

BEE-HIVE CONSTRUCTION & BEEKEEPING SKILLS TRAINING
FOR YOUTH IN
GOKWE SOUTH RURAL DISTRICT (JUNE 2011)



GOKWE VOCATIONAL TRAINING CENTRE
June 2011

CONTENTS,

1.0 Background

1.1 Objectives

1.2 Benefits of Beekeeping

1.3 Tools and Beekeeping Equipment

1.4 Beekeeping and Technology Choices

..... 1. 4.1 local Technology advantages &disadvantages

..... 1. 4.2 Modern Technology advantages &disadvantages

1.5 Apiary Site Selection

..... 1.5.1 Factors

1.6 Bee Colony

..... 1.6.1 Life stages

..... 1.6.2 Functions

1.7 Bee Languages

1.8 Enemies & Predators

.... 1.8.1 Control methods

1.9 Bee Supplements

... 1.9.1 Forage

... 1.9.2 Feeding

1.10 Management

... 1.10.1 Apiary management

... 1.10.2Record keeping

... 1.10.3Colony manipulation

1.11 CONCLUSION

GLOSSARY

BACKGROUND,

The skills Training for 100 Youth from Gokwe South Rural district, on bee-hive Construction and beekeeping skills development, has been practically designed to assist these youth in addressing challenges related to beekeeping techniques create product market linkages and sustainable management of the natural and planted woodlands from which the bees harvest pollen and nectar.

The training also seeks to help the Gokwe South Youth farmers to produce and market their beekeeping products to viable high value markets a development that shall assist in improving their source of livelihood and as an excellent opportunity to generate incomes. This training is designed to ensure many participants go into beekeeping. And also to ensure sustenance and affordability of the hives, the Manual has been designed to equip and empower Gokwe Vocational Training Centre with relevant skills to make all required technology locally this ensures that the costs of entry into the sector are affordable, repairs and expansion is supported locally.

Course Objectives

The Training is to clearly spell out the relationship between beekeeping and the beekeeper in terms of the role honeybees play and services they provide for the benefit of mankind such as:

- Honey production as a way of broadening food production for the rural population
- Increased food production in agriculture through pollination of crops
- Provision of source of income through selling beeswax and honey
- Demand for conservation of remaining woodlands in catchment areas
- Promotion of rural afforestation programmes to provide honeybees with forage

THEREFORE:

Participants, at the end of each session from day one to the last day of training shall be able to:

- State and explain, the benefits derived from beekeeping and explain the economics of scale of beekeeping
- State and explain the beekeeping systems that are user friendly and generate sustainable production.
- Be able to define a honeybee colony, and be able to identify and describe the three (3) honeybee castes and the function of each member of the honeybee colony
- To state factors to be considered in apiary site selection ,be able to list plants suitable for the honeybee foraging
- Demonstrate how to set up top-bar hives and materials required
- Explain the plan of a simple top bar hive
- Should be able to state material needed to construct a low cost top-bar hive and explain and apply steps involved in hive making as well as be able to construct at least two top bar hives
- Participants should be able to define what an apiary is, and state factors considered important on management of an apiary.
- Identify and describe equipment required when handling honeybee colonies and explain the reason why honeybees can be difficult to work with as well as to state and apply steps to be followed when inspecting colonies.
- Participants should be in position to state equipment needed when harvesting and steps to be followed when harvesting, special standards needed when extracting honey
- To state equipment needed when rendering beeswax and describe and carry out beeswax rendering resulting in them be able to explain the process of candle making and other related by-products
- Be able to identify honeybee predators and pests and control

The methodology of training

The training involves

- Group Discussions and plenary sessions
- Lecturing and questions
- Practical demonstrations

The visual and learning aids to be used are as follows

- Flip-charts and markers
- Manuals (reference material)
- Actual material such as bee hives (propolis (bee glue), beeswax and honey combs
- Board and chalk

- Designed charts (for illustrations)

BEEKEEPING HANDBOOK



BEES - THE NATURAL ANSWER TO POVERTY
beeszimbabwe@gmail.com

INTRODUCTION

Just as many people would want to go to heaven but nobody wants to die, people like honey but always stand to be the greatest enemies of the bees.

Telling someone about beekeeping is an uphill task since very few people would willingly and generously lend you an ear, bearing in mind the phobia that comes along with beekeeping. . We hope this manual would help you understand the basic facts of beekeeping.

Beekeeping is judged to be a very lucrative venture that is not labour intensive as you shall learn from this manual. However, the profitability of any venture calls for knowledge, dedication and devotion. This manual shall therefore guide you begin or improve your beekeeping.

ACKNOWLEDGEMENTS

“No man is an island, entire of itself “, so goes the adage. In the production of this manual, would not have been successful had it not been for the suggestions, contributions and participation of dedicated individuals intellectually into this production.

We would like to air the deepest thankfulness to the BKAZ Secretariat, for their devotion towards the production of this manual.

Listing everyone involved cannot be worth the while but attention should be drawn to all parties involved that we will forever extend our deepest gratitude and thankfulness to you all.

Good luck!!

BENEFITS OF BEEKEEPING

In order for us to understand beekeeping fully, we should be informed about the benefits we derive from the project. We do not only have honey as the benefit of beekeeping, we also get propolis wax, pollen and royal jelly.

A. HONEY

*"Honey is the natural sweet substance produced by honey bees from the nectar of blossoms or from the secretion of living parts of plants or excretions of plant sucking insects on the living parts of plants, which the honey bees collect, transform and combine with specific substances of their own, store and leave in the comb to ripen and mature"*¹ Honey is made by several bees species and even wasps.

Honey is largely composed of sugars that contribute 95 percent or more of its dry weight. These are largely simple sugars, namely, fructose and glucose, which comprise 85% or more of the sugars present. These sugars contribute to the physical and nutritional aspects of the honey. Water is the other major component with its concentration being influenced by humidity, nectar and processing. Other contents include minerals like potassium, amino acids and vitamins.

The colour of honey varies from clear and colourless to dark amber. There are other colour shades such as bright yellow, reddish, greyish and greenish. It tends to turn lighter as it crystallizes because the glucose crystals are white. The colour influences marketability. Lighter honeys are often more marketable for direct consumption. The darker honeys on the other hand, are more commonly used for industrial use, especially in western markets. The colour also influences the price with lighter honeys commanding higher prices.

- Honey is food that contains fructose, glucose, sucrose, mineral water and other undetermined substances?
- Honey is a necessary ingredient in making medicines to be taken orally or as injections
- Honey is also used as an ingredient in making some clear soap.
- Can also be used in making drinks e.g. wine.
- Honey is on its own a very reliable cough syrup. Bakers would use honey in their different processes. Honey is made from nectar and pollen.

B. PROPOLIS

It is a sticky dark brown or black glue-like substance used by bees as a sealing agent to close crevices or holes on the hive. This propolis is waterproof and can be used by builders in place of bitumen putty on asbestos roofs. In the hive propolis is an anti-bacteria agent. The propolis can be used in making remedies for diseases such as asthma, skin diseases, arthritis to name just but a few.

Bees make propolis by mixing glue from trees and other substances extracted from flower buds.

C. BEES WAX

This is an inflammable substance acquired after processing some honey combs. This wax is used as a solvent for some injectables. Beekeepers with the knowledge use it for making wax foundations. If you have once come across some crayons you will agree with me that bees wax is an ingredient in making of the wax crayons. In the household, wax can be used to make candles, floor polish, cosmetics, shoe polish and petroleum jelly.



D. POLLEN

Pollen can be very useful to us. Bees are very helpful pollination agents. Plants whose pollination is facilitated by bees produce quality fruits and seeds. Bees also collect pollen (as shall be discussed later on) and store it in their hives. If collected from the cells on the combs, the pollen is very nutritious food that contains minerals, vitamins and carbohydrates. Some suffering from indigestion can take pollen as a laxative.

