THE REPUBLIC OF UGANDA

MINISTRY OF AGRICULTURE, ANIMAL INDUSTRY AND FISHERIES

THE NATIONAL BEE KEEPING TRAINING AND EXTENSION MANUAL

FARM INCOME ENHANCEMENT AND FOREST CONSERVATION PROJECT
APICULTURE PROMOTION SUB COMPONENT

Funded by:-
THE AFRICAN DEVELOPMENT BANK AND GOVERNMENT OF UGANDA

The National Bee Keeping Training and Extension Manual

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Edited by:

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FOREWORD

It is everybody's concern to see that the rural communities generate sustainable incomes as soon as possible. Livestock production and marketing offers an option. Out of the various livestock enterprises, namely, poultry, fisheries, cattle, piggery, etc beekeeping enterprise offers one of the best options for the rural communities and commercial farmers because of its minimal requirements for land, machinery and equipment, labor and capital investment.

In Uganda, honey production potential is enormous, estimated at 500,000 metric tones per year. This potential is not yet fully exploited. The basic knowledge and skills needed to exploit the honey production potential are lacking among the technocrats and farmers.

Over the years, several stakeholders including Government Ministries, Departments and Agencies have been carrying out training of farmers in their own ways without standard guide and uniformity. Some of the guides/manuals used by the stakeholders are substandard. This practice has for long undermined efforts to increase production and enforce compliance to standards.

This manual has therefore been developed to provide the basic standards for training beekeepers all over Uganda.

It is my sincere hope that trainers, extension workers, farmers and students will find this manual very valuable.

Okaasai S. Opolot
For: PERMANENT SECRETARY

ACKNOWLEDGEMENTS

We are very much grateful to the African Development Bank (ADB) and Government of Uganda (GoU) for funding the FIEFOC Project which has produced this very important National Beekeeping Training and Extension Manual. For sure this manual will guide teachers, trainers, students, farmers and beekeepers.

We appreciate and acknowledge the following people who provided literature without which this manual would not have been produced:-

Mr. Kato Agapitus, Entomologist, Mukono, DLG; Mr. Ayo George, DEO, Lira DLG; Mr. Rubaihayo John, DEO, Kabarole DLG; Mr. Mugume Amos, DAO, Kabarole DLG; Mr. Bagonza Adolf, Kabarole Beekeepers' Association, Kabarole District; Mr. Ayatuhaire Asaph , West Honeys Uganda, Mbarara District; Mr. Kanyike Charles, DEO, Nakasongola DLG; Mr. Palanda Robert Obumai, Assistant Entomologist, Adjumani DLG; Mr. Ochoun Emirious, Private Service Provider, Nebbi District; Mr. Lule Henry, DEO, Luwero DLG; Mr. Kefa John, Moyo Beekeepers' Association, Moyo District; Mr. Amafua Morphat, Private Service Provider, Yumbe District; Mr. Kawawa Rashid, DEO, Yumbe DLG; Mr. Cema Philliam, DEO, Arua DLG; Ms. Kesubi Nice Alex, BNU, Arua District; Babua Fred, Arua Moyo Nebbi Beekeepers' Association, Arua District; Mr. Khauka Edmond, Beemaster, Mbale DLG; Mr. Ogwoli Geoffrey, DEO, Sironko DLG; Mr. Kisaali Bosco, Private Service Provider, Sironko District; Nyangas Simon, Private Service Provider, Kapchorwa District; Mr. Oluka Michael, DEO, Bukedea DLG; Mr. Esima Mike, Private Service Provider, Soroti District; Mr. Kwikiriza Jibril, Ag. DEO, Masindi DLG; Mr. Mugisha Daudi, Assistant Entomologist, Hoima DLG; Mr. Kasangaki Patrice, DEO, Kibaale DLG; Mr. Kasereka J. Muranga, Rwenzori Mountains Development Organization (REMODA), Kasese District; Mr. Besekya Hilary, Tropical Bee Care Centre, Bushenyi District; Mr. Tumuhimbise Gordon, DEO, Bushenyi DLG; Mrs. Margaret Rose Ogaba, Kitgum Women Beekeepers' Association (KWOBA); Kaddu John (2012) Bee keeping equipment manufacturer and trainer Kampala, Uganda.

Thanks to all the people who participated actively in constructive discussions during workshops organized, but not mentioned here.

Last but not least, great thanks to Mrs. Kangave Alice, Principal Entomologist Productive Insects/Manager Apiculture Promotion Sub Component of FIEFOC Project, DLH&E, MAAIF Hqtrs; Mr. Butele Cosmas Alfred, Senior Entomologist Apiculture, DLH&E, MAAIF Hqtrs; and Mr. Onzoma Apollo, Senior Training Officer, HRD, MAAIF Hqtrs for having compiled the literature and views provided, and editing.

Dr. Nicholas Kauta
COMMISSIONER, LIVESTOCK HEALTH AND ENTOMOLOGY

List of Acronyms

ADB	-	African Development Bank
BNU	-	Bee Natural Uganda Ltd
BQV	-	Black Queen Virus disease
DAO	-	District Agricultural Officer
DEO	-	District Entomology Officer
DLG	-	District Local Government
DLH&E	-	Department of Livestock Health and Entomology
FIEFOC	-	Farm Income Enhancement and Forest Conservation Project
FIG	-	Figure
GoU	-	Government of Uganda
HIV/AIDS	-	Human Immune Virus/Acquired Immune Deficiency Syndrome
Hqtrs	-	Headquarters
HRD	-	Human Resource Department
Hrs	-	Hours
KBA	-	Kabarole Beekeeper's Association
KTB	-	Kenya Top Bar beehives
KWOBA	-	Kitgum Women Beekeepers' Association
MAAIF	-	Ministry of Agriculture, Animal Industry and Fisheries
MBA	-	Moyo Beekeeper's Association
NAC	-	National Apiculture Centre
NGO	-	Non-Governmental Organization
PE	-	Principal Entomologist
PSP	-	Private Service Provider
REMODA	-	Rwenzori Mountains Development Organization
SE	-	Senior Entomologist
STO	-	Senior Training Officer
TVs	-	Televisions

INTRODUCTION

Over the years several private service providers, NGOs, Projects, Government agencies and departments have been carrying out training of farmers in beekeeping in their own ways without uniformity. In other words there have been many different training manuals/guides being used by the different stakeholders in the apiculture industry, some of which are sub-standard. This practice has for long undermined efforts to enforce compliance to code of practice, standard operating procedures and quality standards in apiculture industry, hence the need for harmonization and uniformity.

The African Development Bank and the Government of Uganda through the Farm Income Enhancement and Forest Conservation (FIEFOC) Project, under Apiculture Promotion sub-component embarked on a series of interventions which include among others, standardization of the national training document. The project therefore provided funds to develop a national beekeeping training and extension manual as a strategy to promote compliance to standards in beekeeping industry in Uganda.

The process of developing the national bee keeping training and extension manual had stages and started in February 2009 with field trips organized for collection of literature from various regions and districts (see appendix 1). This was followed with a 2 day retreat, organized for selected entomologists and private service providers at Ulrika Guest House, Kisubi, 7th - 8th May 2009 (see appendix 2). The aim of the retreat was to consolidate and analyse the literature collected and come up with standard modular training manual for use throughout Uganda. The first draft manual was produced and several consultative workshops followed to finalize it.

The manual is categorized into four(4) broad chapters, namely:

(1) The Honeybee and its importanc

(2) Management of the Honeybee

(3) Hive Products and processing, and

(4) Explanation of common beekeeping terms.

This National Beekeeping Training and Extension Manual have been developed to streamline and harmonize the beekeeping training and extension for the stakeholders involved in the Industry. It will later be translated into major languages of Uganda in order to promote its usage and adoption.

CHAPTER ONE

THE HONEY BEE AND ITS IMPORTANCE

MODULE 1: BEE BIOLOGY AND BEHAVIOUR

INTRODUCTION

There are various types of bees which include the stingless bees, solitary bees, honey bees. This manual focuses on honey bees.

Honey Bees belong to the animal kingdom, Phylum Arthropoda, Order Hymenoptera, class Insecta, Super family Apoidea, family Apidae, genus Apis. The genus *Apis* is divided into several species and sub-species/ races but the 5 main species are: *Apis dorsata* (the giant honeybee), *Apis laboriosa* (the darker giant honeybee), *Apis florea* (the dwarf honeybee), *Apis cerana* and *Apis mellifera*. Research needs to be done to ascertain the major species available in Uganda.

Honey bees are social insects that live in colonies of 10,000 to 60,000 bees. A colony consists of a queen (fertile female), a few hundred drones (males) and thousands of workers (sterile females). They pollinate flowering plants and crops. They also produce honey, beeswax and other bee products of very high economic value.

Learning objectives

By the end of the session, participants will be able to:-

1) Identify the different castes of honey bee colony.
2) State the roles played by the different castes in a honey bee colony.
3) Explain the life cycle of the different bee castes.

Target Participants:

Beekeepers, extension service providers, individuals and organizations/Institutions.

Suggested Number of Participants:

A maximum of 30 persons

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, bees and/or pictures of bees, TVs, Projectors, generators, films about bees and hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Field exercise to identify the different castes in a bee colony

Steps:

Step 1

Write the title **"Bee biology and behavior"** on the chalkboard or flip chart

Step 2

Engage the participants to brainstorm on the meaning of bee biology and behavior.

Step 3

Explain bee biology and behavior to the participants

Step 4

Allocate the participants in 3 groups and assign them the following tasks:

Group 1: Discuss the roles played by the different castes in a bee colony

Group 2: Describe the life cycle of different honey bee castes

Group 3: Discuss the behavior of the bee in different seasons of the year

Step 5

In plenary, participants present findings, the trainer clarifies, summarizes and gives out the hand outs.

HAND OUT: Bee Biology and Behaviour

There are various types of bees which include the stingless bees, solitary bees, honey bees. This manual focuses on honey bees.

Honey Bees belong to the animal kingdom, Phylum Arthropoda, Order Hymenoptera, class Insecta, Super family Apoidea, family Apidae, genus Apis. The genus *Apis* is divided into several species and sub-species/ races but the 5 main species are: *Apis dorsata* (the giant honeybee), *Apis laboriosa* (the darker giant honeybee), *Apis florea* (the dwarf honeybee), *Apis cerana* and *Apis mellifera*. Research needs to be done to ascertain the major species available in Uganda.

1. Castes in a bee colony

Honey Bees are social insects that live in colonies of about 10,000 to 60,000 bees. A colony consists of a queen (fertile female), a few hundred drones (males) and thousands of workers (sterile females). They pollinate flowering plants and crops.

Bees:

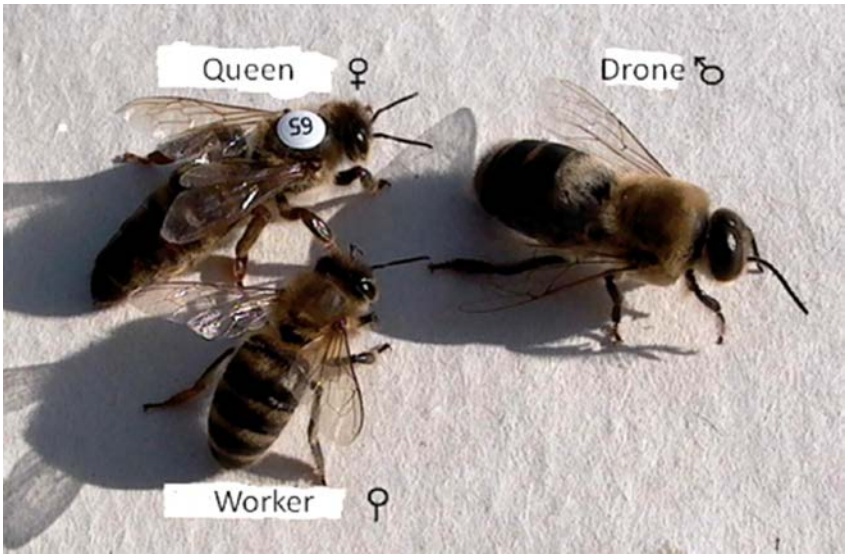


Fig.1: The honeybee castes in a colony

Queen bee

The Queen bee is a reproductive female. There is only one queen in the hive and her job is to lay eggs and produce queen substance (pheromones). When a new queen starts life, she mates only once with drones outside the hive. A good queen lays between 1,500 - 2,000 eggs per day but after two years she lays fewer

eggs. She lives for three to five years. It is very difficult to find the queen but she can be recognized by her long and slender body and short wings. She is fed by the young workers and is bigger than the other occupants due to massive feeding especially with royal jelly. She has a sting that is only used against rival queens. Her pheromones or scents serve to control the other bees and harmonize the colony's behaviour.

The Queen bee can be marked on the dorsal surface of the abdomen for easy identification and to avoid being crushed accidentally during hive manipulations.

Drones

The Drones are males and are bigger than the workers. They develop from unfertilized eggs and their major task is to mate with the queen. They are stingless, very large eyes which are used to spot the Queen during mating. Drones look large and square and make a loud buzzing noise when they fly. Drones are dependent on the workers for food because their proboscis is short and cannot collect food for them. There can be about 200 to 500 drones in a hive but in time of food shortage the workers chase the drones out of the hive to die. Their lifespan is usually not more than 2 months.

The Workers

Most of the bees in the hive are workers- they are all sterile females. The worker bees' change tasks according to age. Young worker bees clean the hive, feed both young and the Queen and make the beeswax combs. They control the temperature of the hive by flapping their wings and also guard the hive. Older workers scout for food and collect the pollen, nectar, water and propolis. They have a sting plus special glands and organs to help them to defend the colony against enemies. The workers are also responsible for the honey formation process.

The lifespan of a worker bee is 7-8 weeks during the main flowering season when they work hard. They can live longer during dormant periods.

2. Life cycle of a bee

Each bee in the course of its life passes through 4 stage metamorphosis: Egg→ Larva→ Pupa→Adult. During the development stages, the eggs, larvae and pupae are known as brood.

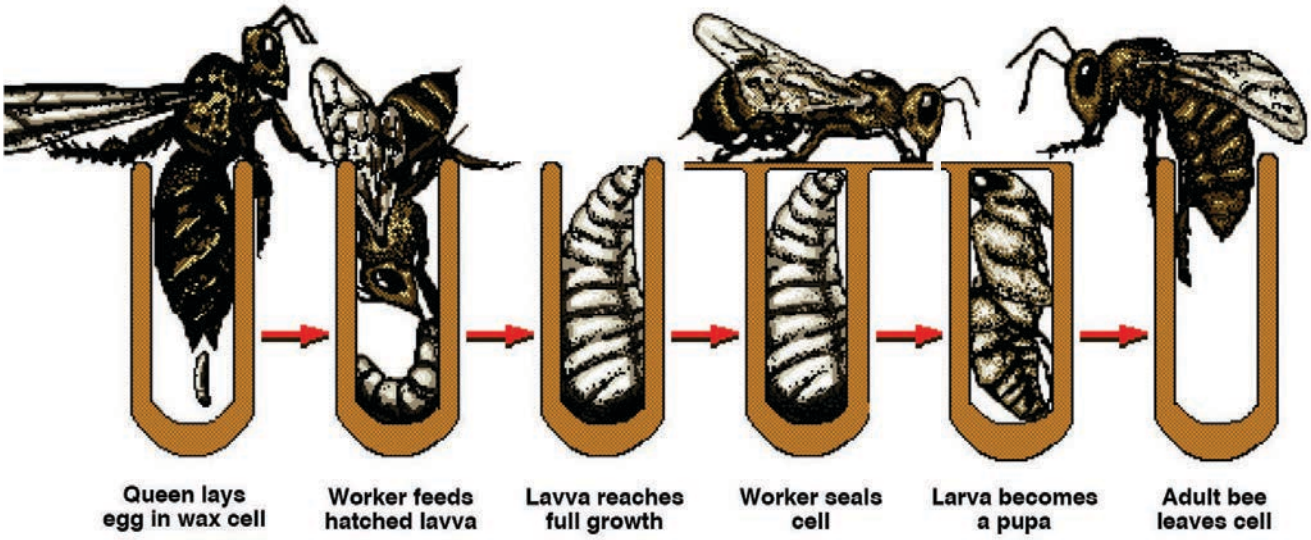


Fig.2: Diagram of the life cycle of the honeybee

The egg laid by the queen looks like a small grain of rice or hair nit. Whether an egg will develop into a queen, drone or worker depends on the type of cell it is laid in *(it is very important to learn the difference between capped brood and capped honey – capped brood is usually dark brown and capped honey is usually white or creamy in colour)*.

The egg develops into larva, which looks like a white maggot. All larvae are fed on royal jelly for the first

three days after which larvae for workers and drones are fed on pollen (bee bread) and honey put into the cell by the nurse bees (younger worker bees). The queen feeds on royal jelly throughout the life.

Fig.3: Peanut-shaped queen cell

Fig.4: Queen cells

Fig.5: Pebbly textured drone cells

The larvae are sealed with a wax capping in the comb after six days where they turn into pupae and later emerge as adult bees as shown in the table below.

Table 1: Life span of bees

Caste	Egg	Larvae	Pupae	Total days
Worker	3	6	11 - 12	21
Queen	3	6	6 - 7	16
Drone	3	8 - 9	12 - 13	24

3. Communication in bees

Bees communicate with one another in a number of ways such as drumming feet, flapping wings like a 'dance' and use of pheromones. The dance performed by the scout bees is one way the bees inform each other of the location of food and how far away it is. There are several types of dances performed by the bees, but the main ones are the round dance and the waggle dance. The round dance is performed by bees that forage less than approximately 100 metres from the hive. Waggle dance is performed to locate food source beyond 100 metres from the hive. The scout bees also perform a characteristic dance to locate the new found home to which bees intend to swarm.

The queen releases a substance called a **"pheromone"** (sometimes called queen substance) which serves different functions. The pheromone enables her to identify members of the colony, to inhibit ovary development in worker bees, to prevent the workers from building queen cells, to help a swarm or colony to move as a cohesive unit, and to attract drones during mating flights. The absence of the queen substance (e.g. when the queen dies) produces opposite responses, i.e. worker bees begin to develop ovaries and to build queen cells, and a swarm searching for accommodation will not cluster but will divide into smaller groups that cannot support the normal life of a bee colony.

Colony decisions are taken by the collective behaviour of bees within one colony sharing the same odour, allowing guard bees to detect intruders.

MODULE 2: THE IMPORTANCE OF BEEKEEPING

Introduction

Beekeeping is the science and art of rearing bees. It is important to keep bees for the production of honey, beeswax, propolis, pollen (bee bread), royal jelly and bee venom; for food, medicine and income. Beekeeping is also important for pollination and recreational activities.

Learning Objectives

By the end of the session, participants will be able to:-

1. Understand and appreciate the importance of beekeeping in the society.
2. Describe the importance of the various bee products and services.

Target Participants:

Beekeepers, extension service providers, individuals and organizations / Institutions

Suggested Number of Participants:

A maximum of 30 persons

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, bee products and flowers and fruits/ their pictures, posters, TVs, Projectors, generators, films about bee products and services, and hand outs.

Methods

- Lectures
- Brainstorming
- Group discussions
- Case studies

Steps:

Step 1

Write the title **"THE IMPORTANCE OF BEEKEEPING"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on why it is important to keep bees.

Step 3

Allocate the participants in 2 groups and assign them the following tasks:-

Group 1: Discuss the importance of beekeeping

Group 2: Explain the importance of each bee product or service

Step 4

In plenary, participants present findings, the trainer clarifies, summarizes and gives out the hand outs.

HAND OUT: The importance of Beekeeping

Beekeeping is the science and art of keeping bees using best practices. Beekeeping is very important, for the production of honey, beeswax, propolis, pollen (bee bread), royal jelly and bee venom; for food, medicine and income. Beekeeping is also important for pollination and recreational activities.

There are various reasons for keeping bees, namely:-

1. For cultural purposes

Honey is used for beverage brewing and occasionally served at important cultural ceremonies such as weddings. It is also served to very important guests as sign of high regard. The Maji Maji rebellion used bees as a weapon to defend themselves against the colonialists. Honey was used in Egypt as cosmetics and also for embalming the Egyptians dead pharaohs. Honey was among the tithes and offertory given by the Jews to the Levites in their culture. In some African cultures honey is also used to pay dowry.

2. As source of food

Honey is delicious and nutritious. It is an important food for many people in Uganda. It is consumed whole or mixed with other foods as supplement. Among the Langi and Acholi, honey is mixed with simsim and groundnut paste. Bee brood (larvae and pupae) have high nutritional value and are fed to malnourished children. Royal jelly and pollen are consumed for their high protein value.

3. As source of medicine

Bee products such as bee venom, honey and propolis are used for treatment of many conditions following the antibiotic nature of the products. The conditions/diseases treated using bee products include stomach upsets, diarrhea, vomiting, wounds, burns, cough, measles, false teeth, toothaches and fungal infections. It also helps to boost the immunity of people living with HIV/AIDS.

4. For income generation

The honeybee products can be marketed locally or abroad to get money, with or without value addition. Beekeeping industry also provides incomes to various stakeholders in the value chain. These include bee farmers, artisans, pharmaceutical industry, food, beverage industry, honey dealers among others.

5. Pollination

The honeybees provide pollination services, thereby playing a vital role in food production and overall agricultural productivity. Over 75% of all the crops in sub Saharan Africa benefit from pollination. Bees are considered the most efficient pollinators because they have hairy bodies which easily pick up pollen grains as they move about in flowers. During a single day one bee may visit several hundred flowers. So bees are important to farmers. More bees means better pollination and high yields. In other countries pollination by bees is hired and fetches additional money to the beekeeper.

6. Conservation of natural resources

Beekeeping is a non destructive activity that could be employed in the conservation of biodiversity in protected areas. Households living adjacent these areas can support the conservation efforts of these resources by establishing apiaries within or at the boundary of these protected areas.

Farmers realizing that vegetation is a source of forage for bees will guard against the destruction and be encouraged to plant more plants for supplying pollen and nectar. In the process many plants are conserved and protected from destruction.

7. Hobby

Other people keep bees as a hobby.

8. Api-Tourism and research

Establishment of bee reserves for purposes of tourist attraction and research holds a big potential for the future.

9. Apitherapy

Bee products are used in the treatment of many human ailments. For example, bee venom is an important remedy for many ailments such as Arthritis, Parkinson disease and other diseases related to the nervous system. The venom can be obtained through bee stings.

10. Beekeeping is a cheap undertaking

(i) Beekeeping does not involve mass feeding of bees because in most cases the bees provide their own food all year round.

