth/Nyuki ni Mali. Nairobi: Kenya Literature Bureau, 1976.

Marchand, D & J. Beekeeping—a practical guide for southern Africa. South Africa: Aardvark Press, 2005.

Noad & Birnie. Trees of Kenya: a fully illustrated guide. Nairobi, 1989.

Winston, Mark L. The Africanized Honeybee in the Americas. Massachusetts: Harvard UP, 1992.

_____. The Biology of the Honeybee. Massachusetts: Harvard UP, 1987.

Check out libraries at the National Beekeeping Station Nairobi, Baraka Agricultural College in Molo, and also at the Organisation for African Unity in Nairobi, for more beekeeping references. You can also purchase some of the above books on the Internet from the Apiconsult beekeeping store. See www.apiconsult.com for more details. Some of the above references are also available free on the Internet See www.apiconsult.com/beekeeping-links.htm for further links to free useful publications on the Internet.

Notes on Beekeeping

ABOUT THE AUTHOR

Tom Carroll was born in Ireland where he grew up on the family farm. He developed an interest in beekeeping at an early age when he found abandoned beehives and equipment belonging to his late grandfather, in the family garden. His interest ripened further when his father hired a local beekeeping expert to remove bees from the roof of the two-storey family house. The beekeeper was old and too stiff to climb the ladder, so he dressed nine-year-old Tom in a bee suit and sent him up to do the job. Tom loved it! From there sprang a lifelong passion for bees that changed his life and took him halfway around the world to work on beekeeping development in Africa.

After finishing with a master's degree in agriculture from University College Dublin in 1993, Tom came to Kenya to work on a beekeeping development project. For the last 14 years, Tom has worked on African beekeeping development in a number of African countries, including Kenya, Somalia, Sudan, Tanzania, Uganda, and Zambia. Tom has served as member of various committees for both the Kenya Beekeepers Association and the Kenya Honey Council.

In the year 2000, Tom established www.apiconsult.com, a website to assist the development of beekeeping in Africa through the sharing of ideas and information.

Tom is currently head of beekeeping with Baraka Agricultural College, which promotes sustainable agriculture and rural development throughout Eastern Africa. Beekeeping is an important part of the college's work. Baraka makes bee equipment, markets honey on behalf of farmers, offers specialised short courses on beekeeping, and manages a beekeeping extension project supported by SHDI that assists farmers to improve their beekeeping in five districts of Rift Valley Province, Kenya.

This book examines the reality and the opportunity of beekeeping in Kenya. The author shares his experience of 14 years of beekeeping development in Kenya and other African countries. African beekeeping is not always as easy as often portrayed with aggressive bees and absconding behaviour resulting in empty hives. For those who succeed in beekeeping, the reward is great with high demand and prices for quality bee products.

The book will be of interest to beekeepers and potential beekeepers in Kenya, Eastern Africa, and other parts of Africa as well as beekeepers in other parts of the world. The guide is well illustrated with many colour photographs.

LegacyBooks

ISBN 9966-7078-6-7