E. ROYAL JELLY

Is special food found in larvae cells? It is food for the queen bee and larvae. Royal jelly is used in making medicine to treat various ailments. People who have suffered from prolonged illness can take this for fast recovery. However, it calls for great knowledge for beekeepers in order to obtain the jelly from the cells without forcing the bees to abscond the hive. Royal jelly has all the constituents of a balanced diet.

Other benefits

Beekeeping is a venture that requires very small pieces of land unlike farming of other crops. You do not have to be financially sound in order to be a successful beekeeper. You also don't need to be an expert as may be expected of you in other agricultural sectors. Bee farming does not require a lot of labour. One can be a beekeeper and be a farmer producing other crops at the same time. Among other things, beekeeping has been found to be one of the most environments friendly. Why? It is because it promotes the planting and maintenance of trees.

In beekeeping carpenters, builders, tailors, blacksmiths and pollination are promoted. Carpenters make hives, builders construct bee houses. Tailors make veils and bee suits while blacksmith and potters make hive tools and clay hives respectively.

Tools required for successful beekeeping

Now that we have cleared the fear attached to beekeeping, let us answer the question, what do I need to become a beekeeper?

- HIVE
- SMOKER
- CATCH BOX
- BEE SUIT (PROTECTIVE CLOTH WITH VEIL and JACKET)
- HIVE TOOL / KNIFE
- GLOVES / GUMBOOTS
- BEE BRUSH

1. veil

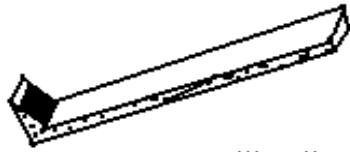
A veil like one in the picture protects you from being stung by bees in the face or head. The twine hanging below if tightened around the neck firmly would prevent bees from entering inside the veil.



2. hive tool/ knife

This tool or knife is used to find the empty side of the hive and also to remove top bars from KTB hive. The knife would be used to cut the combs. The knife can do both the job of cutting combs and removing top bars but the hive tool can not be used to cut the combs off from the top

A hive tool



A hive tool is used to open the hive's top bars.

fig 2

ib

3. The smoker

When we talk of importance, the smoker is the next after the beehive. The smoker puffs out some smoke to render the colony docile. Some beekeepers are already making their own smokers. A good example is that of people from Uzumba Maramba Pfungwe district and Gokwe. They make some smokers just like the one in the picture fig 3.



.The bee suit, gloves and gumboots

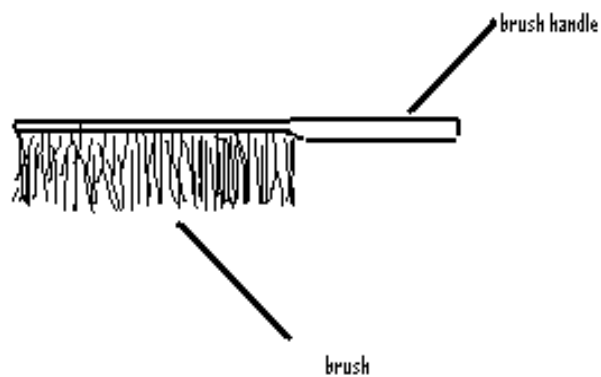
You may need to have a bee suit. In place of a bee suit one can use an overall that has a zip. To avoid bee stings on hands one can put on some gloves and gumboots to protect feet. One can as in the picture tuck in overall in socks if he does not have gumboots.



4. **A bee brush**

This is a very soft brush used to sweep off bees from their combs without killing them. One can use quill or feathers from a large bird such as a turkey in place of the brush

A bee brush



BEE FARMING



People keep bees for different reasons. One can take beekeeping as a hobby. Someone else does it for commercial purposes. Many beekeepers in Zimbabwe inherited the project from their fore fathers. This led to the traditional belief of the sacred bees (Nyuchi dzegonera) these and other facts led to the construction of various models of hives we are now going to discuss. Oral tradition stories (the father who feed on ashes) and other biblical stories (Genesis 43: 11, Matthew 3; 4 and Proverbs 24:13-14) testify that honey was understood to be very special food, and it was available even during difficult times such as drought.

TYPES OF HIVES

Traditionally in Zimbabwe people uses bark, log and calabash hives. In modern beekeeping practices we now use the basket, KTB hives and Langstroth hive.

THE LOG OR BARK HIVE

The bark hives were made by ring –barking trees. The bark removed from a tree was supported by wood wedges that were fixed as in the picture. The bark hive was usually installed high up in the trees to attract bees. The log hive was made from the hollow logs. Both log and bark hives were made by natural materials

LOG HIVE



THE Clay pot HIVE

This was made out of clay and it was in form of very large clay pots. The clay pots or calabash hives were also installed up in some trees

Advantages of traditional hives

- they are cheaper to acquire or make
- they give us plenty of beeswax
- they also supply a lot of propolis

Disadvantages of traditional hives

- They are not durable. Their life span is 3-5 years.
- They contribute to deforestation (they are not environment friendly) because in order to make the hive, one has to cut or ring bark a tree.
- Only the father and boys can work with the hive since women will not be able to climb up trees to harvest honey or inspect the bees.
- It is difficult to extract honey combs from the hive. Bees may make combs longitudinally inside the hive thereby making it difficult to extract the combs from the hives.
- The beekeepers cannot put brood and other unwanted combs back into the hive during harvesting in the event that the beekeeper extracts brood combs from the hive.
- honey and brood are sometimes mixed up in such hives
- Traditional hives are difficult to inspect for disease and pest infestation.

MODERN HIVES

These include the top bar hive and the Langstroth hive.

The basket is woven to the dimensions given above and then plastered using a mixture of cow dung and clay. The entrance should be 5 x 2cm in size.

Advantages of the Greek basket hive

- it is easy to open
- easy to bring bees into the hive
- easy to bring an active young queen bee into the hive
- easy to obtain ripe or sealed honey without disturbing the larvae
- easy for bees to fan and clean the hive
- the yield from the Greek basket is usually 10 to 15kgs

Disadvantages

- the top bars are expensive
- over the top bars you have to put a roof- usually a grass roof which needs constant renovations
- combs can break upon lifting if they are longer than 30cm

THE KENYAN TOP BAR HIVES (KTB)



The KTB hive originated from Kenya. It was named after a volunteer worker who worked in Kenya. Some people in Zimbabwe refer to it as the coffin hive/boxes deriving the name from the shape of the hive. This is the most recommended type of hive for the beginners.

Advantages of KTB hives

The KTB is long lasting. Its life span is 10-15 years. It promotes cleanliness when harvesting and has better yields compared to other types of hives described earlier on. The hive produces 20kg or more of combed honey at one harvest. There is no bee killing during harvesting. One can observe the development of bees by constant visits and inspection of the hive(s). The KTB is environmental friendly. The KTB does not allow intrusion of the hive by beetles, mice, spiders and lizards all of which are serious bee enemies. This type of hive works well with trap boxes. The whole family can work easily with the KTB hive.