(ii) All the necessary inputs and technologies required for beekeeping are available locally. Some may be wasted if bees are not kept, e.g. pollen and nectar from flowering plants.

(iii) Honey and beeswax can be produced in semi-arid areas that are unsuitable for any other agricultural use. The beekeeper requires limited land to keep bees.

MODULE 3: POLLINATION

Introduction

Pollination is the transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant or another plant but of the same species. In other words, pollination is the mixing of the male and female parts of a flower. Pollination is a vital step in the reproduction of flowering plants and is necessary for all seed and fruit production.

Plants require pollen to be transferred from one plant to another and many depend upon insects to do this as they forage. Bees play a vital role in food production and overall agricultural productivity, as pollinators.

Learning Objectives

By the end of the session, participants will be able to:-

1. Define pollination
2. Understand the importance of pollination
3. Identify and list down bee forage plants in their areas
4. Construct a flowering calendar for their local areas
5. Explain possible dangers to bees arising from spraying crops with pesticides, during flowering stage.

Target Participants:

Beekeepers, crop farmers, extension service providers, individuals and organizations/Institutions

Suggested Number of Participants:

A maximum of 30 persons

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, worker bee, flowers, pictures, posters, video and hand outs .

Method

- Lectures
- Brainstorming
- Group discussions
- Field exercise- observing bee forage plants and pollination
- Activity- flowering calendar

STEPS

Step 1

Write the title "Pollination" on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on why pollination is important.

Step 3

Allocate the participants in 2 groups and assign them the following tasks:

Group 1: Identify and list bee forage plants in their areas.

Group 2: Explain the dangers of agricultural pesticide use on bees.

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise:

walk with the trainees around the local area to see how pollination takes place and to identify bee forage plants in the area

Step 6

Construct a flowering calendar for the local area

HAND OUT: Pollination

Plants require pollen to be transferred from one plant to another to aid reproduction. This transfer of pollen grains is called pollination. It can be transfer from the anther to the stigma of the same flower or another flower of the same plant or another plant but of the same species. In other words, pollination is the mixing of the male and female parts of a flower. Pollination is therefore a vital step in the reproduction of flowering plants and is necessary for all seed and fruit production. Over 75% of all the crops in sub Saharan Africa benefit from insect pollination. Other agents of pollination are wind, animals, birds, water, man and reptiles

Insects including bees forage plants for food, they visit many flowers a day in search of pollen and nectar. Many flowering plants depend upon these insects for the pollen transfer (pollination) as they forage. Adequate insect pollination improves the quality of the crop; uneven, misshaped and small fruits are often indication that pollination has been insufficient.

Among the insects, bees are considered the most efficient pollinators because they have hairy bodies which easily pick up pollen grains as they move about in flowers. During a single day one bee may visit several hundred flowers. Furthermore, bees are consistent foragers and tend to work one kind of flower at a time.

Scout bees will locate the best flowers and then encourage their hive mates to use the same source. Pollen from the anthers is trapped in hairs covering the bee and carried to the stigma of the same plant or another from the same species. This is the first step towards fertilization and the production of seeds and fruits.

Bees, therefore, play a vital role in food production and overall agricultural productivity, as pollinators. So beekeeping provides pollination services.

Fig 6: The worker bee visiting a flower, helping to pollinate the plant

In some countries the economic value of pollination is higher than the value of honey. Beekeepers move their hives to different bee forages in order to maximize honey flow and to improve crop pollination.

In America, India and China pollination by bees is hired and fetches additional money to the beekeeper. Growers are willing to rent hives from beekeepers. Hives are placed near to the blooming crops (especially fruit and oil seed crops) and removed after flowering. Many beekeepers make money in this way and still have the honey from the hive. They end up with a double profit!

In Uganda, examples of organizations that have practiced pollination services are:-

- Kawere Coffee Plantation in Mubende District.
- J. P. Cuttings in Lugaluga, Wakiso District.

Bees are known to increase and improve the yields of avocado, coffee, cotton, sunflower, mandarin, onion, papaya, beans, mango, bananas, and many other cash crops.

So bees are important to farmers. More bees mean better pollination and higher yields. If bees are killed, the value of crops is reduced. Therefore it is in everyone's interest to maintain strong population of honeybees. Insecticides kill bees and contaminate hive products. Farmers can help by selecting and using the recommended pesticides with great care and never using pesticides when flowers are open. Foraging insects work on open blossoms and will be killed if sprayed at this time. If pesticides must be used, it is best sprayed early or late in the day when crop flowers are closed and there is no wind to drift the spray onto other flowers or hives. Farmers should always try to choose a pesticide that attacks the pest but will not harm bees. Beekeepers should teach others the value of pollination by insects. They should also educate neighboring farmers about insecticides and their negative impact on the bee colony.

Forest trees are also important bee forage and forests are essential for the survival of bees. **No trees, no bees**: **no honey, no money**. Conserving forest biodiversity is therefore important for beekeepers. Forest trees native to Africa that are important for bees include among others:-

- *Acacia* species
- *Coffea* species

- *Combretum* species
- *Diospyrus* species
- *Dombeya* species
- *Julbernardia globiflora*
- *Pentaclethra macrophylla*
- *Vernonia amygdlina*
- *Calliandra callothyrsus*
- *Eucalyptus* sp.
- *Musa* sp.

There are commercially available and major sources of forage for bees to produce excellent honeys, and can flower all year round. The following are examples of such plants: black berry (*Rubus argutus*), calliandra (*Callindra callothyrsus*), Citrus (*Citrus* spp.) e.g. tangerine and orange, coffee (*Coffea* spp.), clover (*Trifolium incarnatum*), sunflower (*Helianthus* spp.), cotton (*Gossypium* spp.), mango (*Mangifera indica*), cashew (*Anacadinaceae*), neem (*Azadirachita indica*), eucalyptus (*Eucalyptus* sp.), banana (Musa sp.), bottle brush and passion fruit.

Bees forage on different flowers in different areas depending on what is available. Most plants flower only at certain times of the year but bees need food over many months, so a variety of plants must be available. It is a good idea to identify which plants bees feed on in your area. It is then possible to plant flowering plants around apiaries to ensure the bees have adequate forage when they need it. Wild plants should be allowed to grow wherever there is space, including by the side of roads, near houses and in between fields. Produce a flowering calendar listing the flowers that are available each month of the year.

CHAPTER TWO

MANAGEMENT OF THE HONEY BEE

MODULE 4: BEEKEEPING SYSTEMS

Introduction

The long relationship between humans and honey bees started with honey hunting. To reduce the hardship and unpredictability of harvesting from wild colonies, people found ways to increase their control over bees through the ownership and management of colonies kept in hives. Currently, there are various beekeeping systems used, ranging from the local/traditional methods to the modern systems.

Learning Objectives

By the end of the session, participants will be able to:-

1. Appreciate the importance of keeping bees in hives.
2. Describe the different beekeeping systems.
3. Understand the economic importance of the different beekeeping systems.
4. Select the most appropriate beekeeping system (the best hive type) for their areas based on cost benefit analysis.

Target Participants:

Beekeepers, extension service providers, individuals and organizations/Institutions

Suggested Number of Participants:

A maximum of 30 persons

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, different bee hives / their pictures, posters and hand outs.

Method

- Lecture
- Brainstorming
- Group discussion

STEPS

Step 1

Write the title **"BEEKEEPING SYSTEMS"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the different beekeeping systems in their areas.

Step 3

Allocate the participants in 3 groups and assign them the following tasks:

Group 1: Explain why people keep bees in hives

Group 2: Explain the different beekeeping systems in their areas

Group 3: Discuss the economic importance of the different beekeeping systems

Step 4

In plenary, participants present findings, the trainer clarifies, summarizes and engages them on cost benefit analysis of different bee keeping systems and gives out the hand outs.

HAND OUT: Beekeeping Systems

There are different beekeeping systems used and these include:-

(a) Honey hunting and bee-killing

The long relationship between humans and honey bees started with honey hunting in the wild. Honey hunting continues in some communities to date. It involves killing the bees in the wild colony so as to obtain combs containing honey and brood (larvae and pupae). This primitive method involves use of open fire to kill the bees, eventually destroying not only the colony but also the environment as bushes are set on fire in the process of harvesting honey.

Advantages

- Minimal work and knowledge is required
- There is no investment or expenditure involved

Disadvantages

- Nests and bees are destroyed
- Bees may become aggressive
- Remaining bees may abscond
- Access to the nests can be far and dangerous
- Combs get mixed up during harvesting hence producing poor quality honey
- Environment is destroyed if trees are cut down or set on fire.

To reduce the hardship and unpredictability of harvesting from wild colonies, people found ways to increase their control over bees through the ownership and management of colonies kept in hives. These beekeeping systems range from the local/traditional methods to the modern systems.

(b) Bee-having

This is an intermediate step between honey hunting/bee-killing and beekeeping. In bee-having, bees are housed in hollowed sections of tree trunks, clay pots, gourds, bark hives, or woven twigs and mud baskets. Combs containing honey are fixed and removed periodically. The farmer provides protection to the bee colony in return for periodic harvests of honey, wax and other bee products. The idea is to maintain the colony for future harvests instead of destroying it for a one-time harvest.

Both bee-killing and bee-having are carried on with very little understanding of the biology of the bee. It is not uncommon to find bee-having among farmers who have relatively sophisticated equipment which allows for management of their colonies. They remain bee-havers because they lack the training to make optimum use of their equipment.

This method is sometimes referred to as local/traditional.

Advantages

- Bees and nests are conserved
- Minimum cost (cheap locally available materials and labor)
- Suitable for defensive bees
- Less risky than honey hunting
- Hives can be placed near homes

Disadvantages

- Combs are fixed and must be broken during harvesting
- Honey yields are modest
- Hive inspection is difficult.

(c) Beekeeping

Beekeeping implies the manipulation of a bee colony based on some understanding of the bees. This gives great ease of management and harvesting for higher yields and better quality of honey. Beekeeping therefore can be lucrative at any level of technology, but the level used should fit together with the local cultural and economic reality.

There are 3 categories of beekeeping namely:-

(i) Local/traditional beekeeping in fixed comb hives.

(ii) Transitional (between local/traditional beekeeping and modern beekeeping): in top bar hives.

(iii) Modern beekeeping: in frame hives

Advantages

- Hives can be managed efficiently
- Bees are less disturbed and therefore less defensive
- Hives are easy to visit, harvest, treat, feed, unite and divide
- Hives can be made to the right volume and combs are movable
- Honey and beeswax can be of good quality

Disadvantages

- Equipment can be costly
- External financial support and donated equipment may be required
- Hive must be made very precisely in order to work effectively
- Diseases and pests can be spread easily due to movement of equipments.
- More knowledge and skills are required

Choosing the most appropriate hive type

The best hive is one that is appropriate given the materials that are available, and the skills and financial resources of the beekeeper. The simpler and cheaper a hive is to make, the more people will be able to take part in beekeeping. An expensive system does not necessarily result in higher output. To avoid unnecessary debt and dependence on external support, beekeepers should be able to make or buy cheap hives made from local materials. This independence gives them the freedom to get started in beekeeping and expand their business. Honey harvests are affected by the availability of forage for bees, the strength of the colony, and the size of the container used as a hive. It is not simply the type of hive that determines how much honey the bees will store but also the size.

Features of an appropriate hive

- **Attractive for bees** - dry, correct size, nice scent, easy to protect from pests and predators.
- **Suitable for the beekeeper** - affordable, manageable, locally available, sustainable.

Fixed comb (local/traditional) hives

Fixed comb hives are containers made from whatever materials are locally available, such as grasses, logs, bark, raffia palm, clay, etc. Bees build their nest inside the container, just as they would build in a naturally occurring cavity. The bees attach the combs to the inside upper surface of the hive. The honeycombs need to be cut off from this surface to be harvested and cannot then be replaced.

Fixed comb hives such as the hollowed out logs, bark hives, clay pots and woven grasses, etc are cheap to construct, relatively easy to manage and suitable for defensive bees like in tropical Africa, including Uganda. The main inputs are local knowledge and local materials, rather than external financial support and donated equipment. Fixed comb hives, usually cylindrical in shape, have been used in Africa for generations. A variety of different styles can be found across the continent, from hollowed-out logs and bark formed into cylinders, to clay pots and woven grasses. Local methods have evolved over a long period to suit local resources and indigenous bees. Honey bee brood diseases are not observed to cause problems in fixed comb hives, probably because of the frequent movement of tropical honey bee colonies and their rebuilding of combs, thereby the brood is reared in fresh combs, leaving no chance for the brood diseases to persist and accumulate.

Fixed comb hives are a proven technology that have stood the test of time and can be highly profitable. The replacement of fixed comb hives with other hive types should not be considered necessarily inevitable or desirable. Cost-benefit analyses prove that fixed comb hives are more profitable than other hive types in tropical Africa. Most honey harvested in tropical Africa today comes from fixed comb hives e.g. in the North West Province of Zambia, beekeepers harvest high quality honey and beeswax from fixed comb and export these products to the European Union.

Top bar (transitional) hives

Top-bar hives are boxes with a series of bars arranged side by side along the top. Bees are encouraged to construct their combs from the undersides of these top-bars. Top-bars enable the beekeeper to lift individual combs out of the hive for inspection. Combs containing unripe honey or brood can be replaced and those containing ripe honey can be removed for harvest.

Harvesting honey and beeswax from top-bar hives is simple and can be achieved without damage to the colony. Top-bar hives are particularly suitable for beginner beekeepers because it is often easier to learn how to manage and harvest from a top-bar hive than from a fixed comb hive. Installed at waist height and kept close to home, top-bar hives are often popular with women. All the equipment needed for top-bar hive beekeeping can be bought or made locally. Top-bar hives are often introduced by projects keen to promote new and seemingly modern ideas, yet they function well only if the beekeeper understands the bees, the benefits and limitations. Poor use of top-bar hives can lead to disappointment and abandonment.

Frame hives

Frame hive is a box with movable frames. This type of hive is appropriate in tropical Africa but is expensive to buy and maintain, machinery is required to extract the honey. Beeswax yields from frame hives are low compared to fixed comb hives.

MODULE 5: BEEKEEPING EQUIPMENT

Introduction

Many different types of equipment are used in beekeeping industry right from the apiary through harvesting and processing to transporting and storage of hive products.

Learning Objectives

By the end of the session, participants will be able to:-

1. Identify the different beekeeping equipment and their uses
2. Demonstrate the operation and use of the various beekeeping equipment

Target Participant

Beekeepers, extension service providers, artisans, individuals and organizations/Institutions

Suggested Number of Participants:

Maximum 30

Duration:

4 hours.

Materials

- Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, beekeeping equipment and/or their pictures and hand outs.

Method

- Lectures
- Brain storming
- Demonstrations
- Group Discussions

STEPS

Step 1

Write the title **"BEEKEEPING EQUIPMENT"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the different beekeeping equipment in their areas.

Step 3

Allocate the participants in 3 groups and assign them the following tasks:

Group 1: Identify the different beekeeping equipment and their uses

Group 2: Demonstrate the operation and use of the various types of beekeeping equipment

Group 3: Discuss the economic importance of the various types of beekeeping equipment

Step 4

In plenary, participants present findings, the trainer clarifies, demonstrates, summarizes and gives out the notes.

HAND OUTS: Bee Keeping Equipment

Introduction

Beekeeping equipments include beehives, harvesting gear, processing gear, storage and transportation facilities.

1. Bee hives

Types of beehives

1. Traditional hives (fixed comb hives)

a. Woven basket hive

- They vary in shape, size and type of materials used for example they can be conical or cylindrical in shape, the cylindrical one measures approximately 90 cm in length and 30 cm in diameter
- **Materials:** papyrus, bamboo, fibre, twigs or sticks, cow dung or soil for smearing, grass or banana fibre or dry banana leaves as cover. Durability of the hive depends on the materials used and management.
- One end completely closed, One end bearing 5 - 6 holes of diameter 8 - 10 mm in a row

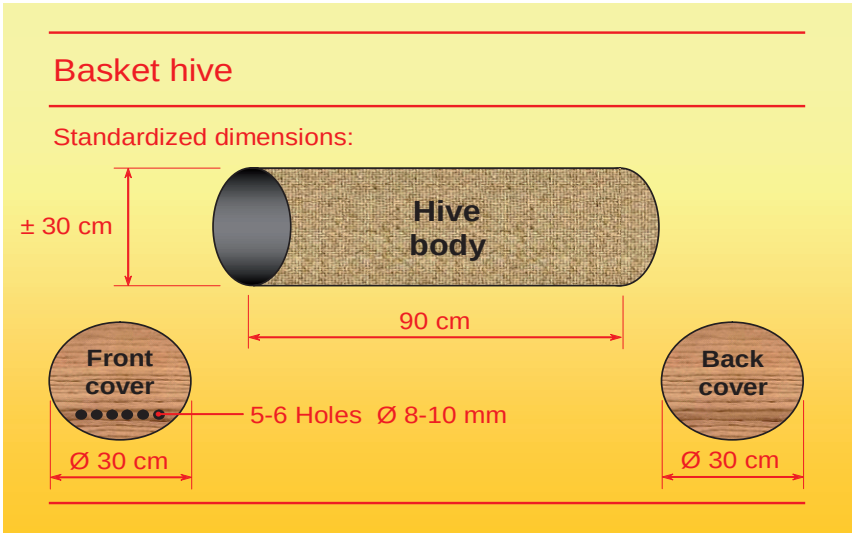


Fig 7: Measurements for Woven basket hive

Fig 8: Woven basket hive

Advantages

- Cheap
- Materials are locally available
- Does not require a lot of skills and technology
- High propolis productivity.
- High wax productivity

Disadvantages

- Difficult to inspect
- Combs break when transported over long distances
- Production is limited since hive cannot be extended
- Difficult to harvest and a lot of smoke is needed
- Difficult to determine harvesting capacity or volume because of differences in length and diameter.
- Swarming and absconding are common

b. Log hive

- Cylindrical in shape.
- One end closed but one end bears the entrance hole for the bees

Fig 9: The log hive

Advantages

- Cheap
- Materials are locally available
- Does not require a lot of skills and technology
- High wax productivity
- Durable with good practices
- High colonization rate.

Disadvantages

- Difficult to inspect
- Combs break when transported over long distances
- Production is limited since hive cannot be extended
- Difficult to harvest and a lot of smoke is needed
- Difficult to determine harvesting capacity or volume because of differences in length and diameter.
- Swarming and absconding are common

c. Clay hive:

- Made from baked clay soil
- Can take the cylindrical or oval shapes
- The cylindrical has entrances at one end
- The oval shape has entrances at the bottom with the top covered a plank of wood.

Fig 10: Clay hives

Advantages

- Cheap
- Materials are locally available
- Does not require a lot of skills and technology
- High wax productivity
- High colonization rate

Disadvantages

- Difficult to inspect
- Delicate to transport as it may fall and break
- Production is limited since hive cannot be extended
- Difficult to harvest and a lot of smoke is needed
- Difficult to determine harvesting capacity or volume because of differences in shape.
- Swarming and absconding are common

d. Johnson hive

- Made from well seasoned timber of Musizi, Nkago, Nkuzanyana and Muvule measuring 12 x 1 inches.
- Doors measure 30 X 30 cm
- Sides measure 91 cm X 30 cm
- Top board measures 97 cm X 30 cm with iron sheet cover
- Bottom measures 91 cm X 26 cm
- With a queen excluder in the middle
- With entrances on either side of the excluder
- Wire loops for hanging

Fig: 11: Picture of Johnson hive

Advantages:

- Separates honey from brood
- High wax production

Disadvantages

- There may be two colonies in the hive creating confusion
- A colony may seal off the queen excluder with propolis and remain on one side of the hive.
- Combs break when transported over long distances
- Production is limited since hive cannot be extended
- Swarming and absconding are common

2. Improved hives (movable top bar hives)

a) Kenyan Top Bar Hive

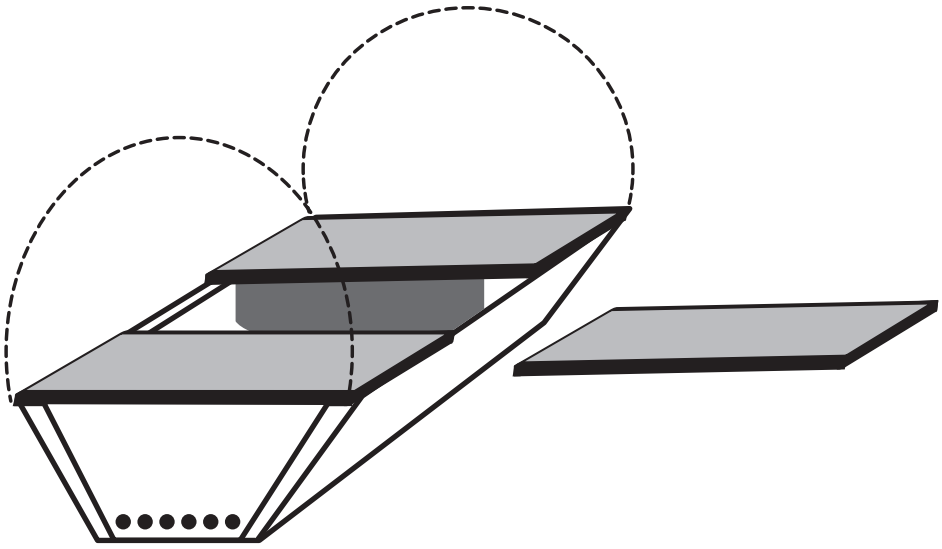


Fig 12: KTB hive showing how the comb attaches to the bar inside the hive

Fig 13: A top bar lifted from a KTB hive

Fig 14: A KTB hive being opened

NB:

1. All top bar hives should have top bars with dimension of width of 3.2 cm and a length of approximately 48cm.
2. Kenya top bar hive can be made out of bricks, timber, bamboo, papyrus, basket and clay.
3. The cover can be fabricated provided it is waterproof material e.g. Plastic sheets, grass, banana fibers, and mats

Advantages

- Colony splitting and multiplication easy.
- Control of swarming is possible.
- Easy to inspect to know the condition of the colony
- Harvesting is easy and possible to select sealed combed (ripe) honey
- Materials for construction are available
- Durable
- High colonization rate when baited.

Disadvantages

- It requires high skills and technology to manufacture
- Expensive for an ordinary person to afford
- Production is limited as it can not be expanded
- Combs can easily break while in transit

b) KTB Catcher box:

The KTB catcher box is usually a quarter of the actual KTB hive. It is used for trapping passing bee swarms in the wild.

Fig 15: Catcher box for a KTB hive

3. Modern hives (Movable frame hives):

Examples: **Langstroth** and **Dadant**

Frames arranged vertically right on top of the brood chamber (super)

a) Langstroth hive:

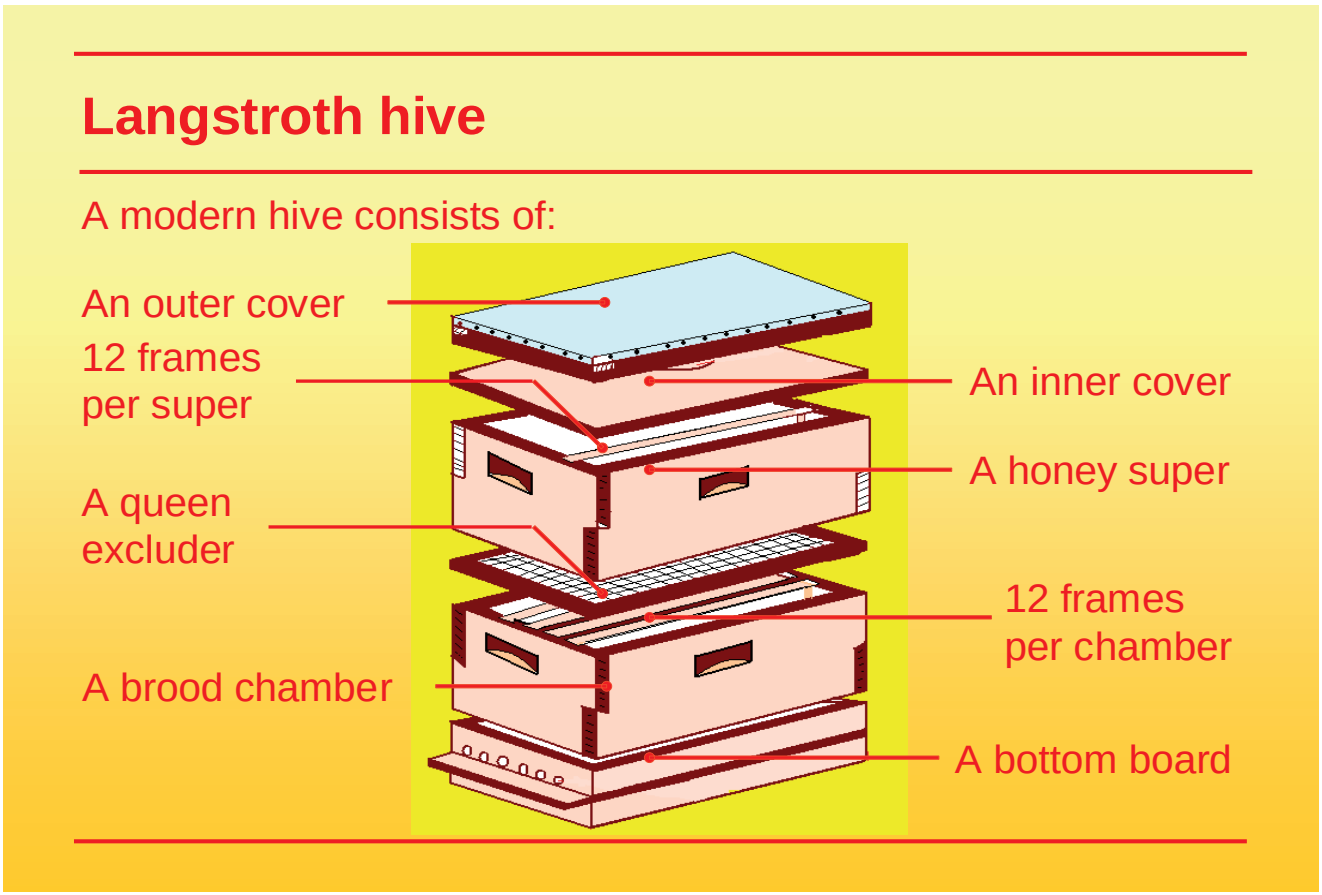


Fig 16: Langstroth hive showing the different parts of the hive

Fig 17: Langstroth hive

Fig 18: Langstroth hive- brood chamber, empty frame, honey chamber, combed frame, queen excluder, cover

Fig 19: Catcher box for a Langstroth hive

Advantages of Langstroth / Dadant hives

- Transportable
- High honey yield
- Easy to inspect and harvest
- Easy to control swarming
- Bee breeding and queen rearing possible
- Long lasting

Disadvantages of Langstroth / Dadant hives

- Very expensive
- Some of the materials for construction need to be imported
- Requires high skills and technology
- Production of other hive products is very minimal (wax and propolis)
- Requires high management skills.
- It is prone to pest and disease attack.

b) Brick frame hive

- The main body of a frame brick hive is made of bricks with 2 sides, a front with holes for bees to enter and a back.
- 28 frames
- A cover for protection against rain

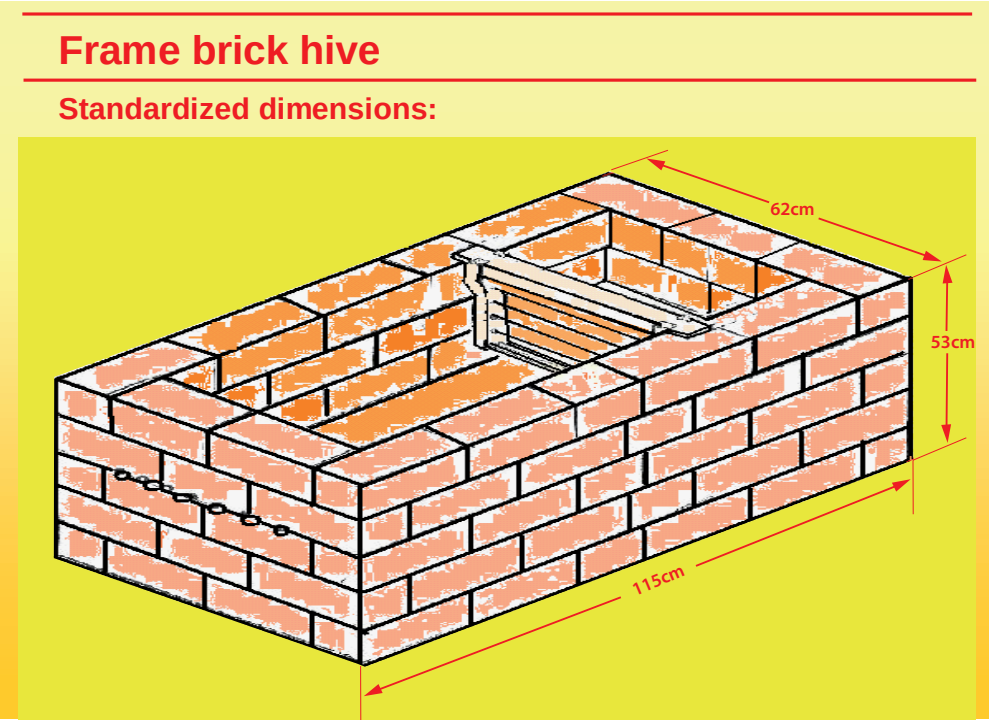


Fig 20:Frame brick hive

Advantages

- High honey productivity
- Easy to manage, inspect and harvest
- Long lasting
- Breeding of bees possible
- Not expensive
- Materials locally available
- Having natural insulation properties

Disadvantages

- The frames require high level of skills to construct
- Not transportable
- More prone to pests, diseases and floods

2. Bee harvesting gear

a) Smokers

The body consists of a galvanized metallic sheet of gauge 28 canon and pumping bellow.

The canon has a chamber with 2 holes- one for incoming air and the other one to let out smoke. Inside the chamber is placed a sieve to protect the inlet from being blocked with ash.

The pumping bellow consists of 2 pieces of wood of size 12 cm X 20 cm, returnable spring, leather or canvas material.

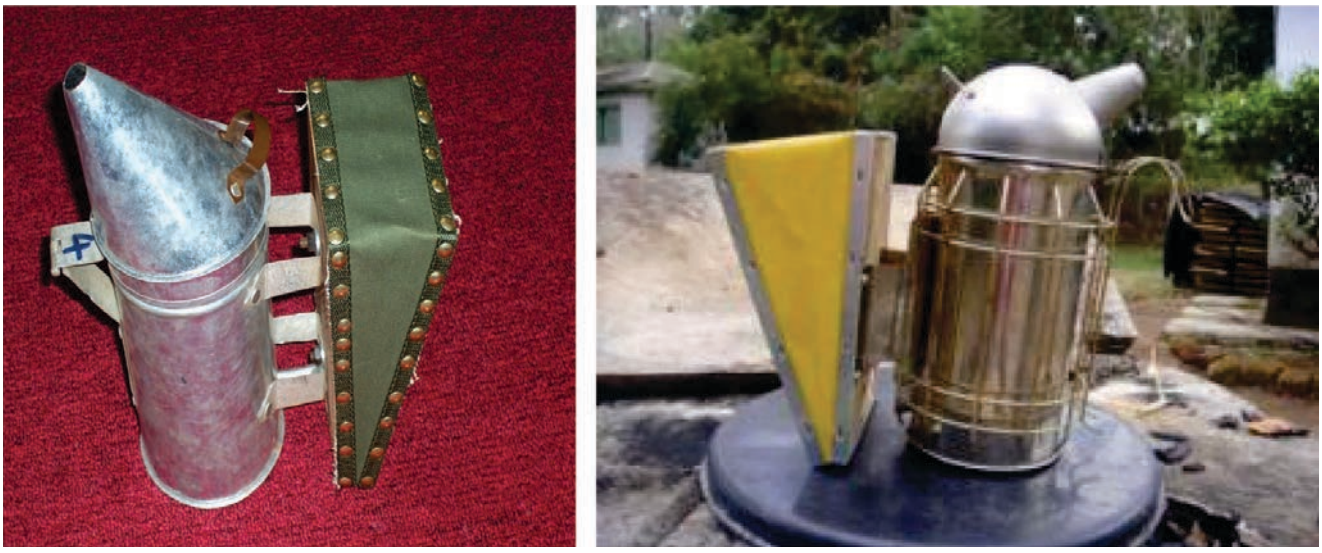


Fig 21: Bee smokers

Recommended materials for smoking

- Semi dry grass
- Wood shaving
- Coffee husks
- Maize comb
- Bean husks
- Millet husks
- Dry cactus
- Dry pawpaw stem Etc.

Recommended procedures in lighting a smoker

- Put glowing charcoal on the sieve in the canon chamber, followed by any of the smoking materials mentioned above, filling the chamber 3 quarter way.
- Before closing the smoker fill the canopy i.e. the last quarter with fresh green grass or leaves.
- Gently, start pumping the bellow and smoking

b) Bee suit

Consists of an overall and a head veil; the overall is made of white or yellow khaki material with a head veil attached to it. The net of the head veil is made out of strong black nylon material in order to have good vision and ventilation. The hat of the veil consists of the same khaki material of the overall with a round stretching stiff ring of approximate diameter of 42 cm. The veil is attached to the overall with a double zip and can be detached. The overall should cover whole body right from the legs, arms up to the neck with a long jacket zipper from the fry up to the neck. The overall should be fitting loosely (not tight) with provision of pockets; at least

4 pockets - 2 at the chest and 2 around the thighs. There should be elastic of code 16 at the wrist and ankles.

Fig 22: Bee suit

c) Bee gloves

Can be made of soft leather material or soft latex gloves, joined with a piece of cloth of the same khaki material and colour of white or yellow as that of the overall, reaching up to the elbow fixed with an elastic of code 16.

Fig 23: Soft latex gloves

d) Gumboots

Gumboots to be used by a beekeeper should be white in colour and of his/her own size. One can innovate a gumboot out of polythene sacks used for carrying maize, beans, sugar and used as overshoes and tie over the overall near the knee.

e) Hive tool set

Consists of a bee brush, hive opener and stainless steel knife:

- The bee brush should be made of soft natural fibre e.g. sisal fibre. One can also use bird quill feather or very soft leaves or grass provided they are clean.
- The hive opener is made out of flat iron bar of 6mm thickness, width of 25mm and length of 24cm. The hive opener is sharpened at both ends but curved at one end and should be painted with rustproof paint to avoid contamination of honey with corrosion and rusting with honey.

Fig 24: Bee brushes

Fig 25: Hive openers

Fig 26: Knife

3. Bee processing Equipment

a) Air-tight buckets

They should be white or yellow in colour and of food grade material of capacity not more than 25kgs for ease of transportation.

Fig 27: Airtight Bucket (food grade)

b) Food grade drums

The drum must be made of stainless steel, air-tight and rested on wooden pallets.

Fig 28: Food grade drum

c) Refractometer

It is a machine used to determine the percentage of moisture in honey. It is imported ready made.

Fig 29: Honey refractometer

How to use a refractometer

Open the slide cover and put a drop of honey sample and cover. Hold against light, view from the eye piece and adjust accordingly until you get a dark border line; where it marks is the percentage of the water content of that sample. Then, clean the slide thereafter.

d) Weighing scale

It is a device used to weigh honey, beeswax and other bee products. There are 3 types of weighing scales commonly used in Uganda, namely:-

(i) Platform Weighing Scale.

- It comprises of a platform and a scaled arm.

How to use a platform weighing scale

Put the container with the bee product in question on the platform and adjust the scaled arm until it balances. The reading where it balances gives you the weight of the product in the container.

ii) Clock Face Weighing Scale

It has a scaled clock face with a pointer, 2 hooks and re-setting nut. These weighing scales vary with maximum weighing capacity ranging from 25kgs to 200kgs.

How to use a Clock Face Weighing Scale

1. Re-set the pointer to 0' mark using a re-setting nut.
2. Use upper hook for suspending the scale in a rope tied to a horizontal bar.
3. Hang the container with the product on to the lower hook.
4. Take the reading from the scale where the pointer ends and record.

iii) Clock face-with- weighing bowl-and-base weighing scale

It has a scaled clock face with a pointer, a bowl, a base and re-setting nut. They vary with maximum weighing capacity ranging from 1 gram to 2kgs.

How to use a Clock face-with- weighing bowl-and-base weighing scale

1. Re-set the pointer to 0' mark using a re-setting nut.
2. Put the container with the product on the bowl.
3. Take the reading from the scale where the pointer ends and record.
4. Used to weigh small quantities

e) Straining cloth:

Fig 30 (a): Straining cloth

Fig. 30 (b) Straining cloth tied around a bucket ready for straining honey

f) Centrifuge extractor

It is a machine used to extract honey from combs and framed combs. It comes ready made. Some are made of food grade plastic while others made of food grade stainless steel. They have extracting capacity ranging from 2 frames to 18. The combs or frames are arranged either radially, triangularly or rectangularly in order to extract honey. There are manual extractors as well as the electrical ones.

All types have a spout for draining the honey out of the tank. The bottom is convex inside to allow all the honey to drain. They are fitted on 3 stands. The main body is cylindrical. They have 2 transparent plastic covers.

Fig 31: Centrifuge extractor

g) Honey settling Tank

There are 2 types; food grade plastic tanks and stainless steel tanks. They vary in capacity from 25, 50, 100, 200 and then 400kgs. It has a cover and a spout with a convex bottom inside. Some come with inbuilt honey strainer while others come with separate double strainers.

Fig 32: Honey settling tank

h) Honey Press:

Fig 33: Honey Press

i) Honey jars:

Fig. 34: Honey jars

j) Bee house:

Fig 35: Bee house

k) Honey collection and processing premises:

1. The honey processing environment should be free of pests, contaminants and pollutants i.e. it should be free from filth, fumes, stagnant water/breeding places for mosquitoes, swampy areas, agrochemicals, human or animal waste or garbage.
2. The premises should be suitable in size for the purpose of handling/processing food
3. It should be spacious to allow smooth flow of processes
4. Adequate lighting should be provided
5. It should be vermin and bee proof
6. Have good drainage
7. Have high roof-the ceilings shall be smooth, impervious and easy to clean

MODULE 6: MAKING BEEKEEPING EQUIPMENT

Introduction

Most beekeeping equipment can be made locally or simply using the local materials. It is therefore important to know the recommended dimensions and how to make some of the key equipment required for primary production at the apiary.

Learning objectives

By the end of the session, participants will be able to:-

1. Explain the dimensions of beekeeping equipment
2. Make different bee keeping equipments and tools.

Target Participant:

Artisans, beekeepers, service providers, individuals or organizations

Suggested Number of Participants:

Maximum 20

Duration:

2 hours (classroom), 3 days for practical session on making beekeeping equipment.

Materials

- Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, equipment plans, materials and tools for making equipments and finished pieces of the equipment for demonstration and hand outs.

Method

- Lectures
- Practicals

STEPS

Step 1

Write the title **"MAKING BEEKEEPING EQUIPMENT (*Specify Equipment*)"** on the chalkboard or flip chart and introduce it.

Step 2

Ask one or two participants to help you in demonstrating and modeling the different beekeeping equipment specified in step 1 above.

Step 3

Give out the equipment plans. Go through the plans carefully. Explain using the finished piece of the equipment.

Step 4

The trainer asks the participants some questions to check their understanding and clarify on gaps.

Step 5

Practical sessions for making the equipments

HAND OUTS

(i) Kenya Top Bar Hive Plans

The only exact measurements required in the construction are those of the top bar itself. Others are not too critical, so the size of the hive can vary to suit local conditions. Give these plans to a local carpenter and explain the following dimensions:

Dimensions for body

Lid: 94cm x 52cm

Side: 26cm x 87cm

Bottom: 24cm x 87cm or to 90cm maximum

Ends (2): 25cm in height, 42cm wide at top and 20cm wide at bottom

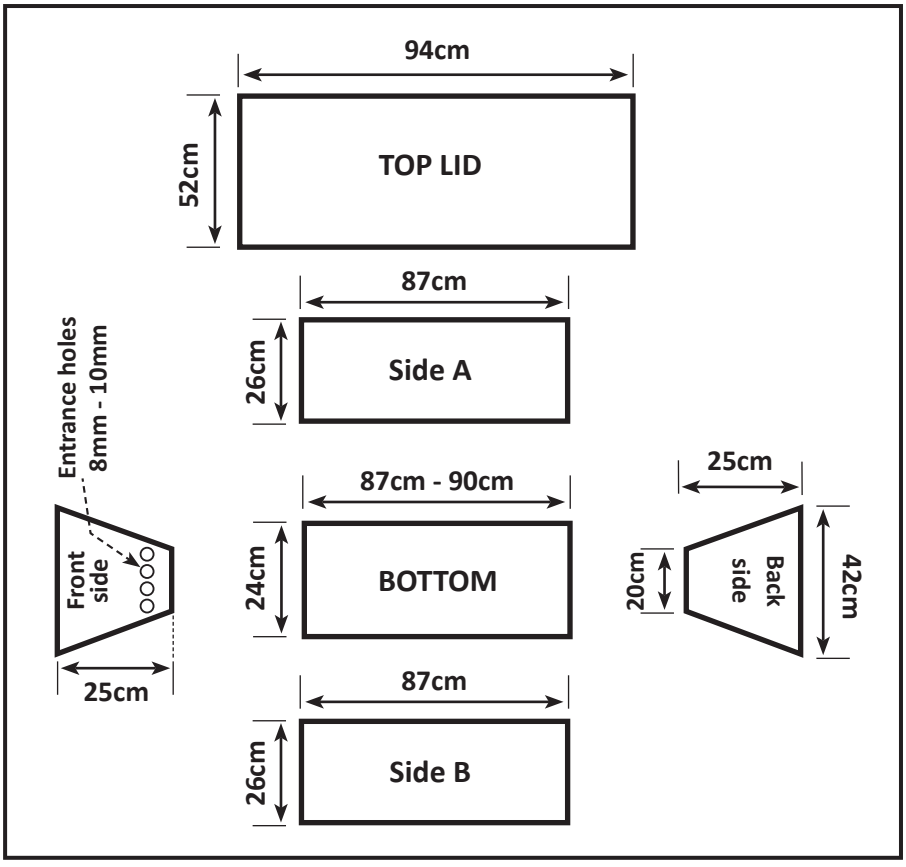


Fig 36: Dimensions for the body of a Kenya Top Bar hive

Dimensions for top bars:-

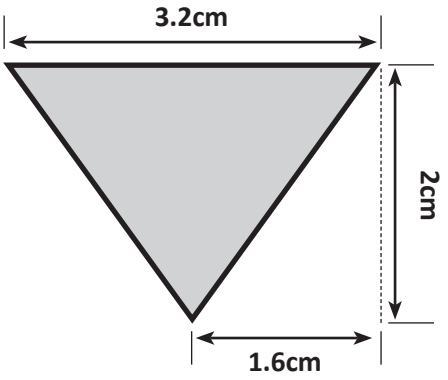
Length: 45.5cm

Width: 3.2cm

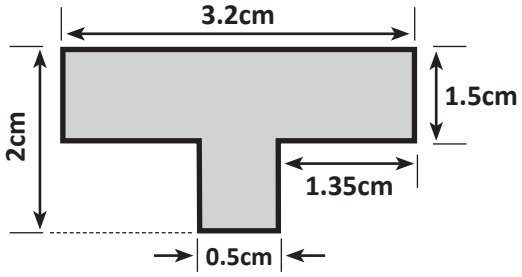
Types of top bars:

T- shaped, V- shaped, Grooved-top bar and half round top bar

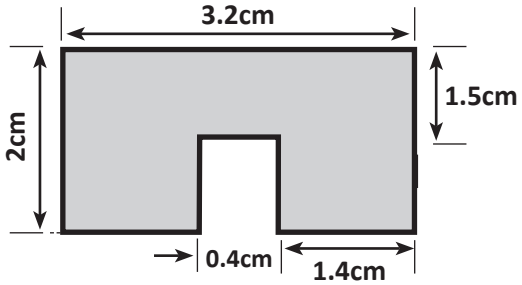
(i) V - shaped top bar



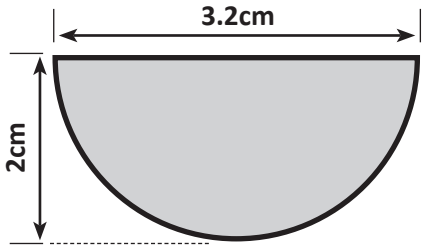
(ii) T - shaped top bar



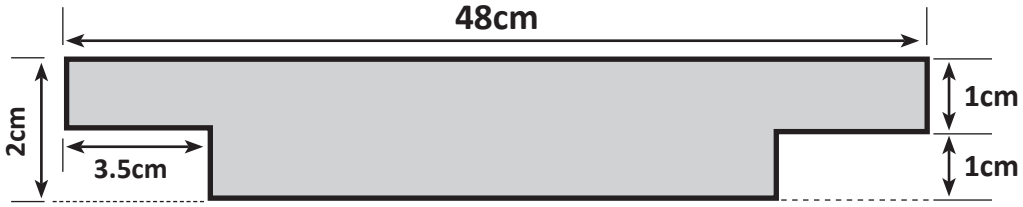
(iii) Grooved top bar



(iv) Round top bar



Note: All shapes **MUST** be rebated at both ends to stop slide off from the hive.