Disadvantages of KTB hives

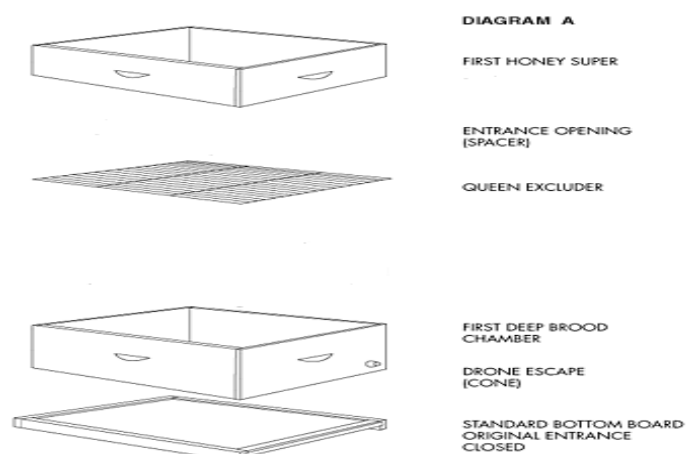
To make a KTB hive one requires knowledge and expertise. One needs to have basic skills in carpentry. You get very little propolis from the hive. The KTB is expensive to acquire compared to traditional hives. To harvest from the hive requires two people, the one harvesting and the other who will be applying smoke to the hive using the smoker

Type of beehive	Yield	Comb honey (Kg)	Liquid honey (Kg)	Wax (Kg)
Bark (traditional)	Maximum	20	10	2.5
	Average	15	7.5	2.5
	Minimum	10	5	2.5
Frame (modern)	Maximum	40	20	5
	Average	30	15	5
	Minimum	20	10	5

At this stage we now know about other hives like the Greek baskets, the clay hives and the KTB hives but we can not discuss modern beekeeping methods without mentioning the Langstroth hive. The hive was devised by Lorenzo Lorrain Langstroth hence its name Langstroth main idea was to achieve proper management of the bees. Improved beekeeping had began in the years dating back to 750BC with the Greeks then, having hives with bars and having regulations that discouraged overstocking of bees.

THE LANGSTROTH HIVE

This is the most modern type of a hive. It is more complicated than all types discussed. The Langstroth hive is the most productive of all the hives. More on this hive is going to be discussed in the next manual.



This hive unlike the Kenyan top bar and other hives applicable to our Zimbabwean situation, is made up of detachable components namely, the hive cover, the inner cover, the super chamber, the queen excluder, the brood box and the floor board. In the super chamber(s) and the brood box there are some moveable frames that are fitted with wax foundations. The hive cover acts as the roof of the hive and is usually made of a metal sheet. The rest of the is made of wood except the queen excluder that is made

up of a metal gauze with holes that only permit worker bees to pass through. The gauze is fitted into a wooden frame.

Unlike in the KTB hive, the brood chamber is specifically meant for brood rearing. Looking at the structure of the hive you would notice that this brood chamber or hive body is the largest in terms of volume. This has been designed so that enough brood and food (honey) is available in required proportions in the hive at any time of the year since the beekeepers is not going to disturb the chamber. During harvesting, the beekeeper is not supposed to disturb the brood box so that he/she leaves enough honey for the brood and the swarm in the brood box.

The brood box is usually separated from the super chamber by a queen excluder. Since the beekeeper is not supposed to harvest honey from the brood box, the queen excluder serves the right purpose to ensure that the queen is confined to the brood box. Combs in the super should not at any given time have brood. If this happens when the queen excluder is on then it would mean that investigations should be carried out. It might be that the colony is now queen less and a worker bee is now laying eggs or that the excluder might be damaged as to allow penetration by the queen. The queen's confinement to the brood box guarantees the probability of the beekeepers acquisition of honey only from the super(s) during harvesting.

The movable frames fitted in the super and brood chambers are designed to allow standardized comb building and the availability of bee space between the combs. Wax foundations for the Langstroth frames are made in such a way that when fitted to the frames, to the bees they appear as unfinished combs and hence would encourage the bees to finish them off-thereby encouraging productivity.

The illustration below shows us the structure of the Langstroth hive.

Advantages of the Langstroth hive

- It produces the highest amount of honey.
- There is no bee killing during harvesting
- It is environment friendly
- It does not allow intrusion of hive by bees enemies like mice and spiders.
- It works well with trap boxes
- It makes it easy for bees to fan and clean the hive
- It is fitted with wax foundations that reduce work for the bees in making combs
- It promotes cleanliness during harvesting
- Brood and honey are never mixed as in log hives
- All members of the family can work with the hives
- The shadow frames can be easily tied up three or more stories high
- The beekeeper can add supers at the rate at which they are required by the bees.

Disadvantages

- It requires expertise in order to make one
- It is expensive to acquire wax foundation and frames have to be bought and are very expensive
- It produces little propolis
- Requires 2 people at harvesting
- Doesn't usually give us wax as combs are usually reused
- Honey extraction from combs requires machines like the centrifugal in extractor

The bee house

This is a house designed so that it accommodates hives in it that will be set up on shelves or stands next to the outer walls of the building so that the hives have direct link to the outside of the building. The bee house is built so that the beekeeper would curb the detrimental effects of the weather elements namely rain, cold, and heat from the sun on the hives. Theft is another disabling factor to beekeeping and to avoid it one can erect these bee houses. Thieves who steal from the hives are vandals who are not worried about future outputs and hence their operations would lead to absconding of hives by bees. Beekeepers with bee houses face very little risk of veld fires and can have affordable terms when it comes to insuring their hives unlike those with open apiaries. NB* every apiary should be protected from intrusion by a fence.

Depending on what the beekeeper wants to achieve, the bee house can be able to accommodate twenty hives.

THE TOP BAR HIVE

Top bar lining

The ktb top bar guides the bees in their making of combs. However some bees may construct their combs across the top bars. To avoid bees from doing this, the beekeeper should line the top bars with wax.

Method

Heat some wax until it liquidifies. Dip one top bar in water and place it flat on top of another dry top bar. The wet top bar should be placed so that it will cover half of the dry top bar lengthwise. Hold your top bars over a bucket of water in a slanting position so that when you pour the heated wax on to the dry top bar, it would flow downwards along the wet top bar into the bucket. The wax will stick onto the dry top bar but not onto the wet bar. When you remove the wet top bar, a straight wax line would be left stuck onto the centre of the dry top bar. This wax line is called a wax foundation. Place the waxed top bar on the hive. The bees will build their combs following the wax foundation.

When you have constructed the hive, heat some propolis in a tin. The propolis shall become sticky. Use the propolis to randomly paint the inside of the hive. The idea behind all this is to have some propolis stuck on the walls of the hive. After this painting process, close the hive i.e. put back the top bars. When you mount the hive makes sure that there is a cover on top of the top bars e.g. a piece of asbestos.

Comparison between modern and traditional hives

Description	Frame [modern] hive	Bark [traditional] hive
Origin	Kenyan top bar hive	Traditional in Zimbabwe [bark of tree]
Capacity	20kg-40kgs minimum liquid honey per hive per season	10kg liquid honey per hive per season
Cost		
Advantages	<ul style="list-style-type: none">• Yield more honey• Each comb is movable and can be shifted or taken out for inspection• Beekeeper crop ripe honey comb only without breaking the unripe combs• When moving combs bees are gently handled and less alarmed• Only few guard bees are required at the entrance holes; therefore colony feel safe even passing at a close distance• No need of tall trees, i.e. even women can be beekeepers	<ul style="list-style-type: none">• Easy and very cheap to make, i.e. readily available materials• No need for high capital• Limited skill is required• Not expensive to manage and maintain
Disadvantages	<ul style="list-style-type: none">• Expensive when made of wood• Beekeepers need modern skills and spend more time• Close management of colonies for profitability• Control is difficult if not suspended in wires and steel stands	<ul style="list-style-type: none">• Quality of honey is degraded by bark debris and other foreign particles, e.g. grass• Yield per annum is lower than in frame hives• It is very difficult to inspect the colonies inside the hive• It is not easy to detect bee diseases or pests in the colonies• It is cumbersome and dangerous to climb trees during hanging and cropping; and especially difficult for women

IMPORTANT FACTS ON FACTORS ON SITE SELECTION

A GOOD APIARY SITE

- Bees protected from winds and have full benefit of the available sunlight suffer very little from hive diseases e.g. (Nosema)
- During the honey flow early and late sun will allow the bees to leave the hive earlier in the morning and return later at night.
- The desirable location will have shade for the bees part of the day during the hot months.
- Bees use large quantities of water in the hive both for cooling the and dilute honey especially in winter and for feeding the (brood)
- The character of soil in an apiary can have a direct effect on the bees especially during winter and rain period
- Heavy clay or clay like soils are not desirable since they hold too much water
- A sandy type of soil removes moisture immediately
- A wet location with its resulting wet or damp bottom board can thus aid the spread of diseases e.g. (Nosema) and lower the brood rearing temperature in winter this increases the humidity in the hive.
- High humidity can also aggravate a condition of dysentery.
- Markers or a range of colours in the yard (apiary) will help to orient the bees- the greatest danger of having colonies too close is that young queens on their mating flight may not be able to find their way back to the hives.