Materials

Any timber for the body and the top bars must be suitable, well seasoned wood.

Instructions

- Cut the sides, ends and bottom to the required size.
- The sides of the hive should be at an angle to approximate the curve of the combs that the bees will naturally make (this limits the inclination of the bees to attach the comb to the side walls).
- All surfaces need to be smooth and all joints free from cracks and gaps.
- Make 6 - 8 small round or triangular shaped holes at one end of the hive near the bottom as the entrance: 8 - 10mm in diameter.
- The top bars require critical measurements and uniformity and must be 32mm or 1.24 inches wide.
- Put a strip or groove along the centre of the top bars, onto which beeswax is placed to encourage comb formation and bait.
- This hive should hold between 20 to 33 top bars packed tightly in the hive with no gaps.

Note:

Try and make the top bars the exact same measurement (32 mm) in all your top bar hives (the standard top bar is 19 inches or 48cm long) to allow bees to be transferred from one type of hive to the other.

(ii) Mud and Stick Hive

The body of a top bar hive can be made up of locally available materials provided that the standard measurements of bars are followed.

So the following dimensions are given only as a guide and can vary according to local needs.

However the measurements for the top bar are critical and must be 32mm wide.

Internal Dimensions for body

Length: 900mm **Width:** 440mm **Height:** 300mm

Dimensions for top bars

Length: 480mm **Width:** 32mm

(The length is just a guide but it **MUST** be 32mm or 1.25 inches wide for top bar).

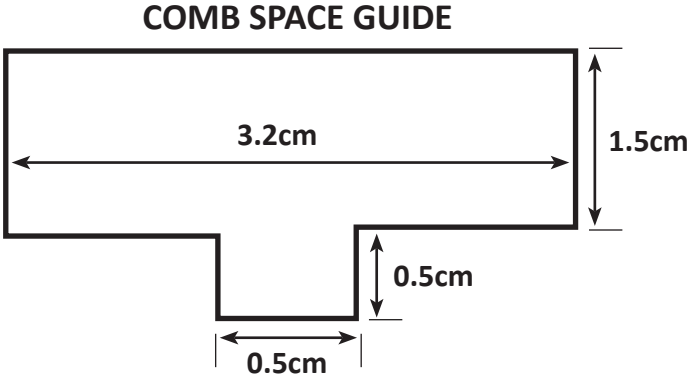


Fig 37: Top bar measurements

Materials

- Long and short sticks

- Wire, string or acacia bark fibre
- Mud or dung (mud from a termite mound works the best)
- Material (wood, tin or polythene to cover the hive
- Timber for the top bars

Instructions

- For the body you will need approximately 50 long and 30 short straight sticks.
- Make a frame of sticks first to form the bottom or base of the hive.
- Tie on other sticks to the frame to form the sides. Make slightly sloped sides if possible.
- Use wire, twine or fibre to tie all the sticks together. If you bind them tightly then you can have a very strong frame that does not wobble.
- Plaster outside the frame with mud and cow dung and leave to dry. Make 6-8 small holes of 8-10mm in diameter at one end of the hive as the entrance. These should be close to the bottom of the hive to make it easy for the bees to keep the hive clean.
- Experiment with any available low cost material to cover the hive. Use tin or timber if available (approx 57cms x 97cms). But don't put a tin roof directly on the top bars as it might get too hot in the sun – leave a gap between the top bars and the tin cover. You may also use a plastic sheet over the lid to stop the hive getting wet.
- Construct the top bars from timber and put a strip of wood along the centre, onto which beeswax is placed to encourage comb formation and bait. This is called a comb guide.

  Try and make the top bars the exact same length in all your top bar hives to allow bees to be transferred from one type of hive to the other.

iii) Langstroth bee hive plan:

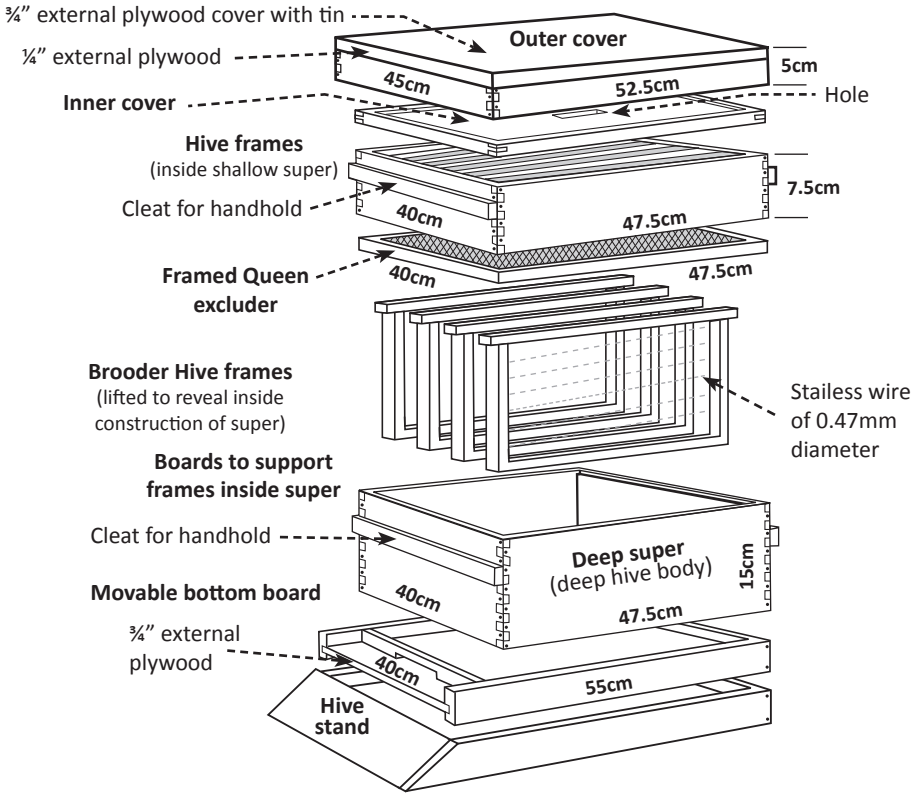


Fig. 38: Langstroth hive dimensions

LANGSTROTH HIVE

All wood used should be of 2cm thickness.

(1) Cover

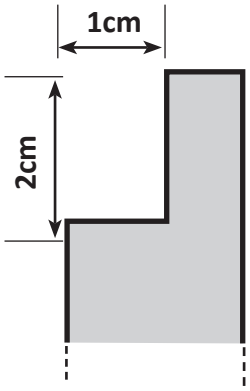
- Frame 57cm x 50cm of width 4cm and thickness 2cm
- Fitted with plywood top of size 57cm x 50cm
- Then covered with plain iron sheet gauge 32.

(2) Inner cover

- Plywood cut to size 48cm x 48.5cm

(3) Supper / Honey box

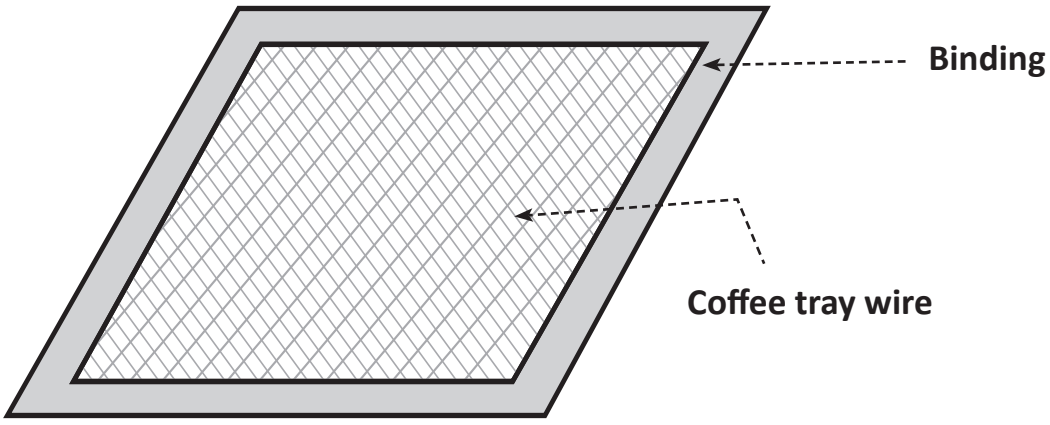
- Size 42.5cm x50.5cm and height of 14cm
- It has a top rebate inside on the sides of 42.5cm. The rebate size is 2cm in depth and 1cm in length.



- Fitted with frame spacers to accommodate 11 frames

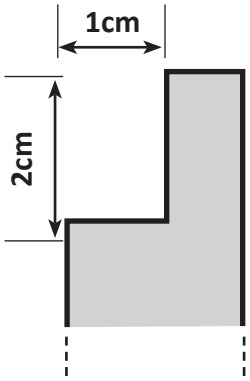
(4) Queen excluder

- Coffee tray wire cut to size 42cm x 50cm
- Framed with bindings at the edges. The size of the bindings is 2.5cm width and 2mm thickness



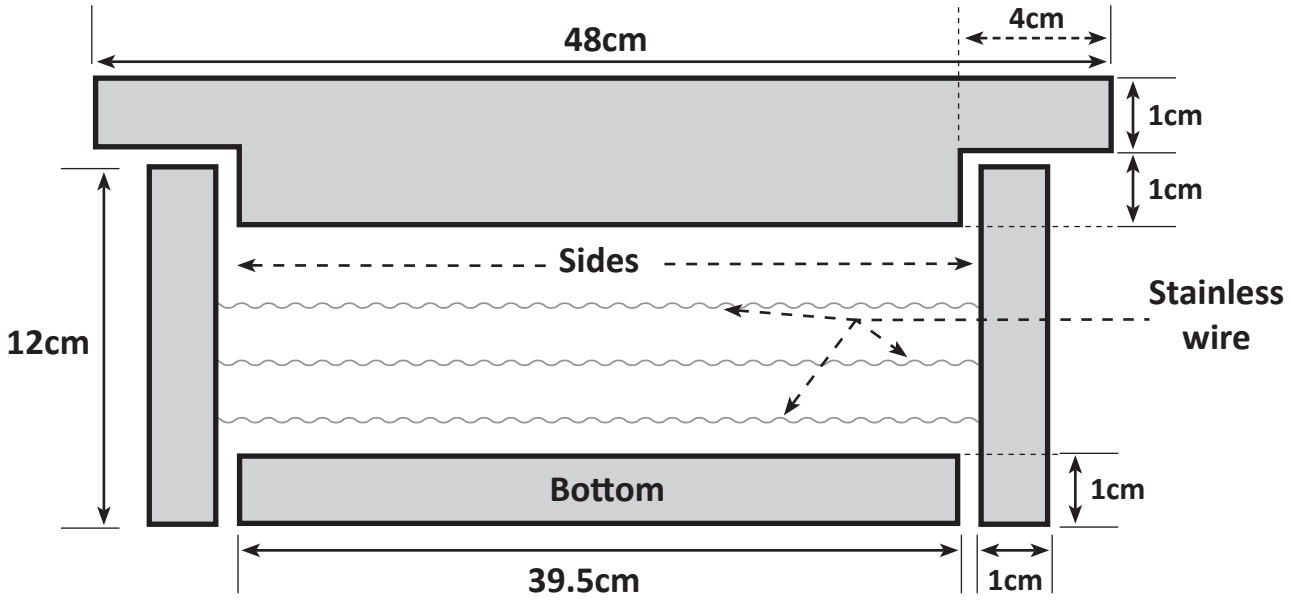
(5) Brood box

- Size 42.4cm x 50.5 cm x 28cm
- Fitted with bottom board which leave 1cm gap from bottom line
- It has a top rebate inside on the sides of 42.5cm. The rebate size is 2cm in depth and 1cm in length.

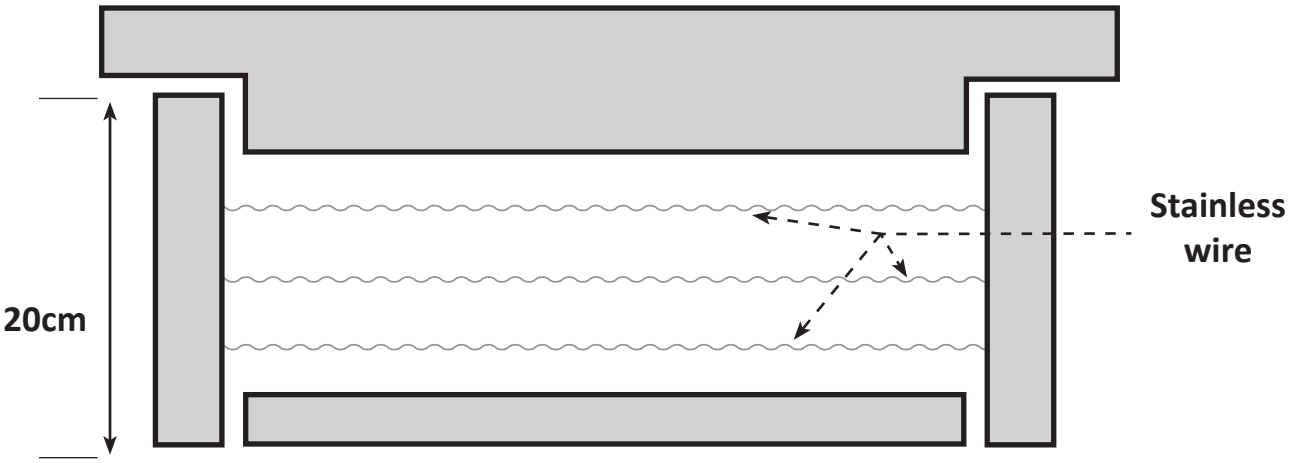


- Fitted with frame spacers to accommodate frames

(6) Supper frame



(7) Brooder frame



All other dimensions are the same as of supper and brooder frame except the sides

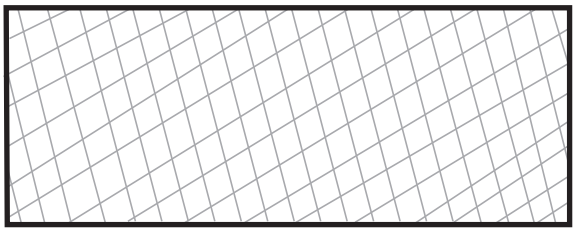
- Top pieces are made of sizes 2cm x 2.5 cm
- Top piece is fitted with a groove
- Side and bottom pieces are made of sizes 1cm x 2.5 cm

(8) Stainless wire

- Super frame is fitted with 2 stainless wires of gauge 0.47mm
- Brooder frame is fitted with 3 stainless wires of gauge 0.47mm

(9) Wax foundation sheet

- Super frame is fitted with comb foundation sheet
- Brood frame is fitted at least ½ of the comb foundation sheet



(iv) Solar wax melter plans

A solar wax melter provides a simple and safe method to extract wax. It is a glass or plastic covered box that uses the heat of the sun to melt beeswax.

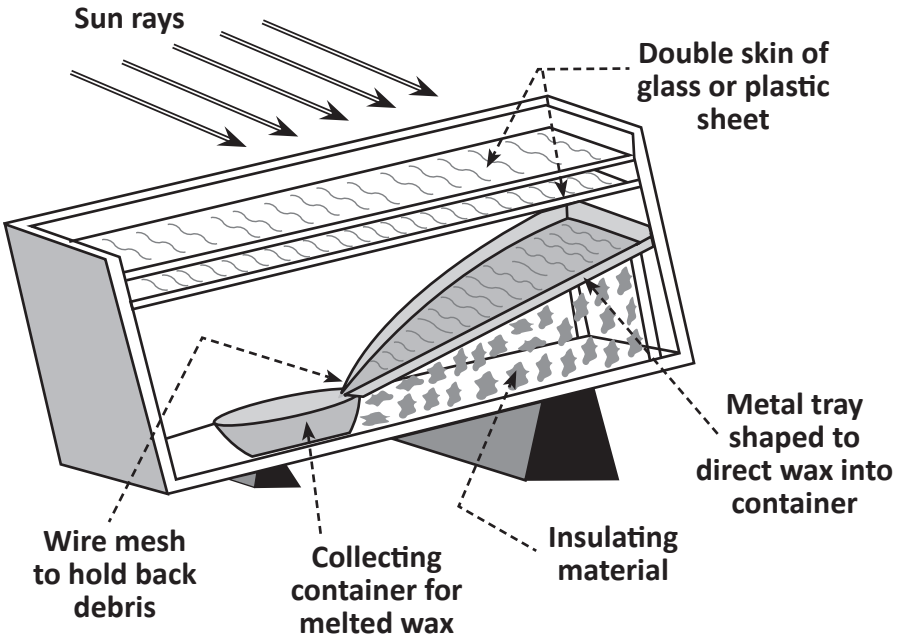


Fig 39: Solar wax extractor

The dimensions of the body depend on the materials and space available.

Materials

- Wood and black paint for the body (inside and outside)
- 2 Glass sheet of 2mm gauge with a space of 4mm in between
- Stainless metal sheets for tray (unpainted)
- Container (plastic with sloping sides works best)
- Wire mesh over the container to strain wax

Instructions

1. Make a box
2. Make the collecting container
3. Make the melting tray
4. Put the separating mesh
5. Construct a double clear glass or clear plastic lid. The 2 sheets should be about one inch and a quarter (1¼") or 4cm apart to help increase and retain absorbed heat. The entire box should be painted black from outside for maximum heat absorption.

Using the solar wax extractor

1. The melter is placed in a sunny spot. The box is tilted at an angle to catch the sun.
2. Combs are placed on the metal sheet. The sheet should not be painted, as paint contains lead, which can contaminate the wax. The melter can be used to render old combs, cappings and other hive scrapings.
3. The wax melts and runs into a collecting container through a wire mesh, to form wax blocks according to the shape of the collecting container.

(v) Bee veil

The most important piece of the bee suit is the veil for covering the head.

Veil 1 - Dimensions for body:-

- The length will vary depending on the size of the hat.
- The total finished depth of the veil should be 70cm (20cm of cloth, 30cm of screen, and 20cm of cloth).

Materials

- Cloth x 2 pieces
- Elastic x 1 piece
- Black screen x 1 piece
- A hat with a brim

Instructions

- The cloth used for the veil needs to be a cool material so the head does not get too hot.
- Cut and sew the cloth and screen according to the size of the hat.
- Place drawstrings around the bottom and top of the veil.
- Place the veil over a hat with a wide brim. Ensure the veil is kept clear of the skin.

Alternatively insert stiff wire or flexible sticks through the veil and make a ring to keep it stiff.

The lower edge of the veil must be fixed tight so that bees cannot get in.

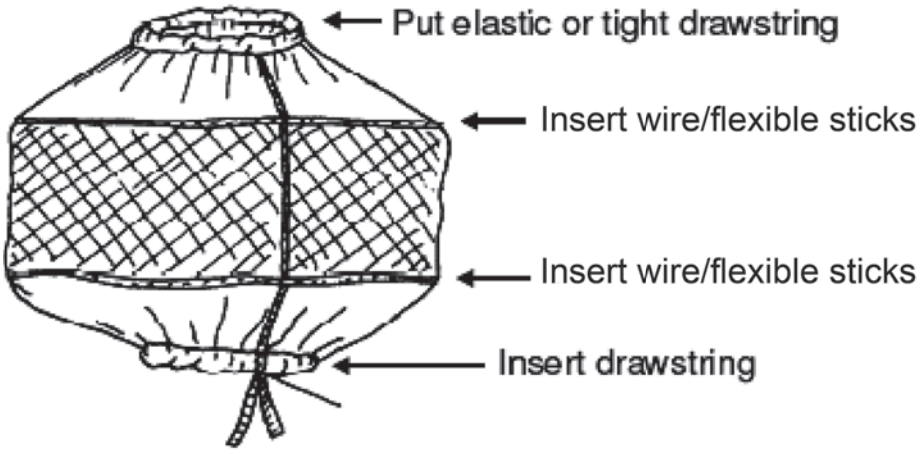


Fig 40: Bee veil

Veil 2 – An alternative veil can be made as follows:-

Materials

- Cloth x 2 pieces
- Black screen x 1 piece

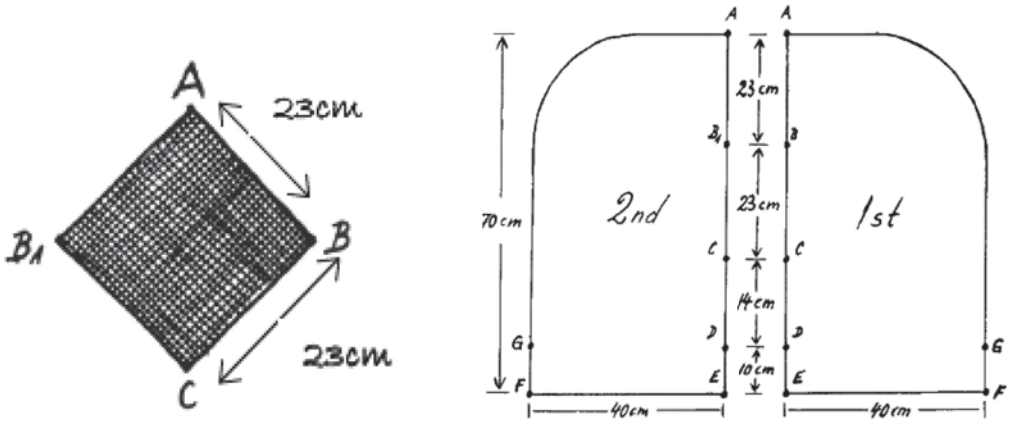


Fig 41: Dimensions of Bee veil

Instructions

1. Cut the cloth and mark the points A – G on the material (see above).
2. Sew the screen and first cloth from A to B_1 (see below).
3. Sew the screen and cloth from B to C (see below).
4. Attach the second cloth and sew from A to B, and to C and to D (see below).
5. Sew the back of the veil from A to G and finish the hem (see below).

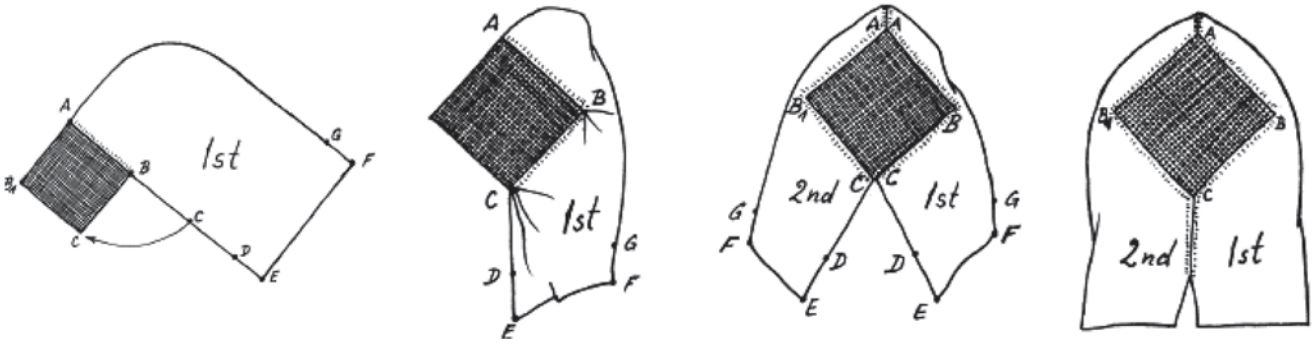


Fig 42: Bee veil parts

Bee veil and Overall plan:

BEE VEIL

(1)

(i). Cut 2 round pieces of materials of diameter 18cm for the top of hat

(ii). Cut 4 pieces of material for the of the hat

(2)

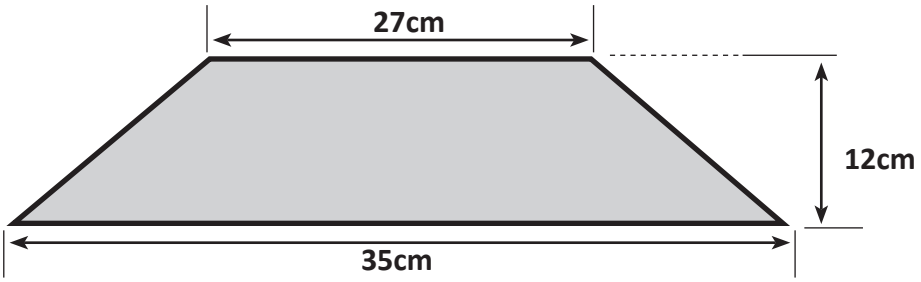
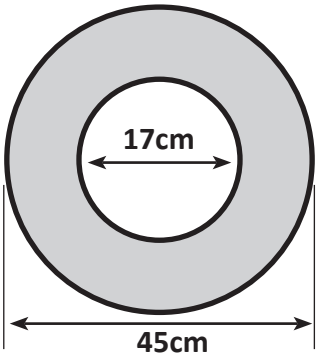


Fig 43: Bee veil plan:

(iii) Cut 2 round pieces of material for the hat base (circular and hole of 17cm in the middle)

(3)



Sew together 1 round top No.1, 2 pieces sides No.2 and 1 base to make a hat.

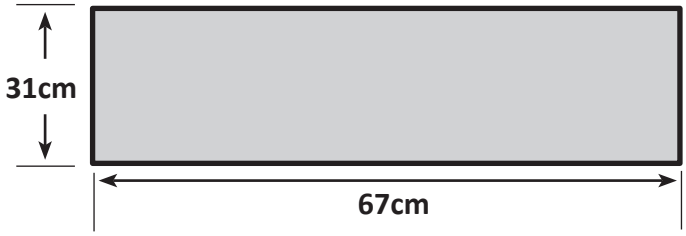
Fit 2 hats together and fold the base over a ring wire of 125cm circumference and sew.

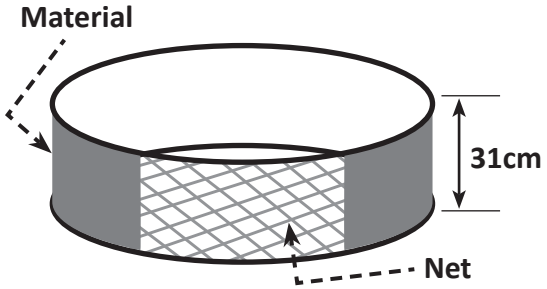
(4)

(i). Cut a black net of size 63 cm x 31 cm

(ii). Cut a material of size 67cm x 31 cm

(iii). Sew the material and the net at either side of 31cm to make it round.





(iv). Cut material of size 160cm x 11 cm. Fold it into 2 to make 160 cm x 5.5 cm and sew all round the above net and cloth.

(v). Then fix 2 self locking jacket zips of 56cm starting in the middle back on either sides

(vi). Then sew the whole piece on the hat.

(vii). Put another ring wire 15cm from the hat and sew over it a material of 160cm x 5cm.

OVERALL

1. Get a piece of material 160cm x 90 cm then fold it into 2 to get 45cm x 160cm.

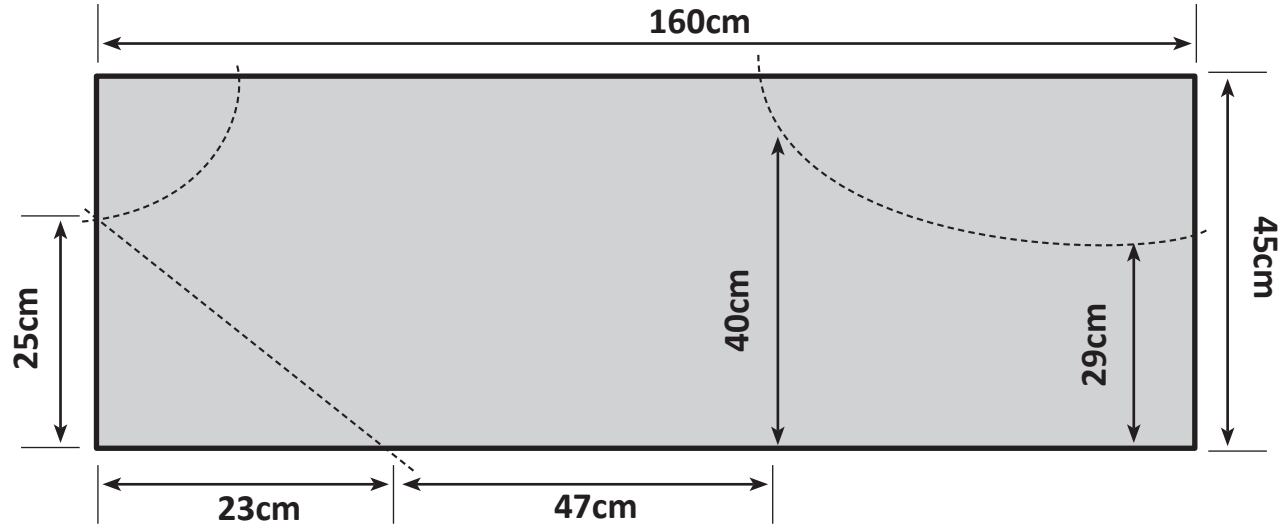
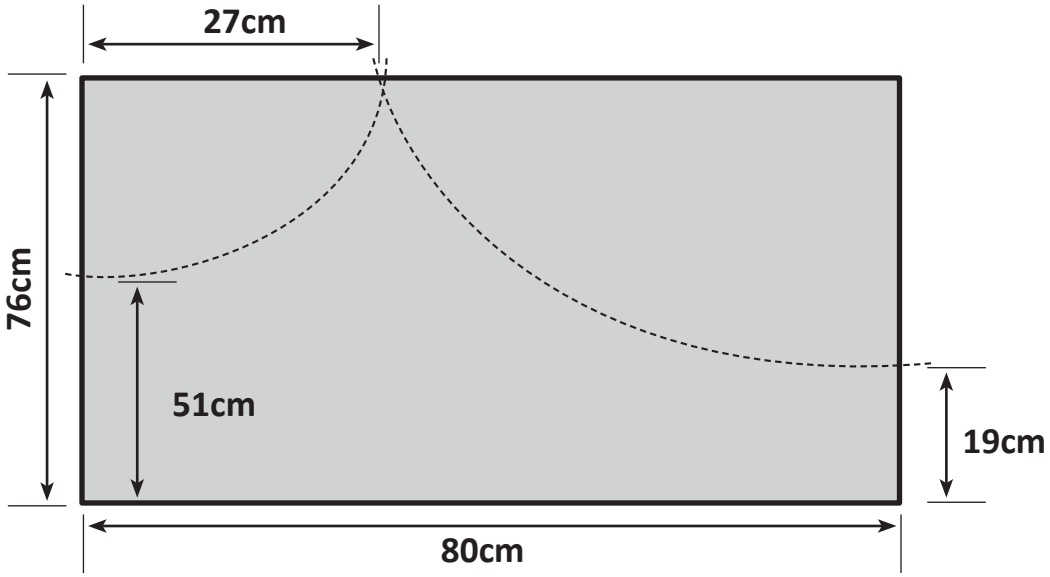


Fig 44: Overall plan:

You have to get 2 pieces one for the left and another for the right.

2. Get a piece of material of size 80cm x 76cm and fold it into 2 to get 80cm x 38cm.

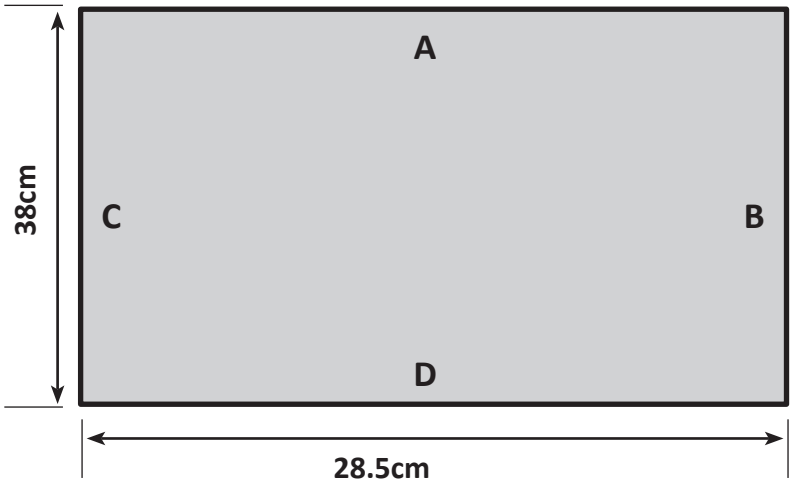


You get 2 pieces for both hands.

3. Cut 2 pieces of size 26cm x 29 cm for the down pockets
4. Then cut 1 piece of size 13cm x 18cm for the upper pocket and cut a covering flap of 18cm x 19cm and fold into 2 to get 9cm x 19cm and fix a stick- on (kamatta).
5. Start sewing the left and right pieces in No.1 at the back and thighs and then fix a zip of 76cm at the front.
6. Fix a collar according to the size of the overall
7. Then fix the 2 down pockets and one upper pocket.
8. Put lastic at the end of the arms legs and back.
9. Fix the covering flap on the upper pocket
10. Sew the second part of the zip from the veil.
11. Put flap with stick-on ***(kamatta)*** at the front and back when the zip starts and ends.

vii) Bee glove plan:

Gloves



(i) Buy latex gloves with cotton lining inside (to absorb sweat and easy to put on and off)

(ii) Cut 2 khaki materials as per size above (that is 38cm x 28.5cm)

(iii) Join side B to C and make it round.

(iv) Put a provision for a elastic at side A

(v) Then sew side D to the gloves of left and right so that it becomes longer up to the elbow.

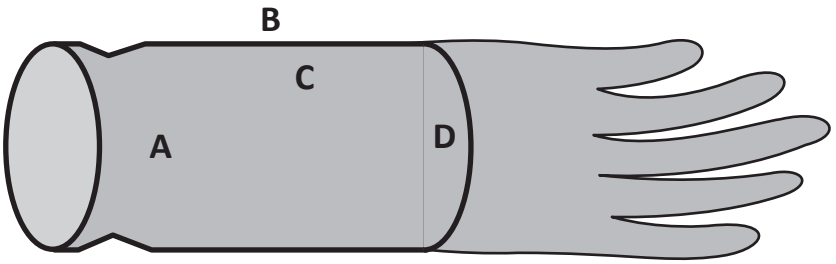


Fig. 45: Measurements of Bee glove

viii) Measurements of Bee Smoker:

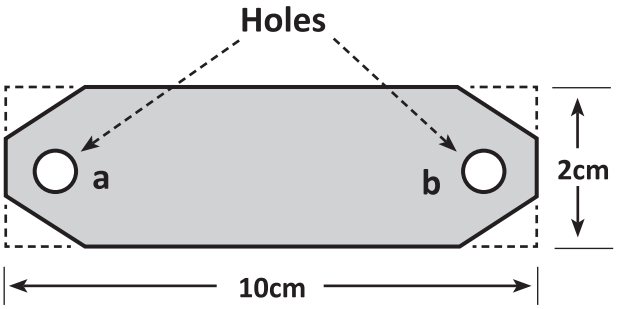


Fig 46: Measurements and making of a bee smoker:

Steps:

(1)

(i) Cut the pylon wire as per size above

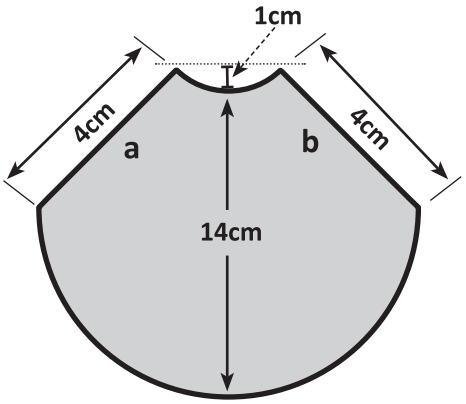
(ii) Make holes a and b with diameter of the rivet to be used

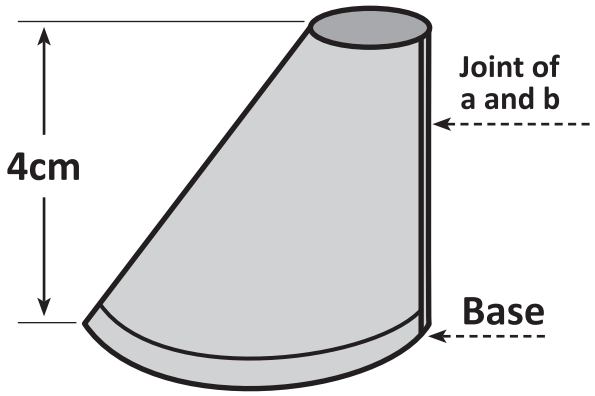
(iii) Cut off corners

(2)

(i) Cut as per size above plain sheet gauge 28.

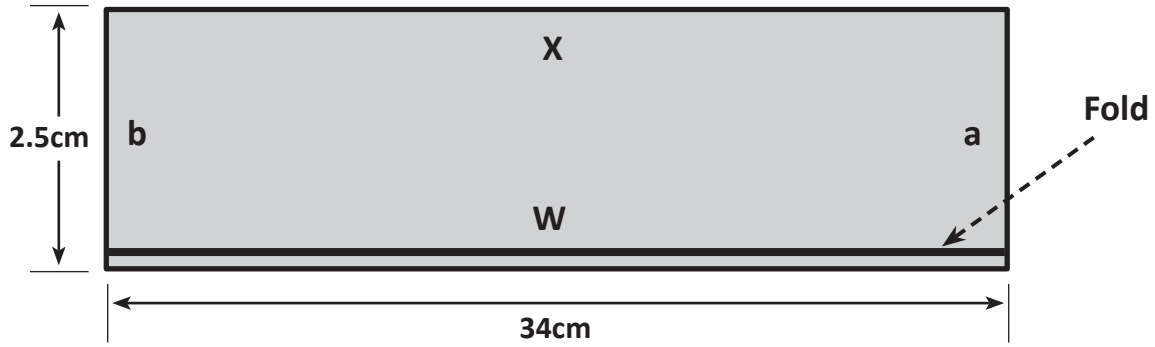
(ii) Join sides a and b to make a cone with a hole.





(iii) Fold out the base 2 mm at right-angle to the base of the cone

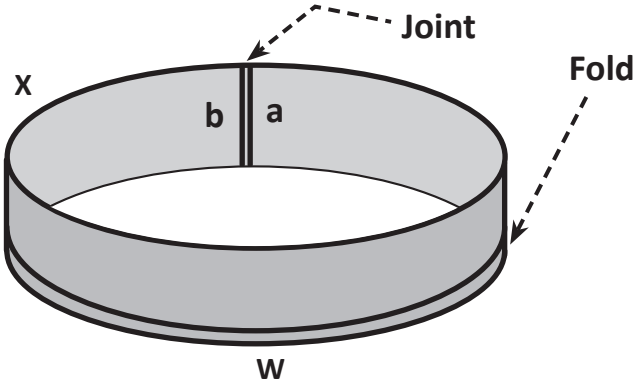
(3)



(i) Cut plain sheet gauge 28 as per size above

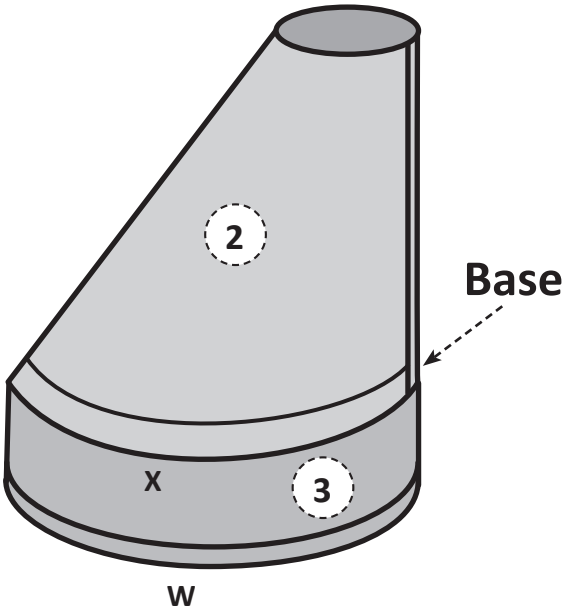
(ii) Fold to remove the sharp edge at side W.

(iii) Join side a and b and make it round

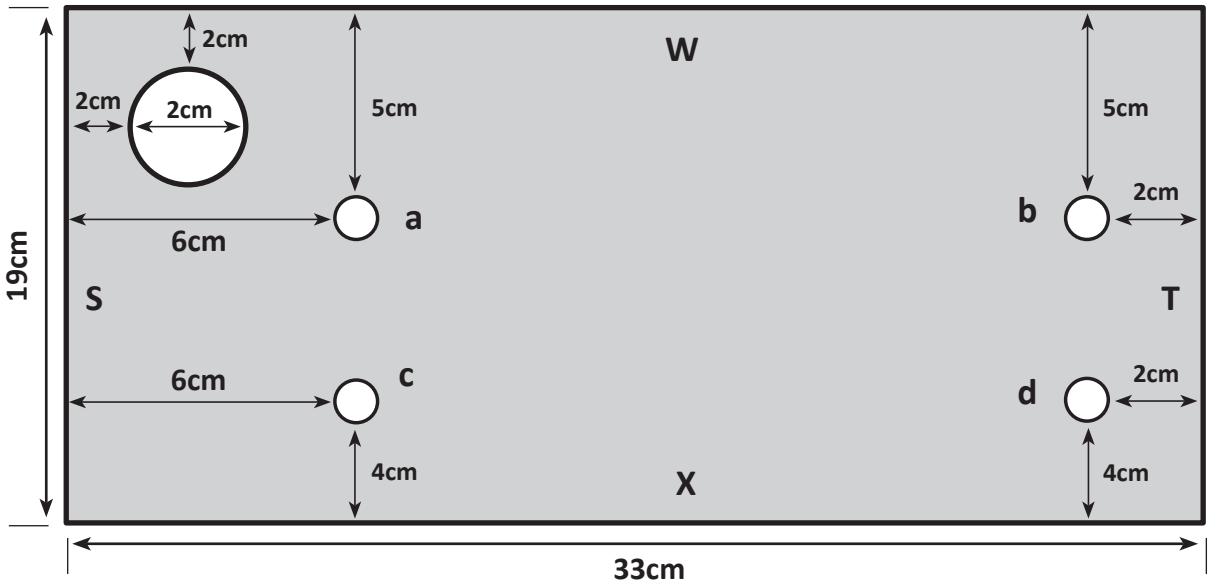


(iv) Fold 3mm at right angle all round at X.

(4) Fix No. 2 to No. 3 and join firmly the base of the cone to the ring at X.



(5)



(i) Cut plain sheet gauge 28 as per size above.

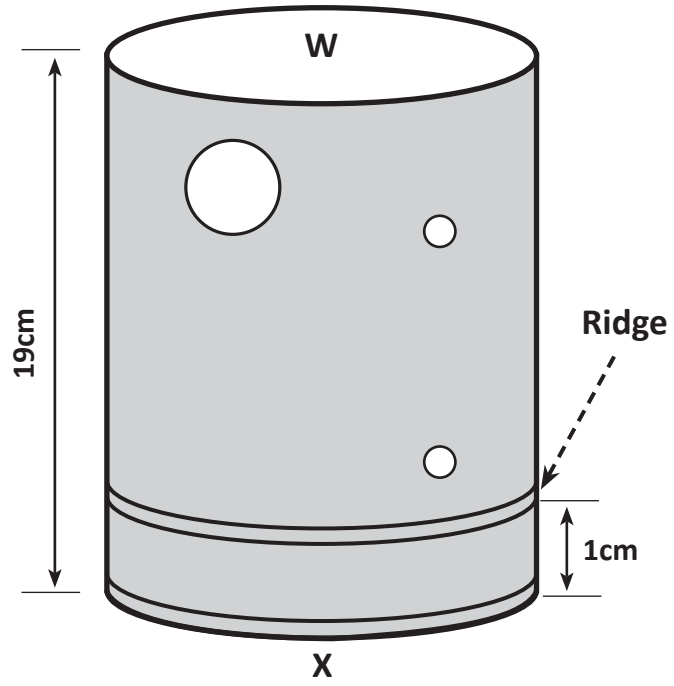
(ii) Make a hole of 2cm diameter.

(iii) Make holes a, b, c and d as the size of the rivet to be used.

(iv) Join side S to T and form a cylinder of 10 cm diameter.