MAKE APIARY EASY TO OPERATE

- Good working conditions speed up production
- The beekeeper and helpers will work with greater ease and comfort in a well planned bee yard
- There are many factors which the beekeeper must consider to make his work easier and more convenient honey production is the goal so the bees come first if a choice is to be made but a location should be convenient to work in.
- A loading hole in a bee yard is a great help. It should be so constructed that when a truck is backed up on it the truck bed is level with the ground for loading bees is also simplified and considerable lifting avoided
- Hedgerow may be planted around the yard for a permanent location the time and trouble spent setting out a hedge would pay after the hedge has grown to a height of six or seven feet the bees are forced up in the air and above the heads of people
- Permanent locations like the homes we live in deserve consideration and planning and a little extra time spent finding and preparing locations means dollars in future years.

A hive can be set directly

- To avoid dangers to dampness and rotting of the bottom board, it is advisable to set it on pieces of boards, bricks concrete etc.
- When hives face the same direction in straight rows, each hive itself, the bees are apt to become confused at the entrances.
- Hives are arranged in pairs in such a way that they face each other with entrances six (6m) apart.
- When hives face south the colonies get the benefit of a morning and a late afternoon sun, when the temperature begins to drop down
- To keep the grass and weeds away from the immediate front of the hive, salt is sometimes used for killing of all kinds of vegetation around the entrances it must be liberally applied in front of every hive at the beginning of the season. Sheep are very good for keeping down grass in the whole bee yard.

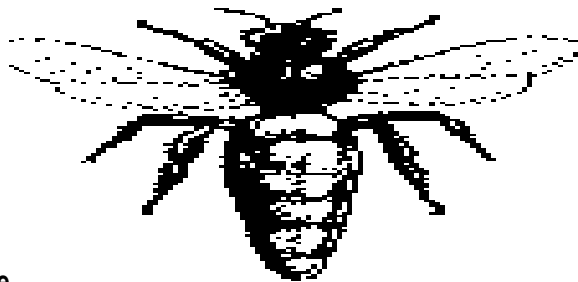
- A bee house can accommodate 8 - 20 colonies

Bees can be very productive if properly managed. The apiary itself should be well maintained. Your apiary (place where you keep bees) should be fenced to prevent stray animals and vandals. You should likewise have the most recommended beehives in your apiary in order to obtain a good harvest

MODULE 3

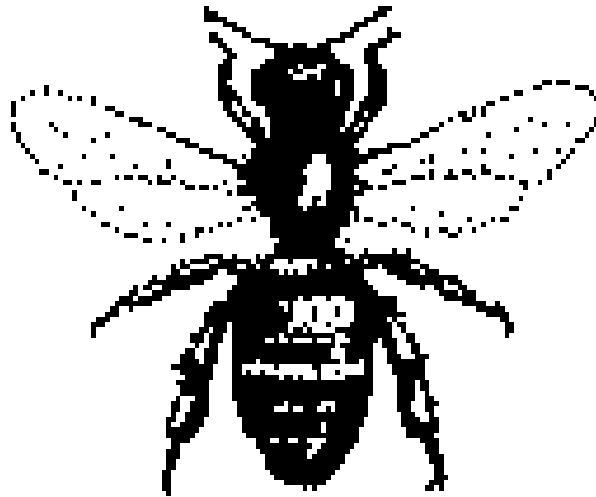
THE BEE COLONY

The bee colony can have 60 000-80 000 bees. However of this whole number there is only one queen bee. The male bees (drones) constitute 500-800. The greater number of bees is the workers. These are usually 60 000 or more in a normal colony.



The queen bee

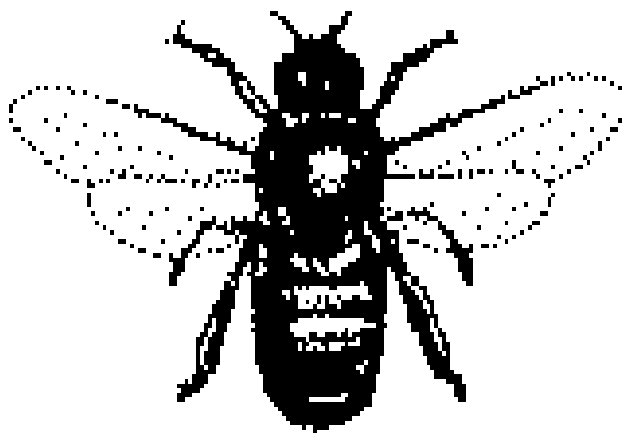
- is the only mother in the hive
- is the longest bee of the three types of bees in the hive
- has wings that are shorter than its abdomen
- has sparkling golden hairs like those of a drone
- does not have a proboscis to suck nectar
- does not have a sting and does not have pockets to carry pollen
- is mentally less developed than the worker bee
- lays an averages of 2000 eggs per day depending on how old she is and other factors like the availability of food in the locality
- does not secrete wax
- matures after 5days from the day it is hatched
- mates with 7-8 drones that die soon after the process
- is fed by worker bees
- the queen also controls the activities in the hive by secreting some substances that the bees lick from her body and pass on



Worker

These are female bees whose sex organs are underdeveloped. They are sometimes called virgin bees because they are never mated. The worker bees are the most numerous and smallest bees. They constitute 98% of the colony's population. The life span for these bees is very short. They live for 4-6 weeks. This is because they are the hardest working bees in the hive. The worker bee has a proboscis to use for sucking nectar. It also has some pollen baskets on its legs.

The worker bee has a sting to fight off enemies thereby protecting the hives from enemies. It is the worker bee that does all the household and field duties for the colony. The duties include building combs, collecting pollen, propolis, blocking cracks and crevices in the hive. They are the bees that make honey, feed the brood and the queen and maintain the temperature of the hive conducive for the livelihood of the brood. They usually ensure that the temperature around the brood is at 35-36 degrees Celsius. The workers scout for food and shelter. These bees emerge from the fertilized eggs unlike the drones which come from unfertilized eggs. It takes 3-4 hours to 2 days for the worker bee to be strong after emerging from the cell. The worker bee can only lay eggs when the queen dies without replacement.



The drone

These are male bees that have a life span of 12-16 weeks. They do not have a proboscis and do not have a sting. Drones have very big eyes that seem to meet, and they are fatter than the worker bees. Their wings are longer than those of the queen, and their wings are longer than the abdomen. They do

not have pockets to carry pollen. The drone is the laziest bee that can be found in the hive. Drones can be booted out of the hive during drought because they are parasitic to the workers. They are not productive. Only 7-8 of drones mate with the queen. There are usually 300-500 drones in a hive. Our African bee is called *Apis mellifera scutellata*.

The life span of a worker bee

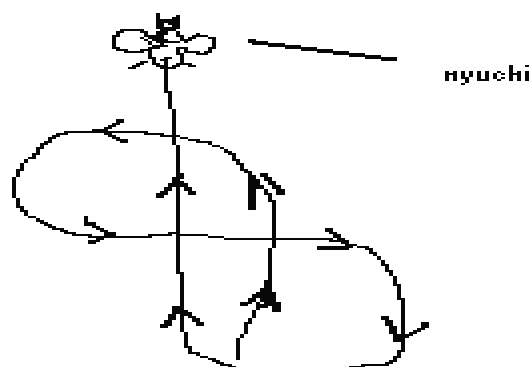
Days	Activities/duties	Descriptive name for the bees
1-2	Cleaning cells and keeping the brood warm	Hive bees
3-5	Feeding old larva	Hive bees
6-11	Feeding young larva	Hives bees
12-17	Producing wax, building combs, carrying food, warming the hive	Hives bees
18-21	A guarding the hive entrance	Hive bees
22-28	Visiting flowers, pollinating them, collecting pollen, nectar ,propolis and water	Foraging bees
29-45	The bee's life comes to an end	Foraging bees

The illustration above shows the life of a worker bee from the day it emerges as an adult until the day of its death.