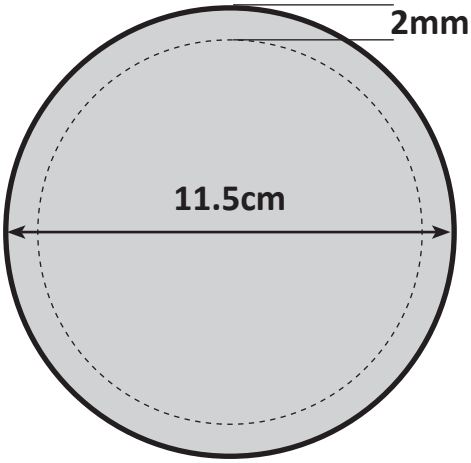
(v) Fold 1mm to remove the sharp edge at side X.

(vi) Fold 1mm at right angle at side W near a big hole.



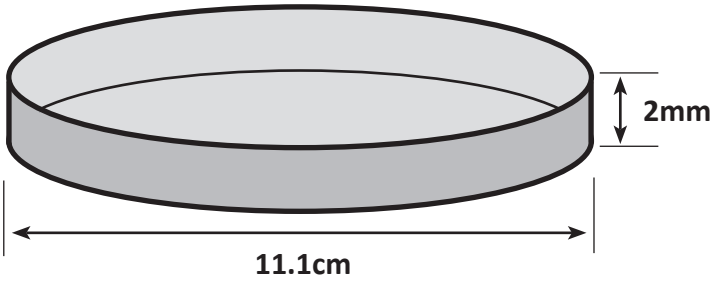
(vii) Put a ridge 1 cm from side X.

(6)

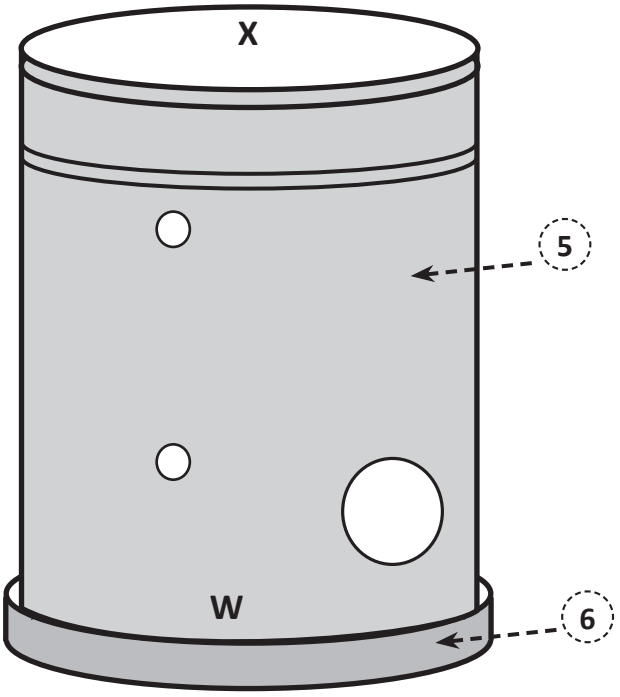


(i) Cut a circular plain sheet of gauge 28 with a diameter11.5 cm.

(ii) Fold 2mm at right angle facing upward all round.

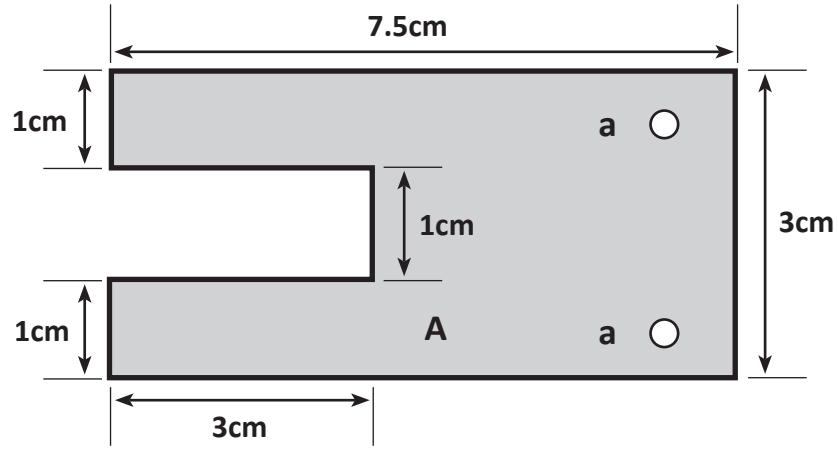


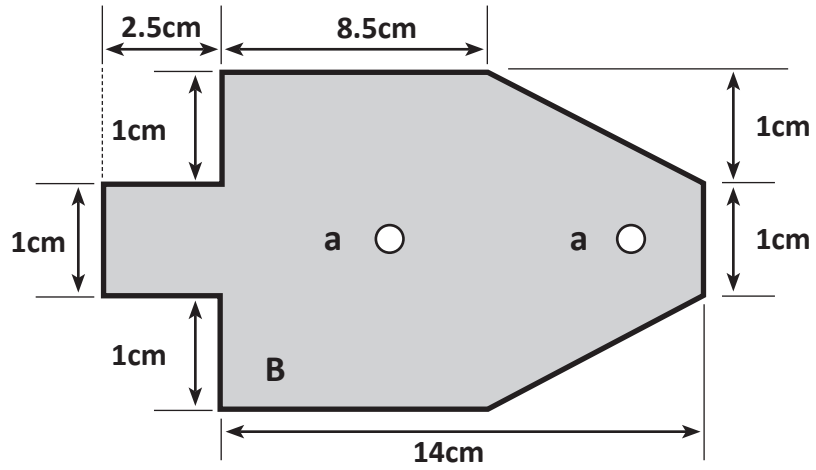
(7) Place side W No.5 on No.6 and fix firmly the bottom



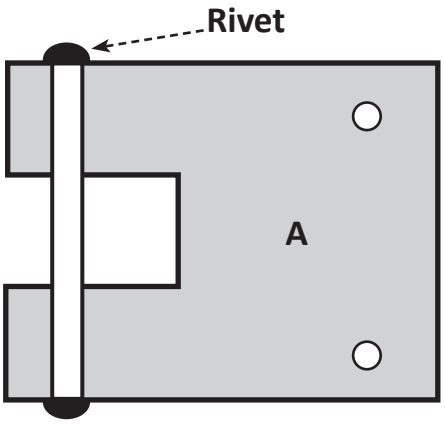
(8)

(i) Cut plain sheets gauge 24 as per size



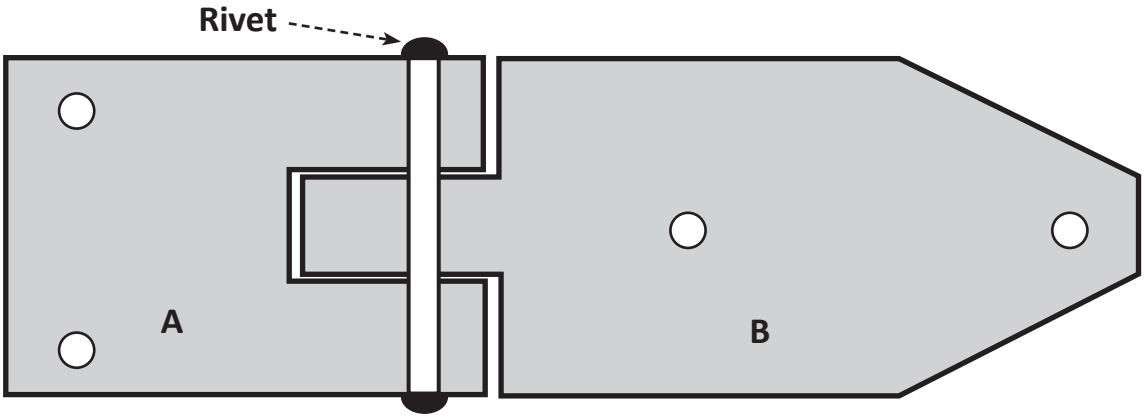


(ii) Fold the 2 tongues around a rivet.

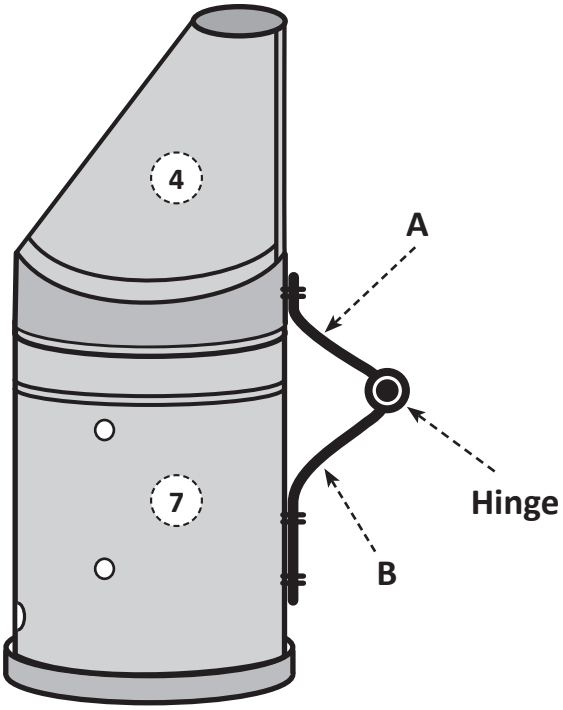


(iii) Put holes as the size of rivets.

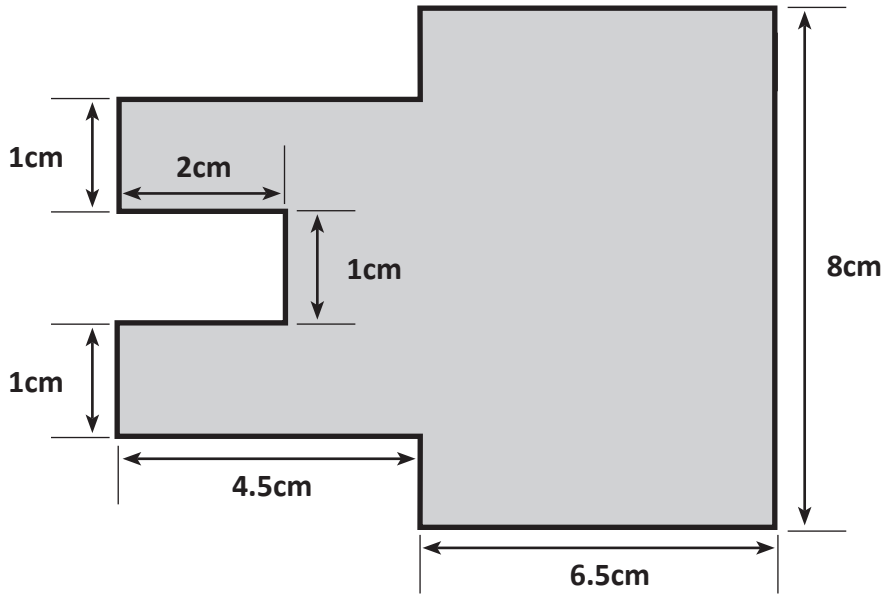
(iv) Fold the tongue of B around the rivet which was fixed in part A and form a hinge as below.



(9) Fix the part of No. 4 to part of No. 7 with a hinge above.



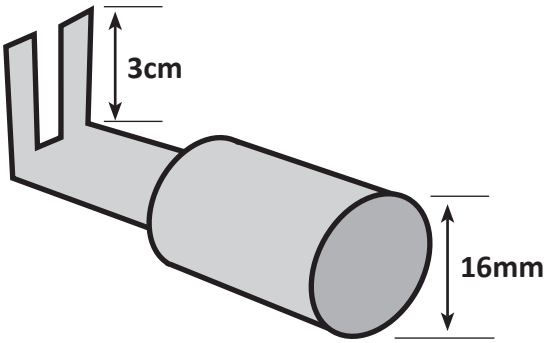
(10)



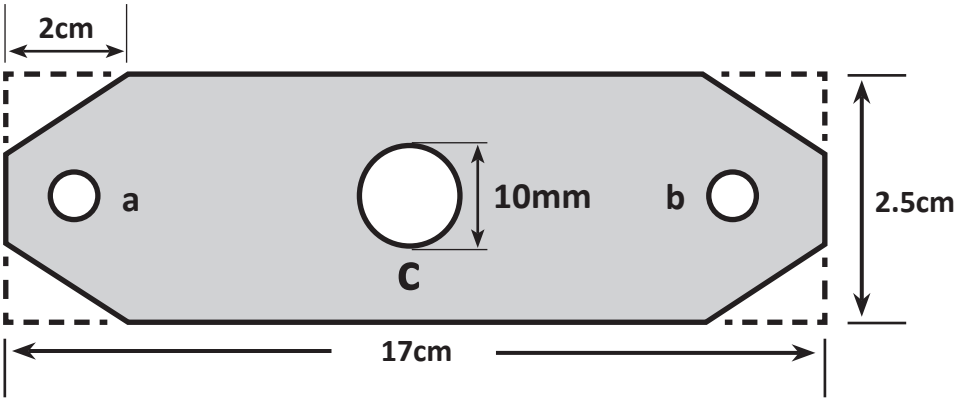
(i) Cut plain sheet gauge 28 as per size

(ii) Fold the biggest part on a round bar of 16mm diameter.

(iii) Bend the 2 tongues at 3cm at a right angle.



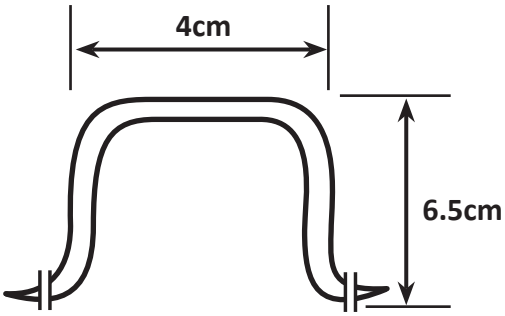
(11)



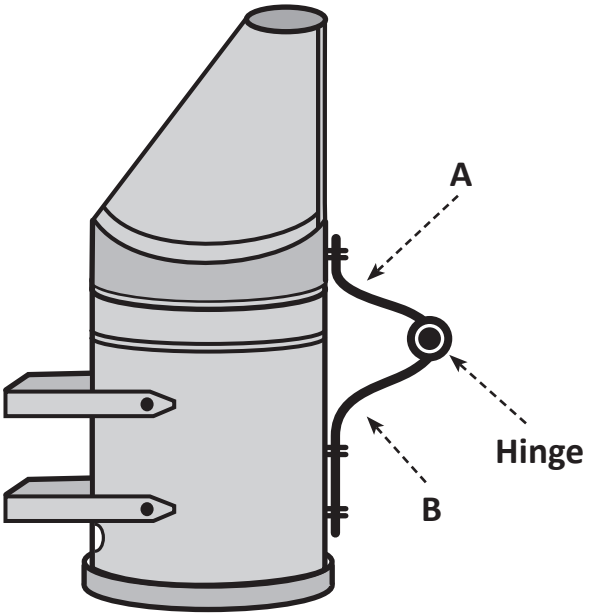
(i) Cut plain sheet gauge 24 as per size (2 pieces).

(ii) Make 2 holes (a and b) to accommodate rivets and hole C to fit 10mm bolt

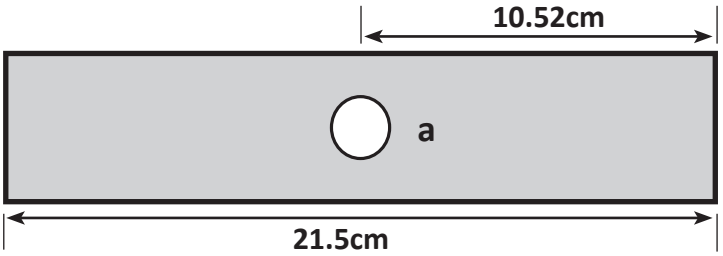
(iii) Bend the above in small **'n'** letter like.



(iv) Fix the 2 piece on part **No. 9** using hole **a,b,c** and d which were made in **No.5**

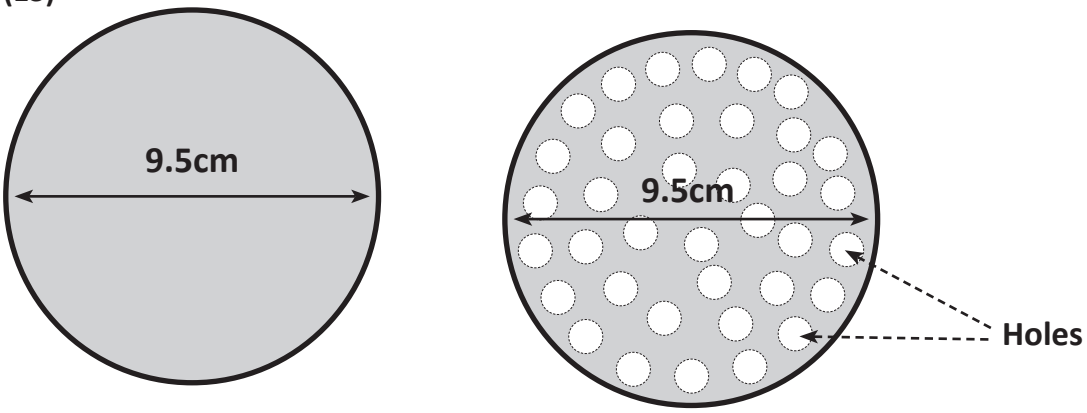


(12)



(i) Cut 2 pieces of plyan wire and make a rivet hole in the middle

(13)

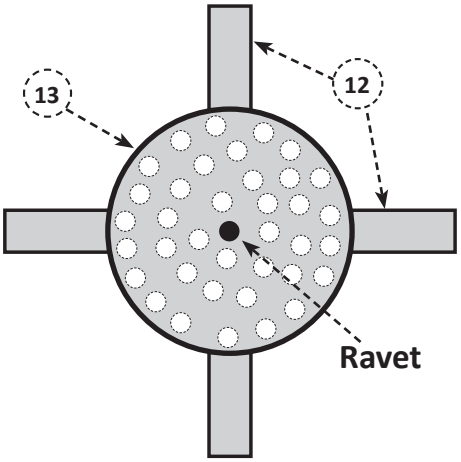


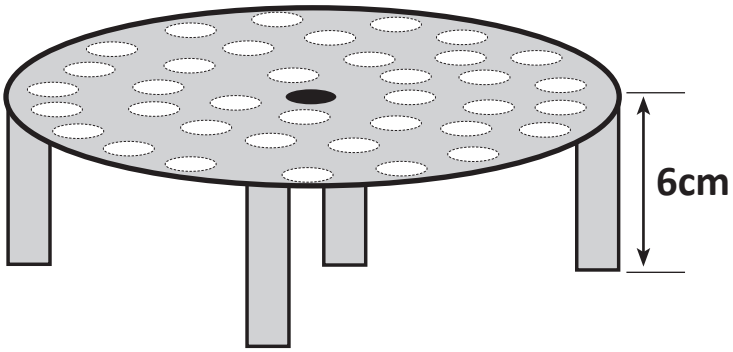
(i) Cut plain sheet of gauge 28 of diameter 9.5cm

(ii) Put about 40 air holes at random in the above piece of about 8mm diameter.

(14)

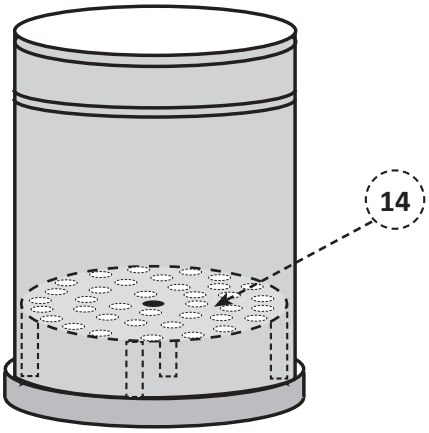
(i) Cross the 2 pieces of No.12 and fix them on No. 13 with a rivet as below.





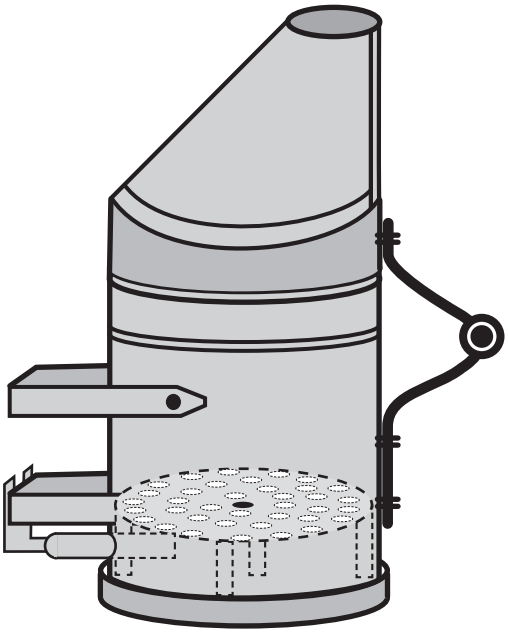
(ii) Then fold the four points of No.12 at 6cm to form standing legs.

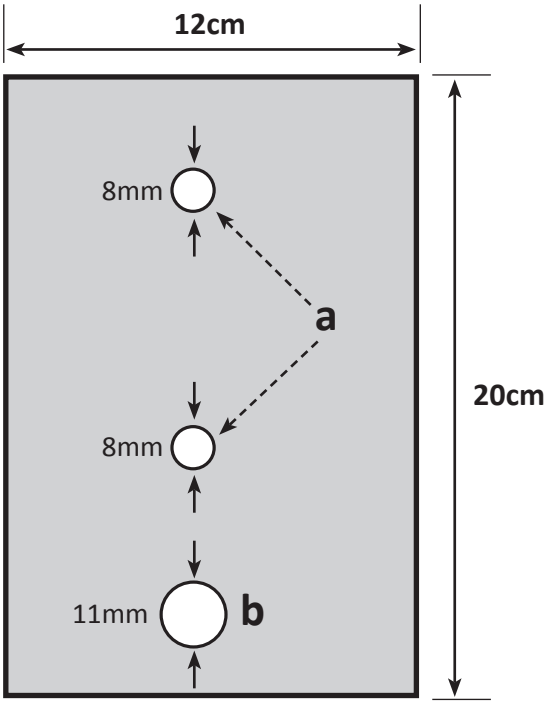
(15) Put No. 14 inside No.7 with legs standing down.



(16) Put No. 10 into a big hole of 2cm diameter when its tongues touch the lower of No.11

(17)





(i) Cut 2 pieces of wood as per size above with a thickness of 1cm.

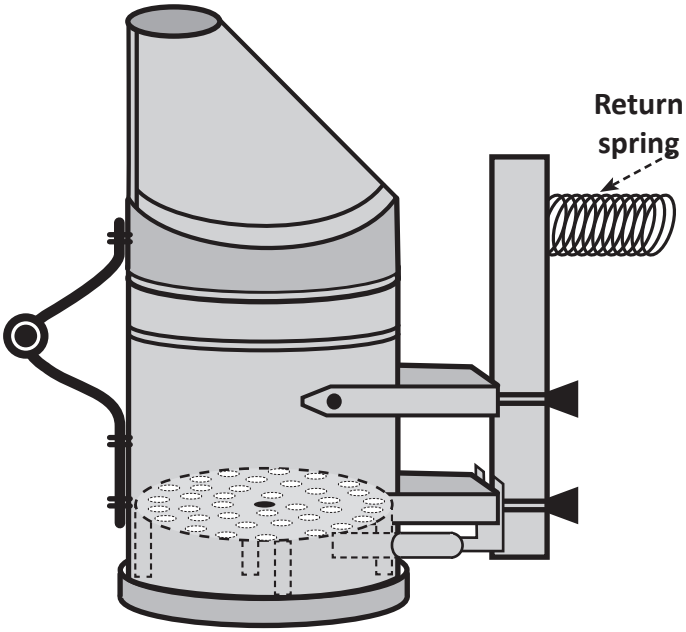
(ii) Drill 3 holes in the middle line.

(a) holes should correspond with holes of No.11 to fix 10mm bolt.

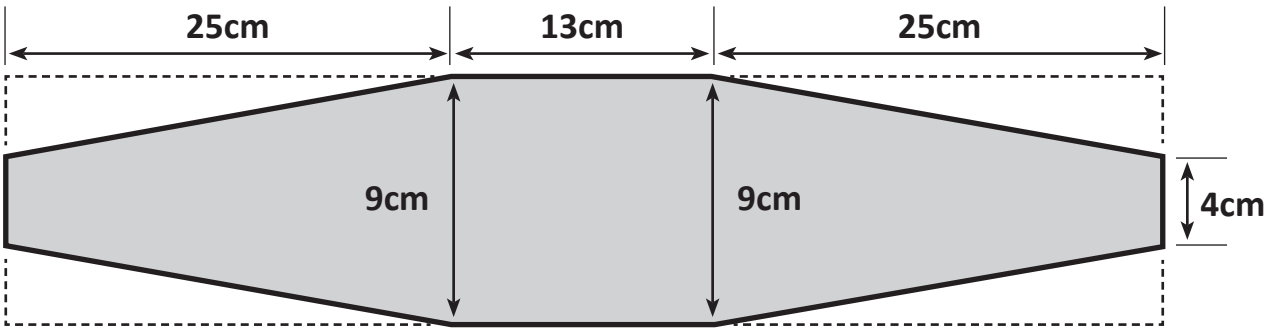
(b) holes **'b'** should be directed to the air pipe No.10 as fixed in No.16.

(iii) Fix the drilled piece with 10mm bolts using holes of No.11.

(iv) Fix a return spring at the upper part of wooden piece.



(v) Cut a canvus as per size.



(vi) Fix the canvus around the wood starting from bottom with taxi nails.

(vii) Fix the second wooden piece against the spring and nail the canvus around it.

(viii) Fix the lace around the two pieces of wood over the canvus with chair pins at least 1cm apart to seal any air leakage.

MODULE 7: APIARY MANAGEMENT

Introduction

An apiary is the location of beehives or bee colonies in hives. Apiary management is the set of routine activities in an apiary depending on weather or seasonal changes and the initial objectives of set up. It is important for a beekeeper to know and use Good Agricultural Practices (GAPs) in his/her apiary for maximum yields and quality products.

Learning Objectives

By the end of the session, participants will be able to:-

1. Identify a good apiary site
2. Demonstrate hive hanging and placing
3. Demonstrate how to attract bees into a new empty hive, catch a wild swarm, transfer bees into a hive, division of an existing colony and unite smaller colonies.
4. Keep clean and hygienic apiary
5. Carry out hive inspection
6. Keep good records

Target Participant

Beekeepers, extension service providers, artisans, individuals and organizations/Institutions.

Suggested Number of Participants:

Maximum 30

Duration:

3 hours.

Materials

- Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, protective wear, hive tool set, films, video, generator, projector, apiary and/or their pictures and hand outs.

Method

- Lectures
- Brainstorming

- Demonstrations
- Group discussions

STEPS

Step 1

Write the title "Apiary management" on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the characteristics of good apiary site.

Step 3

Divide the participants into 3 groups and assign them the following tasks:-

Group 1: Describe hive hanging, hive placing and how to attract bees into a new empty hive

Group 2: Describe catching a wild swarm, transferring bees into a hive, multiplying an existing colony and uniting smaller colonies

Group 3: Describe hive inspection and record keeping

Step 4

In plenary, participants present findings, the trainer clarifies, summarizes and gives out the notes.

HAND OUT: Apiary Management

The location of honey bee colonies (beehives) is called an apiary. Beehives are hollow containers that can be closed and are purposely made to house bees, and these include:

a. Traditional hives with fixed combs e.g. log hives and woven hives.

b. Top bar hives with movable combs e.g. Kenya Top Bar (KTB) hives.

c. Modern frame hives with movable combs e.g. Langstroth.

Apiary siting

A good apiary management starts with choosing a good site to hang or place hives. If you choose a poor site people and animals may be stung. If the site is insecure honey and hives can be stolen. The following are recommended practices for a good apiary site:-

- The site must be easy to get to and from in order for you to check the hives regularly.
- An apiary can house up to 20 hives depending on the availability of flowering trees in the area as bees forage up to 3 km from the apiary.
- A high hedge or fence should be put around the apiary to separate the bees from people and animals, as bees can be aggressive. The apiary should be away from human and livestock dwelling areas, roads and public areas.
- It should be safe from strong direct sunshine, be shaded during the hot part of the day but have sun in the morning. Shade must be constructed if none is available at the site.
- It should be safe from strong direct wind and allow good air circulation.
- It must be near a fresh water supply; this can be a river, pond or even a dripping tap.
- It must be near food sources such as trees/nectar bearing crops, and cash crops that need pollination. Putting hives in a bee house/shed, which can be locked to prevent thieves stealing the honey, is one option. But there must be holes in the wall to allow the bees to get enough fresh air in and out of their hives.
- It is better if the apiary is away from areas where children play or any source of continual noise. Noise can disturb the bees and make them defensive.

- The apiary should be on higher ground, away from marsh or land liable to possible flooding. Humid conditions encourage fungal growth and prevent honey maturing and bees from foraging.
- The apiary must not be close to areas where pesticides are used as they may kill the bees and contaminate the honey.
- The bees will also appreciate being away from smoke, fire and unfriendly neighbours.
- There should be good water not contaminated one.
- Should not be near the road.
- Should be near good plantation like coffee plantations.

Remember that once the bees enter the hives it will be more difficult to change things so choosing a good site to begin with is most important!

Hive Hanging

- Hang hives using strong greased galvanized wires to protect the bees from pests.
- Hang hives in or under well-shaded trees.
- Suspend hives from wires so that predators such as the honey badger cannot push them over.
- Remember always when hanging hives that it is important to allow for ease of harvesting. Honey quality is improved by careful harvesting which is easier when the hive is within easy and comfortable reach.
- Use trees or solid poles to hang the hive.
- The hives should be hung at waist height above the ground. This is important in modern beekeeping as the beekeeper wears a bee suit making climbing difficult. Traditional hives are usually hung in trees.

Alternatively a hive can be suspended on a rope with a pulley that can be lowered for harvesting.

Hive Placing

- Place hives on sturdy stands especially hives, which are not strong enough to hang.
- Place hives to allow you to approach the hives from behind.
- Placing hives on stands makes them accessible and easy to harvest and manage.
- Remember the stand should be sturdy and high enough for the hive to be at waist height.
- The legs of the stand must be placed in cans of used engine oil to prevent pests such as ants getting into the hive. Alternatively put bands of grease around the legs and spread ashes around the stand to discourage grass growth.
- The legs of the stand must be fitted with rat guards.

  Alternatively hives can be put under a shelter or in a bee house. This can be a simple hut with holes in the walls for bees to get in and out. A bee house is useful because it can be locked to prevent thieves stealing the honey or the hives.

Whichever method is chosen, it is always important to remember

- To avoid long straight rows of hives to reduce drifting and disease transmission.
- To cut the grass short around the hives.
- To remove small stones or debris in the apiary as the beekeeper may stumble over them.
- Positioning the apiary should comply with all conditions of beekeeping.

It often happens that bees do not enter the hive for quite a while. It is disturbing to see that the new hive that you have worked so hard to build stays empty and the empty hive does not produce any honey! There is therefore need to attract bees to the new empty hive.

How to attract bees to the new empty hive

- Keep the hives clean and pest free – no dirt, spiders, cobwebs or insects.
- Place hives along the swarming routes of bees.
- Use bee attractants or baits such as beeswax, propolis and lemon grass (wax the top bars for example).
- Use bait hives and catcher boxes to catch a swarm.
- Transfer bees from a fixed comb hive or from a wild nest.
- Divide an existing colony.
- Buy bees

Catching a wild swarm of bees

Swarming happens when the colony gets too big and the bees want to reproduce the colony by making a new queen. The old, experienced queen and most of the adult workers leave the hive with the swarm and fly out of the old hive looking for a new home. New queen later hatches out and takes over the old colony and the remaining bees. The beekeeper can capture the swarm and place it into a temporary or permanent hive. The swarm has a better chance of staying into the new hive if it is captured during a nectar flow season.

Transferring bees into the hive

It is possible to transfer bees from a wild nest or from a traditional hive with fixed combs in order to colonise the hive.

How to divide an existing colony

Choose the strong, productive and less defensive colony to make divisions to increase your colonies. You can make a division of an existing healthy colony in order to colonise a new hive. Make division after the honey flow to increase colony numbers. The best time to divide a colony is when the bees are getting ready to swarm.

Avoid making divisions during the honey season because it will reduce the amount of honey to be produced. Between the beginning and the peak of the flowering seasons, strong colonies can suddenly become overcrowded with clusters of bees near the entrance, and large numbers of drones. To check if a colony is getting ready to swarm look for signs that the colony is overcrowded and the queen has run out of cells to lay eggs in. A colony can fill between 9 and 15 brood combs with brood of all stages, including a lot of drone brood and sometimes there is even little surplus honey. Also the bees will be producing queen cells.

Dividing controls swarming and saves the beekeeper from losing the bees or the trouble of catching a swarm. But always choose the most productive and less defensive colony. By dividing it you are spreading its good genetic characteristics. To divide a colony you must:-

I. Prepare your new hive first – clean and rub it with some beeswax or propolis so that it smells familiar for the bees. Put it next to the overcrowded hive.

II. Use your smoker and suit and keep your smoker alight nearby in case you need it.

III. Choose a big healthy colony to divide and check it has brood, eggs, pollen and honey.

IV. Select a comb with queen cells, remove it from the hive and break all the queen cells except the biggest capped two. You need two just in case one gets damaged.

V. Now transfer the comb with the 2 queen cells into the new hive.

VI. Also transfer one or two other combs with a lot of sealed brood and a little unsealed brood. More brood means adult bees will emerge very quickly in the new hive.

VII. Also transfer one or two combs of food comb with lots of sealed honey and pollen.

VIII. You can make a division with combs as long as the new colony has female worker eggs of less that three days old and larvae in the combs transferred. From the very young larvae they will be able to make new queen cells within a few days and raise a new queen.

IX. Include bees on all the combs you transfer and brush or shake in bees from 2 or 3 other combs as well.

X. Check very thoroughly that you DO NOT have the old queen on the combs you move or brush off. She must remain undisturbed in the old hive or mother colony. If you are in doubt then make sure you leave eggs and at least leave one big capped queen cell in the old hive in case you have taken her by accident. The bees will destroy the queen cell if the queen is present.

Remember to put the brood combs in the middle and the honeycombs on either side to insulate the brood nest. The framing combs feed and help the bees to keep the brood warm. Where there is no honey supplementary feeding can be done.

XI. These bees will become a new colony. Most of the adult bees will remain in the old hive and continue to make honey.

XII. The bees will look after the queen cells in the new colony and a new queen will hatch out. The first queen to hatch out will destroy the other queen cell.

XIII. Wait until dark then move the new hive to a site at least 2kms from the old site if possible.

XIV. If you don't have a place to put the new divided colony 2kms away then you must move both hives 1m either side of the old location. This will ensure that some returning bees go into the old hive and some into the new.

XV. You will need to feed the bees in the new hive, as they will not know where to go and get food in their new place. A small colony can become weak very quickly.

XVI. If you see the queen or brood after 4 weeks then this has now become an established colony.

XVII. If you observe bees collecting pollen after two weeks, this is an indication that a new queen has emerged in that hive.

Uniting colonies

Beekeepers unite colonies in order to enlarge a colony, improve their yield of honey or control a worker-laying problem. A colony can produce surplus honey only if it is strong enough and contains 6-8 combs with plenty of brood and sealed honey and covered well by bees. This very much depends on the colony having a productive queen. If a colony fails to produce surplus honey for 2 seasons, or if it is weakened by repeated swarming, then it can be strengthened. Two weak colonies can be combined to make one strong colony. One large colony collects more honey than 2 smaller colonies. A colony can be united with another colony or with a swarm. To unite a colony with another:-

I. Remove and kill the queen from the weaker, most defensive or least productive colony.

II. Catch and cage the queen from the other colony in a matchbox and place the hive near to the old colony.

III. Smoke both hives thoroughly so that their familiar smells are covered.

IV. To prevent bees fighting also dust them with flour or spray with sugar syrup – they will be busy cleaning themselves and will not fight!

V. Place the queen in her cage in the old hive next to the brood nest. The bees will chew the matchbox to release the queen.

VI. Transfer all the top bars with combs and bees into the old hive. Alternate combs from the different colonies as you do so until all the brood combs are united and then add the honeycombs.

VII. Close the hive and leave the united colony undisturbed for the next few days.

To unite a colony with a swarm you must: -

I. Catch a swarm and if you can find the queen then cage her.

II. Open the hive and remove the old queen (undesired queen) in a cage and kill her later.

III. Smoke the bees and place the new caged queen near the brood nest.

IV. Shake the swarm into an empty part of the hive.

V. If you did not find either queen then do not worry. Leave both queens in the hive and the stronger one will kill the weaker one.

Note:
In the process of uniting the colony, you may experience swarming or absconding.

As the new colony has eggs and larvae in the combs they need to be protected. While uniting the colony the queen should not be kept away for more than 1 hour.

Buy bees

Buy pest and disease free bees only from licensed dealers in colony multiplication and queen rearing.

Hive Inspection

Once the hive is occupied and the bees are busy, it is said to be colonized and it is important to inspect the colony to monitor its performance. Observe the following simple guidelines while carrying out inspection:

I. Do not stand in the flight path of the bees.

II. Work gently without excessive talking or banging noises.

III. Puff smoke gently around the entrance of the hive and remove the lid carefully.

IV. Remove a few empty bars to create a gap at one end of the hive. This should not disturb the bees. Thereafter, remove one bar at a time. Smoke the gap gently and hold the bar vertically so as not to break off the comb.

V. Use a hive tool or knife to separate bars that are glued together by propolis.

VI. Keep the bars in the same order and try not to squash any bees when replacing them in the hive. Squashed bees release a smell (alarm pheromone) that sets other bees on the attack.

VII. Do not visit the hive in the warm part of the day-about six o'clock in the evening is a good time.

VIII. Do not try and work with too many hives at a time, at least not more than 45 minutes in an apiary as bees from the first hive worked on will become agitated and attack, leading to further commotion amongst all the bees.

IX. Always wear light coloured clothes. Ideally, protective clothing should be worn, especially a veil to protect the eyes and face.

X. Make sure the top bars are pushed together as they are replaced, so that no gap exists. Finally, gently replace the lid on the hive.

XI. Always keep the grass cut and the area around the hives tidy.

XII. Always extinguish the smoker if not in use.

Note the following during inspection:

1. Check on the strength of the colony by observing the brood: eggs, larvae and pupae.
2. Is the queen present? If she is hiding, the newly laid eggs can prove that she is present.

3. Is the queen prolific-laying enough eggs?
4. Is the colony healthy? Check on any indication of bee diseases.
5. Check on food stores (honey and pollen).
6. Is honey ready for harvesting? Indication is the capping of the honey cells. The comb should be capped/sealed on both sides.
7. Is the room enough for the bees? If not, remove some of the brood combs and unite with a weaker colony and replace with empty bars.
8. Are there indications of swarming? This is when they construct many queen cells or drone cells. Destroy some and provide more room (as long as the queen is present).

It is recommended to keep simple but accurate record of each hive. To monitor the development in the colony, it is very useful to take notes in a notebook. After inspection, you should make note of what you have found in the colony and any adjustment you have made. For example, note the size or strength of the bee colony, the number of harvested combs etc.

In summary, keep notes on the following:-

- Date of inspection
- Colony strength, i.e. number of brood combs, is there nectar, pollen, honey etc.
- Characteristics of the colony, calm, defensive, very defensive (sometimes some colonies can be so defensive that no inspection maybe carried out on that day).

Record keeping

Good records kept by the beekeeper will help him/her to follow the general progress of his/her operations. Two records are particularly important: colony and operational records.

Why should we keep records?

- It is a good idea to keep records during each hive inspection so that you can follow the progress of each colony and monitor their condition. But bear in mind that each inspection should have some purpose and routine examinations should be planned.
- Records can be kept so that you know what was done last time and what to do next time and what equipment you might need.
- Keeping records allows us to identify where we have made mistakes in colony handling.
- Management records are for the beekeeper's individual benefit. Some people like to keep records of all their financial outgoings. From these they can work out when they might recuperate their costs from the sale of the honey or work out how much profit they will get.
- Most of us can remember what is going on if we have one colony but what about 5 or 10?
- All the data collected is useful when the number of colonies has grown considerably and you want to start selecting the best ones.
- You need records to have any chance of success in selecting good queens to breed or in rearing queens.

Types of records

a) Colony Records

- Date/time of last inspection, forage and weather conditions.
- Date of occupation/colonization
- Age of queen
- Date of last harvest

- Honey yield per hive.
- Colony strength and growth rate (number of combs containing brood)
- Timely manipulation (swarm prevention, feeding)
- Amount of honey/stores in hive
- Characteristics of hive (defensive , calm, productive, poor)
- Swarming record – how often, when and why.
- Pests and diseases.
- Hives name and number
- Type of hive
- Remarks

b) Operational Records

- Visits to the apiary site
- Cash flow – how much money spent or earned.
- Purchases
- Labour
- Transport costs
- Servicing of equipment
- Other expenses
- Income

How to keep records

- A simple table can be drawn in a hard-covered book and stored at home. Alternatively, you can write the information on card and attach it to the underside of the cover of the hive (not inside the hive or the bees will chew it up).
- The column headings will vary according to what you think is essential. Most things can be recorded in the comments column.
- For administrative purposes it is useful to number the hives.
- The record should be read before opening the colony.
- They should be filled out with essential information immediately after every hive inspection.
- Records should be brief.
- You will develop your own method of recording information. With practice the writing of records will soon become an integrated part of every inspection.
- A cash flow record and other operational records should be separate record from the hive/colony record.

Good record keeping denotes a serious beekeeper.

Remember the wise saying:-
"The shortest pencil is better than the longest memory"

Table 2: An example of a hive/colony record sheet

Hive number	Date of colonization	Date of last inspection	Date of last harvesting	No of kgs (yield)	Date of current inspection	Comments	Action
0001	24/10/2001	24/4/2002	- - -	- - -	02/09/2002	Laying queen present. 4 brood combs. 24 honey combs. Colony very aggressive. Honey ready for harvesting.	20 honey combs to be harvested
0002	05/04/2004	01/10/05	01/10/05	8 Kgs of combed honey	02/06/2006	Many bees, strong colony. Queen present. 2 brood combs. 1 honey comb	

Examples of Operational Records:-

Table 3: Visitors' Book

Date	Names	Contact address/ Telephone	Purpose of visit	Comments	Signature

Table 4: Cash Book

Date	Particulars	Debit	Credit

MODULE 8: THE FLORAL CALENDAR AND BEE KEEPING

Introduction

Beekeeping follows seasonal cycles. The seasonal weather impacts upon the bee population and hive products. Reduced food means that the queen lays less eggs and the population of the hive falls. Increased food means increased laying and the population increases. This knowledge is very important in modern beekeeping.

Learning Objectives

By the end of the session, participants will be able to:-

1. Construct a flowering calendar for their localities
2. Identify and explain the 4 key seasons of a colony cycle in a year.
3. Manage colonies during the different seasons in a year
4. Tell signs of harvesting period

Target Participant:

Beekeepers, extension service providers, individuals and organizations/Institutions

Suggested Number of Participants:

Maximum 30

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, dummy board, queen excluder and/or their pictures and hand outs.

Method

- Lecture
- Brainstorming
- Group discussion

STEPS

Step 1

Write the title **"FLORAL CALENDAR AND BEEKEEPING"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the seasons in a year in their areas.

Step 3

Divide the participants in 3 groups and assign each group the following tasks:

i. Identify the plants bees visit during flowering and their months of flowering in a particular area.
ii. Construct a flowering calendar and show honey flow months of the area
iii. Describe indicators of honey harvesting seasons

Step 4

In plenary, participants present findings, the trainer clarifies, summarizes and gives out the notes.

HAND OUT: Floral Calendar and Bee Keeping

Seasonal weather impacts upon nectar and pollen resources, which in turn impact on the colony population (performance). Reduced food means that the queen lays less eggs and the population of the hive falls. Increased food means increased laying and the population increases. Since more bees means more food can be collected the colonies with small populations will emphasize brood rearing. It is important to understand how the bee colony changes throughout the year because the bee colony can be manipulated to produce more honey.

Conditions for bees can vary widely throughout the country and the management of the bees depends on where they are found. Nevertheless, when managing bees for honey production, the aim is to have the maximum colony population during the nectar flow. Provided the nectar flow is good and the weather conditions are right a good honey crop can be realized.

Answering the following questions will give you a good overview of the honey year and help you prepare for the honey flow:-

- What are the plants and trees that bees use?
- When do they flower and for how long?
- When is the swarming seasons?
- Which trees or plants give the best honey?
- When the right is times of the year to expect honey and which are the signs of honey harvesting seasons?
- What factors affect plant flowering?

If the above information is recorded carefully as in table below, it is easy to look ahead and predict which plants will flower when.

Table 5: Floral Calendar

Plants/trees	Month												Pollen/nectar
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

The bees' behaviour is very sensitive to their environment. When there is plenty of food, bees make honey to eat later on when there is little food. The beekeeper shares in this stock of food.