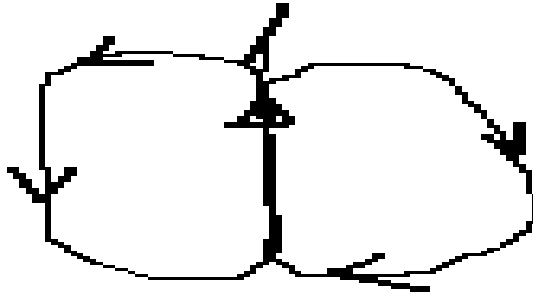
How do bees communicate?

Just like in a group of people, there must be some method of communication that exists between the bees. They need to communicate to inform each other of danger. They also need to inform one another about the availability of food in the locality. Bees communicate through various methods. They communicate through humming, rubbing against each other, through bee dances and through the production of substances that give instructions. These substances are called pheromones. The queen produces some piping noises. When she is still active, the queen does not allow any other bee to lay eggs. This she effectively does by producing a substance that bees obtain by licking her. This substance is passed around the hive by the habit the bees have of feeding each other. So long as there is sufficient of this substance being produced by the queen to satisfy an adequate number of the bees in the hive, no queen cells are constructed.

Bees can also tell one another time by which some trees produce nectar, sources of food and distance of the source of food from the hive through dances. These dances are performed on the comb.



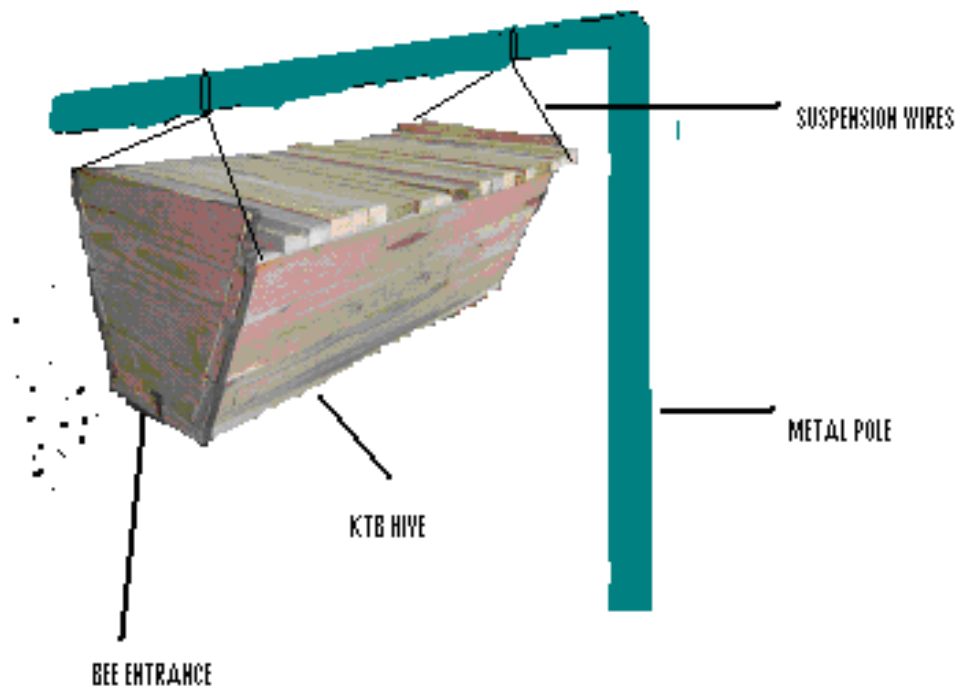
The round dance is performed by a worker bee to tell others about the availability of nectar within a distance of about fifty meters from the hive.



This type of a dance is performed on the comb. The dance was discovered by Yvonne Frisch French. This dance is done on the comb. The dance is done to show that the source of food is within one hundred metres to three kilometres radius from the hive. The maximum distance bees can forage is ten kilometres. When angry the bees spray or emit a substance called isopently acetate.

Enemies of the bees

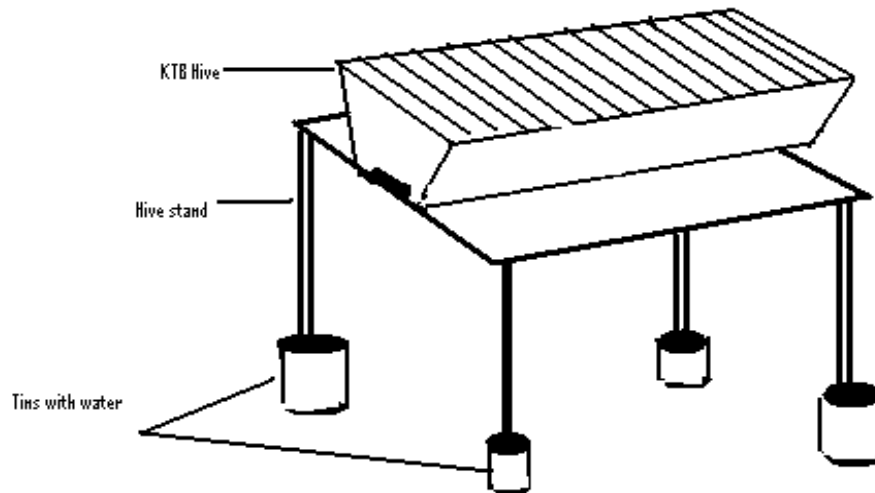
The Worst enemy is a beekeeper who is careless and ignorant and harbours diseases in the hive, does not care or because he/she does not know any better. Ants, spiders, snakes, wasps, civet cats, the honey burger, mice, lizards, aphids the wax moth, fire and birds are some of the enemies of the bees. People can be educated that they become good friends of the bees. A lot of people would destroy swarms every time they see them. Ants rob bees of their honey and wax and cannot be prevented from doing so by bees since ants are too small to be stung. To prevent ants from attacking your hive, hang your hives such that they do not touch the ground as in the picture



Other enemies of bees.

- king bird
- Mice
- Spiders
- Mosquito hawks
- Thieves

You may also mount your hive on a stand whose legs would be immersed in containers with water. See the picture below.

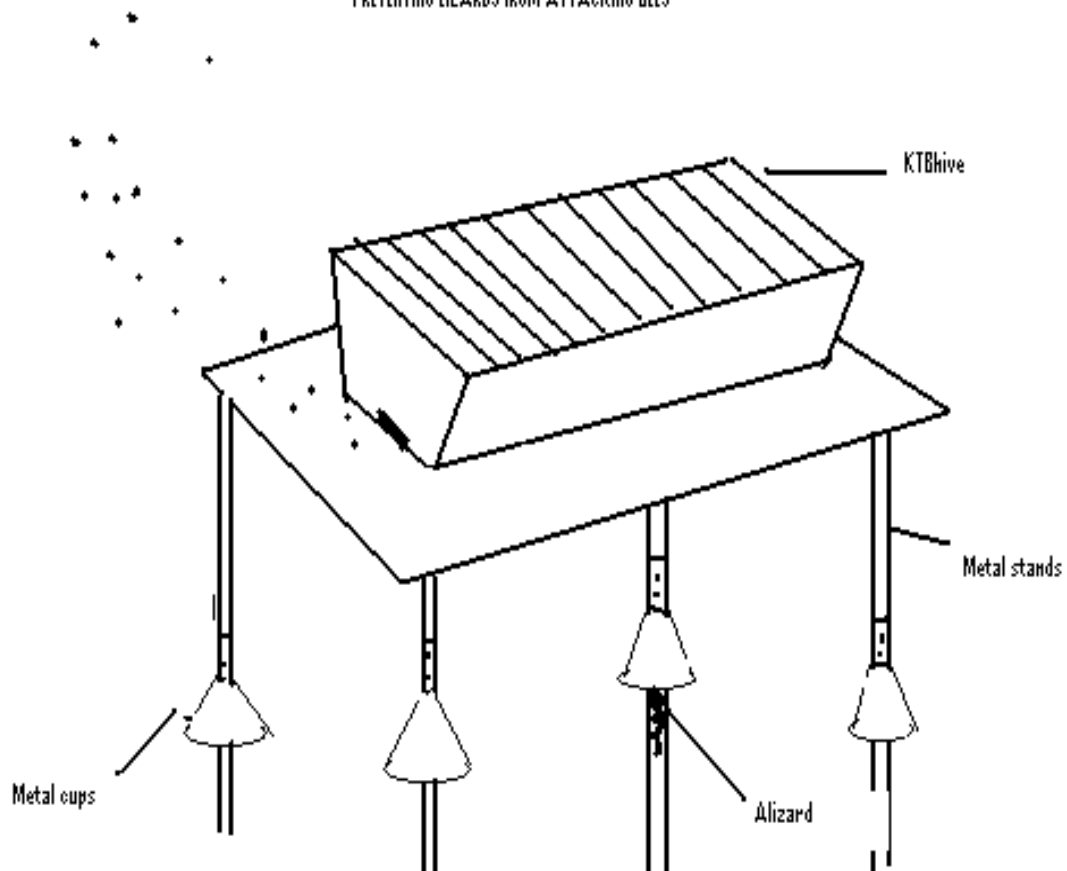


You can as well apply ashes under the hive stand. Spiders trap bees using their webs. If you see the spider webs near your hive, remove it as it might lead to the bees abscond your hive. Kill the spiders that you find near the hive. There are certain wasps that look like bees. These eat bees. They look like small bees but have bigger heads than their abdomen. You can kill these insects with a flat surfaced object like a ruler. This wasp is called a bee pirate.

As for fire, your apiary should be clear of inflammable grass and objects. Make some fireguards/fire paths to prevent your apiaries from veld fires.

Lizards eat bees. To prevent bees from being eaten by lizards install your hives on stands that have metal cones nailed on its legs as in the picture below.

PREVENTING LIZARDS FROM ATTACKING BEES



Eucalyptus trees also give the bees nectar. The discussion about the honey bee pastures portrays the fact that a beekeeper should be responsible for the management of both indigenous and exotic forests.

Feeding the bees

Supplementary feeding is necessary for bees during the dry season or drought lest the bees abscond the hive. You can make this using white sugar.

NB*brown sugar may cause diarrhoea to the bees.

Make a sugar salt solution to feed bees. Salt is a necessity as it avoids bees from having diarrhoea. To make the solution: dissolve 500g of sugar in $\frac{1}{2}$ litre of water and add $\frac{1}{4}$ level teaspoon of salt. Put that solution in a bottle. Perforate the lid of the bottle using a pin or a thin wire. Turn the bottle upside down and suspend the bottle inside the hive on two sticks so that bees can access the small perforations where sugar syrup will be dripping.

Opening the hives for Inspection and Harvesting)

Likewise, you should approach the hive during the cooler hours of the day. Before opening the hive, you ought to puff in, smoke into hive and wait for a while to observe the mood of the bees and steady them up whilst waiting. Remove the top cover on top of the top bars. Count 1-8 top bars from the entrance. These are the top bars that must be left untouched for the bees to keep their brood and honey for food during the dry spell. After applying smoke into the hive gradually open the hive from the last bar going back to the 9th bar. As you open the hive, the assistant will be blowing the smoke for you. Use the hive tool to open the top bars. Lift the top bar and find out whether the honey is ready or not. If ready, cut off the comb and replace the top bar. Do not harvest from more than three hives in one apiary at a time. The honey should be put in plastic containers to avoid contamination. Rusty containers should be avoided at harvesting. It is more recommended to grade honey at harvesting. Grade the honey according to the colour of combs. Light colour combs should be put safely in their own container and do likewise for all the different colours of combs. Sealed honey should not be placed in the same container with uncapped honey. Keep up to date records of your produce per hive to ensure

progress and better management of hives. Generally, keeping of records is very important in beekeeping as it helps you identify whether or not your business is making any headway.

Record keeping

A record of your beekeeping practice should be kept

- record the day when you made the hive
- mounted the hive
- checked/inspected the hive

Record your observations and actions as a result of observations per hive. This would necessarily mean that your hives should be numbered /labelled to avoid confusion. Also a record about the date of harvest, produce acquired per hive in kgs and the monetary value of the produce should be kept. To avoid confusion, make colony records and operational records. Operational records are mostly concerned with expenditure and cash flow. With this type of record you would be able to know whether you are making profit or running a loss.

A serious beekeeper studies his bees and records their behaviour seasonally. In different districts in the country you shall note that:

1. bees behave differently in various seasons
2. there is a season that encourages swarming
3. bees produce more honey during a certain season
4. certain types of bee fodder plants bloom during specific seasons
5. bees require supplementary food during a certain season and
6. during the swarming seasons, the bees have a direction they all follow during defined times of the year

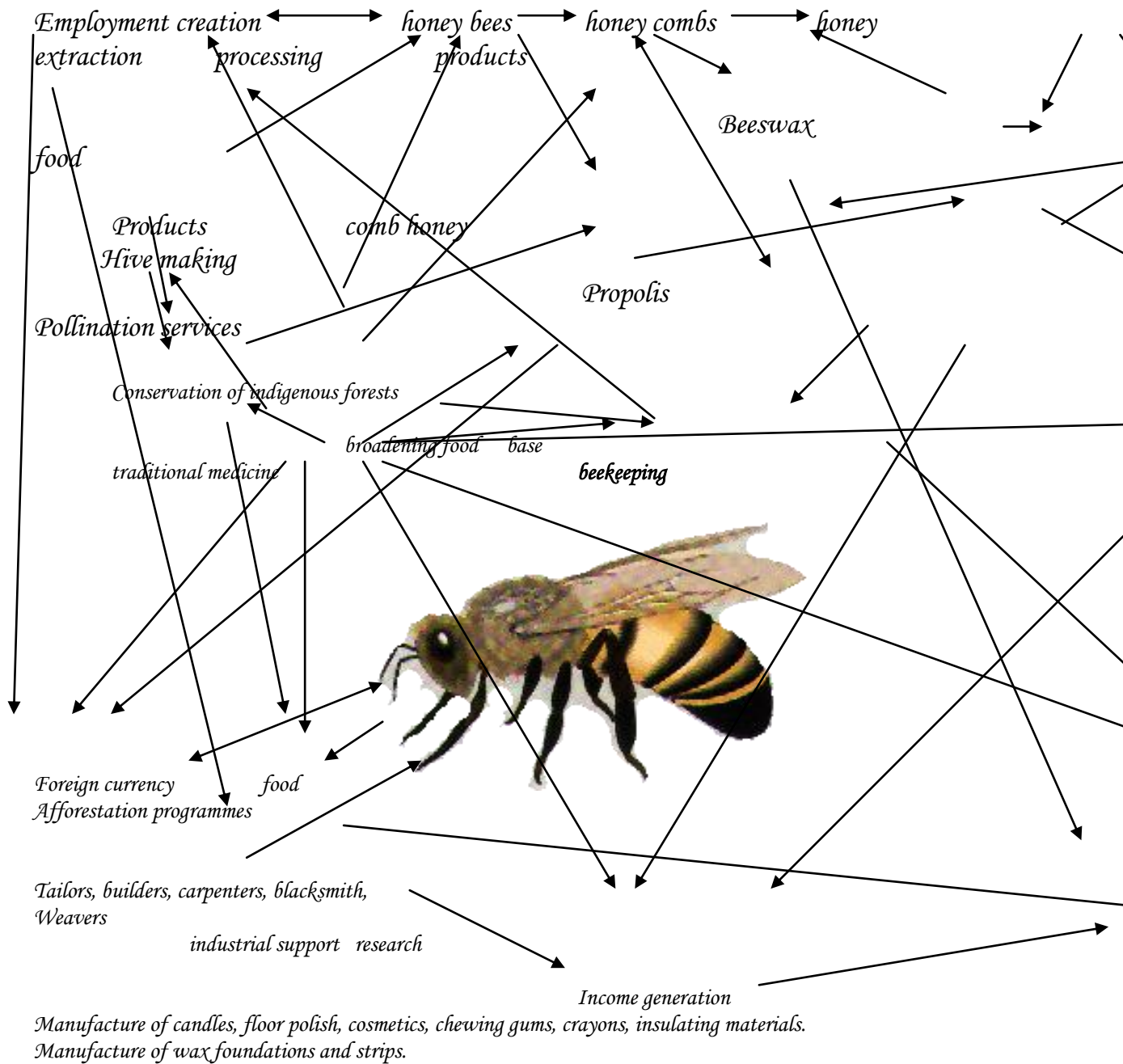
Conclusion

What really distinguishes beekeepers from pretenders is that beekeepers have that nagging desire to explore more about the sector. Beekeepers are practical people and hence draw much of their conclusions from what they experience in their endeavour to learn more. By the same token, you shouldn't accept what you read in this manual without experimenting. The goal of this manual is to share what we have sourced from different other beekeepers so that if helpful, the contributions would promote the beekeeping fraternity. This booklet should encourage your active participation in the development of the project. We at BKAZ Trust will be open for your suggestions, criticism and comments.

BEES CALENDAR

- **JANUARY**
 - * Colonies relatively weak
 - * Queens laying eggs
 - * Bees living on stored honey
 - * Check for ants, hive beetles and deaths
 - * Feed bees
 - * Check for foul brood
- **FEBRUARY**
 - * Colonies not strong
 - * More brood
 - * Feeding is necessary
- **MARCH**
 - * Queen start laying eggs
 - * Feeding is necessary
 - * Swarming if rains have ended
- **APRIL**
 - * Colonies with old queens swarm
 - * All brood combs present and honey areas being built
 - * Combine swarms to strengthen the weaker ones
- **MAY**
 - * Colonies are strong
 - * Brood areas decrease
 - * Little/ no drone brood
 - * Would not be constructing new honey Combs
- **JUNE**
 - * Decline in workers
 - * Drones disappear
 - * Area of brood decreases
 - * No new combs are built
 - * Hive protection against colds necessary
 - * Remove empty combs
- **JULY**
 - * No drones, few eggs
 - * Feed bees
- **AUGUST**
 - * Re-Queen if necessary or replace
 - * Brood rearing has started
 - * Food is short
 - * New combs are built up
 - * Swarming if the queen is old
 - * Feed bees
 - * Move out old brood combs
- **SEPTEMBER**
 - * Swarming is taking place
 - * Catch swarms
 - * Small hive beetles are common
 - * Foul brood- check out
 - * Feeding may be not necessary
- **OCTOBER**
 - * Bees busy
 - * Provide water
 - * Feeding not necessary
 - * Honey storing and harvesting
- **NOVEMBER**
 - * Check for ants
 - * Brood- rearing decreases
 - * Bees busy, depending on the weather
- **DECEMBER**
 - * Queen reduce egg laying considerably
 - * No swarming
 - * No new combs constructed
 - * Crop honey, hat over crop

THE GOLDEN INSECT



Aptitude Test

1. Which one of these is not a benefit from beekeeping/ bee farming?
(Honey/Greek Basket hive/Money/bark-hive/Wax/Langstroth hive)
2. Can we get a queen bee in a traditional hive?
3. Give one noticeable difference between a worker bee and a drone.
4. What may be the reason for the absconding of hives by bees?
5. Name one tree that can provide both the nectar and pollen to the honey bee within your area...
6. How deep should a ktb hive be?
7. How can we protect our apiaries from veld fires?
8. Where do we get beeswax from?
9. Where do we get plopilis from?
10. List three key/relevant stakeholders for your operation.
11. Always when working with bees how many people should be there?
12. List three by-products that we get from beeswax.
13. Name two reasons of opening the hive.
14. Name two marketing channels of honey
15. State two reasons why record keeping is important in beekeeping.
16. What does BKAZ STANDS FOR?

Bee hive Construction & Beekeeping Skills Training

(Program)

TRAINER. Mr. Mutandwa Chaipa (BKAZ)

VENUE. Gokwe Vocational Training Centre

PERIOD Ten (10) Days

DAY ONE (1) BEEKEEPING FOR POVERTY ALLEVIATION

TIME	TOPIC	LEARNING ACTIVITIES	MATERIAL & EQUIPMENT	METHOD OF EVALUATION
0900-0930	Introductions and Course Outline/ pre-course test	Participants answer questions	Hand-outs	Aptitude Record
0930-1030	The Problems of poverty/beekeeping reports	Individual reports	Flip-charts, Board and chalk	Discussions
1030-1100		BREAK		
1100-1130	The value of bees for in income generation	Brainstorming	Flip-charts, Board and chalk	Discussions
1130-1300	The life of the hive	Group discussions and plenary sessions	Board chalk, flip-charts and Manuals	Discussions
1300-1400		LUNCH		
1400-1500	Beekeeping systems	Brainstorming	Flip-charts, manuals	Discussion and groups reports
1500-1530	Selection of bee-plants	Group discussions plenary sessions	Flip-chart and manuals	Discussions and group reports
1530-1600	Bee-plants, pollination and environmental protection	Brainstorming, discussions	Flip-charts and learning charts	Discussions
1600-1630	Questions	Participants refer to topics covered		Discussions
		END OF DAY ONE		

TIME	TOPIC	LEARNING ACTIVITIES	MATERIAL AND EQUIPMENT	METHOD OF EVALUATION
0800-1000	Handling of honey bee colonies/manipulation of honey bee colonies		Flip-charts, manuals	Discussions
1000-1030		BREAK		
1030-1100	Technology choices	Brainstorming/group plenary sessions	Flip-charts, manuals board and chalk	Discussions/presentations
1100-1130	Introduction to hive making	Hands on hive making	Sawn timber, measuring tapes, wood saws, nails, hammer and wood glue (if any)	Discussion on timber sizes and equipment
1130-1300	Hive making (Cont)	Hands –on hive making	Measuring tapes, wood saws and nails	Discussions on timber measurements, cutting angles, and other equipments.
1300-1400		LUNCH		
1400-1600	Hive making (Cont) and Top bar making	Hands – on hive and top bar making	Measuring tapes timber for top bars	Discussions on the measurements of top-bars
1600-1630	Top-bar Lining	Demonstrations hands on top bar lining	Top bars, beeswax, melting containers and heat source	Discussions
1630-1700	Questions	Open discussions		Discussions
1700		END OF DAY TWO		

TIME	TOPIC	LEARNING ACTIVITIES	MATERIAL AND EQUIPMENT	METHOD OF EVALUATION
0800-1000	Keeping safe	Brainstorming	Flip-charts, manuals	Discussions
1000-1030		BREAK		
1030-1200	Site selection	Brainstorming/group plenary sessions	Flip-charts, manuals board and chalk	Discussions/present ations
1200-1300	Hive mounting and setting	Hands on hive mounting and setting	Bee-hives, hive stands, propolis and beeswax	Demonstrations and discussions
1130-1300	Enemies of the honey bee and control	Brainstorming	Brainstorming , Manuals, charts and observation	Flip-charts, board chalk
1300-1400		LUNCH		
1400-1600	Bee diseases	Brainstorming	Manuals and hand-outs	Discussions
1600-1630	Management of an Apiary	Brainstorming/ group and plenary sessions	Flip charts, board chalk and Manuals	Discussions
1630-1700	Installing and hive baiting	Waxing/propolising hive	Beeswax, propolis, hive and hive stand	Discussions
1700		END OF DAY THREE		

TIME	TOPIC	LEARNING ACTIVITIES	MATERIAL AND EQUIPMENT	METHOD OF EVALUATION
0800-1000	Re-cap of previous activities	Individual presentation	Flip-charts, board chalk	Discussions
1000-1030		BREAK		
1030-1100	Beekeeping Business Plan	Brainstorming/group plenary sessions	Flip-charts, board and chalk	Discussions/presentations
1100-1130	Beekeeping plan (Cont)	Brainstorming/ group and plenary sessions	Flip charts, board and chalk	Discussions/presentations
1130-1300	Beekeeping plan (Cont)	Brainstorming/ group and plenary sessions	Flip charts, board and chalk	Discussions and presentations
1300-1400		LUNCH		
1400-1600	Apiary visit/ Inspection	Apiary practical Observations (30min for each group of 25)	A local Apiary with colonized hives	Observations and discussions
1600-1630	Apiary visit /Inspection(Cont)	Practical Observations	Looking into colonized hives	Observations/Discussions
1630-1700	Questions	Open discussions		Discussions
1700		END OF DAY FOUR		

TIME	TOPIC	LEARNING ACTIVITIES	MATERIAL AND EQUIPMENT	METHOD OF EVALUATION
0800-1000	Re-cap of previous activity/observations	Individual presentation	Flip-charts, board chalk	Discussions
1000-1030		BREAK		
1030-1100	Honey Harvesting, Grading	Brainstorming	Honey combs, plastic buckets with lids, flip chart board and chalk	Discussions
1100-1130	Beeswax Making	Brainstorming	Honey combs, moulds melting containers and heat source	Discussions
1130-1300	Candle making	Demonstrations, hands on candle making	Candle wick, beeswax, melting containers and heat source	Discussions and presentations
1300-1400		LUNCH		
1400-1430	Honey standards	Brainstorming	Combed and liquid honey	Observations/ discussions
1430-1500	Markets and Marketing Opportunities	Brainstorming	Packaging containers, labels	Discussion
1500-1515	Review of Course and Plan of Action	Discussions	Flip-charts, board and chalk	Discussions
1515-1545	Determination gain in	Participants write	Test paper	
		END OF DAY FIVE AND DEPARTURE!!		

GLOSSARY OF TERMS

Hive	A hive or beehive is the receptacle for containing managed honeybees. This term is commonly used inaccurately to mean a colony of bees.
Colony	A colony is a single social unit of honeybees.
Bee Space	7-9mm (6-8mm in African bees) or the exact space which bees will leave clear for their easy passage around the hive. Any larger or smaller and they will fill it in. It forms the basis of honey bee management in moveable frame/ comb hives
Comb	Composed of mathematically precise hexagonal cells made of wax. The cells fit neatly together to form a structure of great efficiency and strength which the bees use for food storage or to incubate developing brood.
Brood	The collective term for the young developing bees in the comb.
Brood comb	The term given to the comb where the young bees are reared from eggs. It differs from honeycomb in that it darkens with use due to the remains of the larval cocoon in the cell. The different types of bee have cells of different size or shape.
Brood nest	The part of the bee's comb where the brood is reared.
Sealed cells	Those cells of the honeycomb that have been capped over with wax. They may contain developing brood or ripe honey.
Honeycomb	The wax comb composed of hexagonal cells that the bees use to store honey.
Ripe honey	Nectar processed to make a supersaturated solution of sugars with water Content of less than 20%. It can be recognised by the wax cappings covering the sealed honeycomb.
Unripe honey	Nectar with a water content of greater than 20%. This has not been fully Processed by the bees into honey and if harvested will ferment in store. It can be recognised by the cells not being sealed or the honey being very liquid.
Caste	A group of individuals of the same sex who differ on morphological or behavioural grounds from other groups of the same species. Honey bees have two female castes – queens and workers.
Pheromone	A chemical substance that affects the behaviour of others of the same species. They are of primary importance in honeybee communication and the maintenance of the social life of the colony.
Queen Substance	The pheromones produced by the queen which maintain colony cohesion
Parthenogenesis	Is the development of the egg without fertilisation. In the honeybee drones are produced only from unfertilised eggs.

WORKSHEET QUIZ - THINGS THAT CAN GO WRONG

First aid

Bee sting allergy is a badto a bee's It normally only happens after a person has already been stung and has been already become to bee venom. It is normal to have a slight, local reaction that is rather A large local reaction is shown by an extensive that is widespread and itchy. A whole body reaction happens more than anaphylaxis. Anaphylaxis is a major, medical If a person has a whole body or anaphylactic reaction they should call The first sign of anaphylactic shock is often..... over the whole body. Sometimes a person will have ataste in the mouth. The mucous membranes and may become difficult. The heart rate may either down or up. Falling blood pressure may result in a feeling of The person may experience or or abdominal pain. If a person has collapsed and is conscious he should be comfortable and an called. If the patient is unconscious check he is still and his airway is clear. **Go to the hospital immediately if in any doubt.**

Bee safe by only opening bees on at the right time. This is when the Always let someone know where you are going and when you will be back. Using will help ensure safety by subduing the bees. Always buy the best you can afford.

Migration and Absconding

Migration and absconding are the of bees to a new nesting place. In migration the movement of the bees is and happens every year while in absconding movement can be either or and will only happen when conditions are unsuitable. Migration and absconding differ from swarming because the colony does not andthe bees leave the nest. Feeding bees or plantingproducing plants that flower early or late in the bees season help the bees survive during theperiod can help to reduce absconding due to lack of food. Other reasons for absconding are and And

Dealing with ants

Ants are probably the biggest in tropical beekeeping. To keep ants out of the hive care must be taken to keep the..... clean. The beekeeper needs to the apiary regularly and clear away thefrom under the hives. The hanging or theof the hive stands need to be greased regularly so they are enough to deter the ants from climbing up them. Old enginewill do this job very nicely. If water is used for this purpose it willquickly and must be replaced daily if the season is hot, making much more work. It may be possible to search for ant's nests in the locality and kill them.

There are many more things that can go wrong with the bees; Make a list of the problems and possible solutions

FUNCTION OF THE DIFFERENT HONEYBEE TYPES

(Name.....)

Queen

The queen is the of the colony. Her most important function is to She can lay as many as eggs every The queen also gives off a called This is important for the bees because it gives the colony an individual then the Know this is their hive and that the queen is present. The queen can live for up to The queen is **larger/smaller** than the worker bee. The queen is **thinner/fatter** than the drones. It is **true/not true** that the queen can sting. It is **true/not true** that the queen wears a crown.

Worker

The worker is a **male/sterile female/fertile female**. She is **smaller/larger** than drones and queens. The worker bee does all the of the colony. The work she does includes **cooking/cleaning cells/hairstressing/grooming/foraging/shopping/wax making/frame building/guarding/soldiering/hanging about/storing nectar and pollen/fanning/stinging**. The work she does is usually regulated by her ... but can change to meet the needs of the colony.

Drone

The drone is a honeybee. His function is to the This occurs **in the air/ in the hive/ in a flower bed/ on a leaf**. The drones are **looked after/ fed/ read to/ given beer/ thrown out of the hive in autumn** by the workers. The drone is **larger/ smaller** than the worker bee and is **longer/ shorter/ thinner/ fatter/ hairier** than the queen bee. It is **true/ not true** that the drone can sting. The drone has very big in order to find the queen more easily and strong in order to be able to catch her. The drones are attracted to the queen by a Known as

Fill in the spaces correctly to make the paragraph make sense. Delete the incorrect word choices (there may be more than one correct answer) indicated by bold italics