Manipulating the colony to be at the peak strength at the right time is fundamental to good beekeeping. Good flying conditions (dry weather) for the bees are also important during the nectar flow to get maximum yields. Therefore all management practices are related to the bee colony cycle and understanding which stage the colony is in.

There are four seasons during a cycle and these may occur more than once in a year:

1. **Dearth** – not much nectar is being collected due to bad weather and poor forage.
2. **Build-up** – there are many bee forage plants and the weather is favourable the colony expands.
3. **Honey flow** – many plants provide nectar and flower at the same time
4. **Harvesting seasons** - most plants have stopped flowering and honey is ready for harvesting.

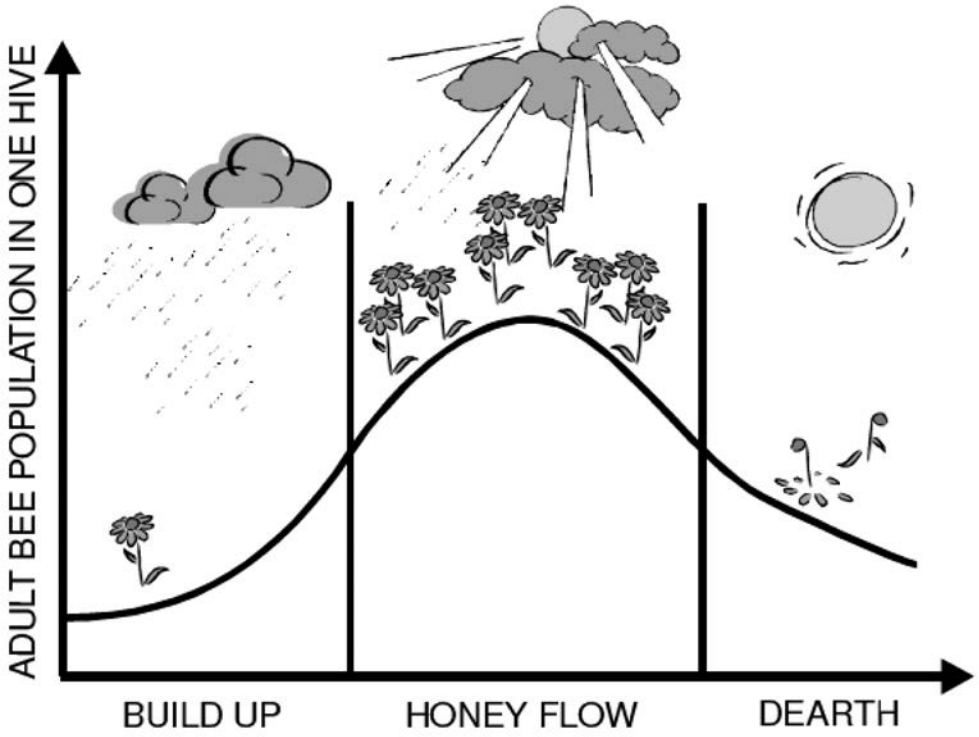


Fig 47: Floral Calendar

Honey flow and harvesting season follow one another.

Managing the bees during dearth

- Weak colonies can be united.
- If combs are dry or movement from the hive entrance is very slow then bees should be fed with sugar syrup.
- Alternatively, do not harvest all the honey from the combs. Leave enough for the bees in the dearth period.
- Decrease the number of combs when the colony gets smaller. A 'dummy board' can be placed near the combs to make the hive space smaller and more comfortable for a small colony. This is a movable partition made of hardboard or similar material. The flight entrance of this empty part of the hive should be closed.
- If the weather is cold then the hive can be insulated with a sack or dry grass at night.
- Check for any attacks by ants, wax moth or other pests as they can cause a lot of trouble to weak colonies. Close the flight entrance with coarse mesh and nails so that mice and lizards cannot get in but bees can get out. Remove all unoccupied combs as the bees will not defend these against wax moths.

Managing the bees during build-up

- Aim to get colonies to be strong and about the same size. A strong colony should have a minimum of 6-8 combs that are fully covered with bees. Combs of sealed brood (without bees) can be taken from very strong colonies and placed in the hives of weaker colonies.
- Feed the colony if it is weak and cannot be strengthened by giving it brood.
- Build-up costs energy, so feed the bees if the honey flow is poor.
- Check that there is enough drinking water in the surroundings.
- Unite very weak colonies. Alternatively weak colonies can be allowed to build up and honey can then be harvested at a much later date.

- Provide more space as necessary. It is important to keep adjusting the size of the hive to the size of the colony. The bees should be able to occupy all the frames. Only then can the total comb surface be protected from intruders and kept at the right temperature.
- To prevent brood from developing in the honeycombs, place a queen excluder between the brood and the honey parts of the nest. However this is not imperative to honey production.
- Check for bee diseases.

Managing the bees during honey flow

- Give the bee space and ventilation when colonies become strong. Provide extra room by moving the 'dummy board' and adding more top bars.
- Check for queen cells (after drones are seen flying) by trying to stop any swarming by destroying queen cells or dividing the colony.

However, it is better to divide colonies during the build-up and not the honey flow as any loss of population can decrease the honey production.

The main principles of floral calendar and beekeeping

- Knowing the area, the plants that bees like and when they flower and for how long.
- Understanding the colony cycle and aiming for strong colonies at the same time as the nectar flow for maximum honey yield.
- Leaving food for the bees when harvesting to keep them during time of food scarcity (dearth).
- Providing space for the bees and expanding and contracting the brood nest as needed.

Management during harvesting season

- Inspect hives which are due for harvesting
- Prepare enough containers for honey
- Have protectives, smokers and helpers ready.

MODULE 9: BEE STINGS AND MANAGEMENT

Introduction

Bees are feared not only in Africa but all over the world. They sting painfully, but the tropical bee, in addition, can kill both man and his animals. However bees should not be considered extremely dangerous. The stings can be successfully avoided and managed.

Learning Objectives

By the end of the session, participants will be able to:-

1. Explain what causes bees to sting
2. Explain how to avoid bee stings
3. Describe how to manage bee stings

Target Participant:

Existing beekeepers interested in gaining more knowledge, or individuals or organizations wanting to start keeping bees

Suggested Number of Participants:

A minimum 10, maximum 30

Duration:

1 hour.

Materials

Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, notes, live worker bees, protective wear and/or their pictures and hand outs.

Method

Methods should include brainstorming, group work and presentation.

STEPS

Step 1

Write the title **"BEE STINGS AND MANAGEMENT"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and body reactions to bee stings.

Step 3

Allocate the participants in 3 groups and assign each group the following tasks:

i. What causes bees to sting

ii. Describe body reactions to bee stings

iii. How to avoid and manage bee

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the notes.

HANDOUT: BEE STINGS AND MANAGEMENT

Bees are feared not only in Africa but all over the world. They sting painfully, but the tropical bee, in addition, can kill both man and his animals. Bees in the forest areas and those in the temperate region in the south are less aggressive than those in the savannah vegetation and in the Sahara; the least disturbance may provoke the desert bee to abscond. Even though stings can kill, bees should not be considered as extremely dangerous. The beekeeper who is afraid of his bees is like a lorry driver who will not drive for fear of an accident, or a farmer who will not go to his farm for fear of a snake bite. It is interesting to note that the bee stings can treat diseases like arthritis and that bee venom is used as a desensitizer for people who are allergic to stings. Thus a few stings that administer small doses of venom may be helpful. But too much can be dangerous, and people allergic to bee stings should not keep bees.

If a sting is inserted into the skin, it must be scraped away with the fingernail or a knife. Do not pull it out, or more poison will be injected into the flesh. If the result is itching and swelling, do not rub the spot, as this action will cause greater pain and swelling. Treat bee stings by applying cold cloths. In extreme cases, victims should be sent to the hospital. Ephedrine may be administered when a doctor's help cannot be obtained.

What causes bees to sting?

- Visiting a hive during the warm part of the day;
- Disturbing them without smoke;
- Breathing into the hive, especially if the beekeeper has been drinking any alcoholic beverage, including beer;
- Wearing a cosmetic item which contains beeswax;
- Talking, drumming or making any other noise when bees are busy nearby;
- Standing in their flight path;
- Wearing dark clothes near the hive during the daytime;
- Making jerky movements near the hive;

- Crushing a bee near a hive or squashing a bee body and smearing the juice on one's body;
- Swatting with the hand to drive a bee away.
- Grazing within the apiary
- Poor selection of the site

How does the bee attack?

It is safe to work as long as no bees attack. However, the first bee sting attracts others to strike. If the victim stands quietly without moving his body, all other attackers will sting on the same spot as the first strike. Every bee that stings puts more alarm pheromone on the spot, thus causing more and more bees to strike, and the resulting pain makes the victim swat round and round, causing other attackers to sting other parts of the body.

How to avoid stings

Remember that a queenless colony is very aggressive during its early days.

Remember that every bee that stings dies afterwards. Thus the apiarist who causes his bees to strike in fact kills them. A reduction of the field force means a reduction of output of work which results in less honey production.

If unprotected, one should run away after the first sting. The attacker may chase the beekeeper, but he should not be afraid of a second sting by the same bee. This bee can be killed so that she cannot return to the colony and pass on information.

The sting of the worker bee is designed to perforate the skin of her enemies and to pump poison into the sting site. It has about ten barbs, so that when it is thrust into flesh, the bee cannot pull it back again. It breaks off with the poison sac always attached to it, enabling more poison to penetrate for as long as it remains in the flesh. The bee's sting is lodged in a special sheath and is released only when the need arises. The sting of the queen bee is longer than that of the worker. It is used only to fight and kill rival queens in the hive. The drone has no sting and is totally defenseless.

Management of bee sting

If you work with bees, one thing is certain, at some stage you will get stung. But most beekeepers are truly amazed by the gentleness of bees and even though stings can kill in certain situations and with certain individuals, bees should not be considered extremely dangerous. Often people get stung purely because they swat at or kill a bee. Bees die after they sting, and will generally sting only when they perceive that the colony is threatened. Bees away from the hive rarely sting unless provoked. Bee stings can range from nothing more than a minor irritation to life-threatening allergic reactions. It is very important to know the difference between a normal and a life threatening reaction. An initial reaction especially for new beekeepers is local redness, swelling, pain and itchiness. This is known as a normal reaction. Life- threatening systemic allergic reactions affect the whole body especially circulatory systems (movement of the blood) and respiratory systems (breathing). Symptoms are not localized just around the sing site.

First symptoms of a severe allergic reaction occurring within the first 5 minutes of being stung include:

- Nausea/sickness
- Dizziness
- An urge to use the toilet
- General weakness and a need to lie down
- Itchy palms, soles, eyes and throat.
- Heart failure

The above symptoms of severe allergic reaction to be stings are very rare. A person showing these symptoms should be taken to a hospital immediately. A severe reaction like this will only happen to a person who has

had several stings in the past and a previous bad reaction.

Severe allergic reactions can be treated by:-

- Using an epinephrine inhaler that can be purchased in some pharmacies in the event that an unexpected allergic reaction occurs.
- Using an Epipen injector, this contains epinephrine. This is an intra muscular injection of adrenaline but is only used in very extreme conditions.

Normal bee stings can be treated immediately by:-

- Applying cold cloths or a cooling agent such as cold clean water, very dilute vinegar or ice. Plastering a thin layer of clay soil over the stung area or applying the gel of the aloe vera plant can also soothe and cool swelling. If nothing else is available then a little honey could be applied to the area.
- Taking an antihistamine which can reduce swelling.

But to reduce the chances of being stung use a smoker. Bees exchange chemical signals or smells to communicate. If one bee is spreading a signal of alarm by stinging an attacker or intruder, then smoking the bees will cover these smells. This stops the bees communicating and can prevent an attack. Because of the smoke threat many of the bees will rush to the honey cells and fill their stomachs ready for an emergency absconding. Once the bees are full they are less inclined to sting because it is harder for the bees to bend. Smoking can reduce the risk of dangerous situations but it should be remembered that no beekeeper would avoid stings completely.

If you are stung then:

1. Stay calm: put the combs back in the hive and close the hive. If the attacker bee chases the beekeeper it is better to kill the bee, so she cannot return to the colony and pass on information.
2. Remove the sting as quickly as possible: The longer the sting is in the skin the more venom is transferred! It is necessary to remove the stinger by scraping underneath the venom sack with a fingernail or a sharp object. The venom sac must not be squeezed or pulled out, as it will discharge venom into the sting site increasing the pain. Do not rub the spot, as this action will cause greater pain and swelling.
3. Smoke the sting site: The smell of the poison is called 'alarm pheromone'. This smell irritates other bees and attracts them to strike on the same spot. Therefore the sting site and fingernail must be smoked quickly.
4. Run avoid human, animal and busy dwellings.

Avoid stings or reduce the number of bee stings by doing the following:-

- Hives should be sited so as not to cause a nuisance to neighbors and animals.
- Make sure the hives are not being bothered by pests.
- Work hives on days when bees are flying well. If it is windy, rainy or cold all the bees will be at home.
- Site your hives out of the midday sun and work bees at midday.
- Avoid working the hive in threatening weather such as extreme heat, strong winds and approaching storms.
- Harvest honey late in the day just before dark.
- Bees can become entangled in hair and clothing. Wear appropriate protection.
- Wash your bee clothes thoroughly periodically especially if bees have been stinging.
- Wear white or light coloured clothes; however the veil itself should be black to enable the beekeeper to see more clearly.
- Avoid strong smells such as perspiration, alcohol, soap and perfume.

- Smoke your face and arms repeatedly before you start working with the bees.
- Don't stand in front of the hive entrance or in the bee's flight path.
- Light 2 smokers incase one goes out during the inspection
- Work the hive with 2 people. One doing the smoking and one the handling.
- Have enough fuel for the smoker at hand. Make sure the smoke is thick, cool, white smoke and that no sparks come out of the smoke.
- Use your smoker wisely – don't over – smoke the bees.
- Keep calm and move slowly and deliberately around the bees. Don't swat at flying bees, flap your arms about or run away.
- Avoid banging against the hive or squeezing and crushing bees.
- Smoke any sting site and try rubbing scented herbs on the spot
- Remember that a queen less colony is very aggressive during this early days, so be extra careful.

Common sense and experience goes a long way toward helping the novice beekeeper avoid or reduce the number of stinging incidents.

MODULE 10: HIVE INSPECTION

Introduction

It is important for a beekeeper to undertake hive inspection in the apiary.

Learning objectives

By the end of the session, participants will be able to:-

1. Understand the important steps in hive inspection,
2. Carry out systematic hive inspection.

Target Participants:

Existing beekeepers, extension service providers, individuals and organizations interested in pest and disease control and quality honey harvesting.

Suggested Number of Participants:

A maximum of 30 persons

Duration:

3 hours.

Materials

Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, colonized beehive(s) and/or their pictures, bee suits, smokers and hive tool set (hive opener, bee brush and stainless steel knife) and hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Field or practical exercise to inspect a hive

HAND OUT: Hive Inspection

Importance things to note during hive inspection

- Check the weather and proceed to the apiary in the late afternoon if the weather is good.
- All the trainees must put on their bee suits or adjust their clothing appropriately.
- There are a number of things you can check in the apiary and the hive.
- The first important thing is to know how to prepare and open the hive.

Steps in hive inspection

1. Light the smokers using charcoal and dry cow dung. Make sure you have plenty of fuel at hand for the inspection. Check for cool white smoke and smoke your hands, head and arms if you do not have the full protective gear.
2. Now check your clothing. Push your veil inside your t-shirt and tuck your trousers into your socks if you do not have a full bee suit.
3. Go to the hive and smoke the entrance holes of the hive but do not stand in front of the hive entrance. Wait for half a minute and smoke it again. Repeat this 8 times.
4. Remove the lid gently and slowly. Knock the top bars gently with your hive tool or knife. You will hear when the combs begin.
5. Loosen and lift a top bar with your knife 6-8 bars away from the last comb.
6. Blow smoke inside immediately.
7. Take out a few top bars to give you room to work (working gap) and use your knife if bars are stuck together. Shake any bees into the hive from the combs by hitting your arm behind the wrist.
8. Move the empty top bars towards the empty side of the hive one by one, leaving no gaps between, where bees can come up. Do this gently, smoke between each step and be careful not to squash any bees between top bars. If a bee gets squashed, smoke it and put it into your smoker. If you do get stung, don't panic, move away and remove the stinger.
9. When you are near the first comb, smoke the bees until you hear them buzz. Too much will irritate them. The smoke will drive them from the honeycomb.
10. Before you lift the comb out, make a gap so the next comb is visible and blow smoke in the gap. Never touch the bees and combs with the smoker. Lift the comb out and look if the honey is ripe then replace it towards the empty side of the hive. Always hold combs in a vertical position or they may break.

    Continue in this way, smoking the bees, checking each comb and shifting each one along to the empty side of the hive.

    Replace each comb in the same order. Cover the working gap with a cloth as often as possible.

    Large portions of pollen indicate that the brood nest is near.

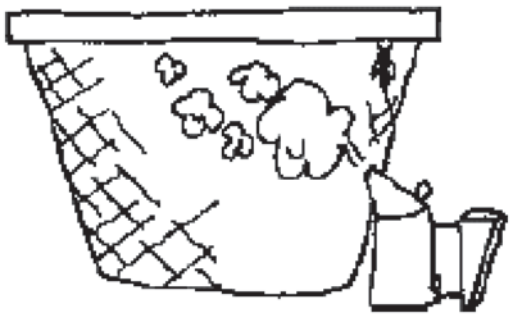
    Now inspect the brood nest (see diagram) but do not disturb it for longer than is necessary.
11. When you have finished, push the top bars carefully back into their original position. Shift 2 top bars with combs in one go. As you close the gaps, drive the bees back inside with smoke. Do not leave any gaps.
12. Close the hive and pass through some bushes to rid yourself of any bees following you.

During this hive inspection and inspection of the brood nest check the following:-

Check for surplus sealed honey.

Bees store honey to eat during times of hardship. If you see combs with large areas of sealed white cappings then the honey is ready for harvesting. The beekeeper will share in this store. Any honeycomb you want to crop must be more than half sealed on either side. Some honey should be left in the hive at all times or

the bees may starve or abscond. If you do not see lots of white sealed combs then this means there is no surplus and no honey should be harvested.



Check if the bees are disturbed or aggressive. It is important to know that some bees are more aggressive than others and may sting or swarm when being worked. Also if bees are hungry they can be angry or if they have lots of honey they can be defensive. Aggressiveness may also be due to queenlessness, disease or pest harassment. Remember pest disturbance can also mean humans! Natural aggressiveness can be controlled by the selection of a gentler queen.

Check for queenlessness.

If you find no eggs, larvae or capped brood (and the hive is aggressive) then it may be queen less.

Check for sealed and unsealed brood.

Sealed brood or larva is the tiny baby bee. This looks like a maggot and is in an uncovered cell. The sealed brood or pupa is the more developed bee and is in a covered cell. If you can see both eggs and larvae then you know the queen is present. If you don't see pupa but see eggs then maybe the queen is new!

Check the brood pattern.

When the queen lays eggs in every empty cell and fills up the comb, she is said to be a good laying queen, showing a good brood pattern. If you find spotty egg laying, too many drones or a slow queen in the hive – then it is a good idea to replace the queen.

Check for honey and pollen.

When there is no honey or pollen in the hive, bees may be more aggressive and stop producing wax. If you do not see any stored honey or pollen then the bees may need feeding with sugar solution. It is very important to learn the difference between capped brood and capped honey. You do not want to harvest the brood.

Honey is always at the top and brood below.

Capped brood is usually dark brown (but can be paler on new combs) and located in the middle of the colony and at the bottom of the comb. You can see the distinct outline of each cell with its thick seal but you cannot see the brood itself.

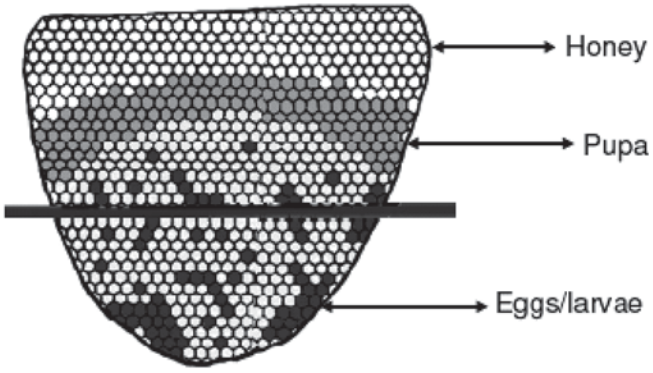


Fig. 48: Comb

Capped honey is usually white or creamy in color and located at either side or above the brood comb. It is harder to see the individual cells and with its thin seal you can see the shiny honey.

Remember:-
NEVER *harvest a brood comb even if it contains large portions of sealed honey.*

Check for old brood combs and black combs.

After a number of seasons the bees will decide to shift the brood nest from the dark combs to the light combs of the honey section. Move the new brood to the original position of the brood nest and crop the dark combs – this will also help to control disease.

Old black combs may also mean that the bees are unable to make new combs and this is not a good sign. The bees may be hungry. It is better to move the old comb out of the hive or to the outside of the nest. Put newer combs in the middle or add a top bar with a wax starter strip.

Check for queen cells.

When the bees make numerous peanut shaped wax cells and the hive is populous then the bees maybe starting swarm preparation. This is a natural instinct to divide the colony in half – the old queen leaves with half the bees and new queen hatches in the original hive.

Check the hive arrangement.

The brood nest should be compact and not spread out. It should be in the center of the colony in order to incubate the eggs. Combs of brood should be placed together. Do not put combs of honey between combs of brood because this could prevent the queen from expanding the brood nest properly.

Check for faulty combs.

Sometimes you may find parts of combs being cross-built or attached to other top bars or combs. Correct this by cutting parts off, changing positions or even removing combs. Never leave any wax pieces on the hive bottom. Replace warped top bars and damaged or lost starter strips with clean wax.

Check for diseases and pests.

Hives are subject to attack by pests such as mites, ants and wax moth.

Seal any small cracks and gaps with pieces of wood glued with wax or propolis.

Check for drone brood.

Transfer any combs full of drone brood to the edge of the brood nest.

This will secure the brood nest space for the more productive workers.

Finally check the location of the hive.

If bees are placed in a damp place the honey will be very watery and unripe honey will ferment. Hives in a hot place or in the direst sun will force the bees to carry water to cool the hive. When they are doing this they will not be producing honey! This stresses the colony and it may leave or die. The apiary should be clean. The grass should be cut short and any branches that reach the hives trimmed to prevent pests crawling in. The wires holding the hive should be greased to also prevent pests.

Close the hive.

Beekeepers must aim for a strong colony with new combs, eggs, unsealed brood, sealed brood, honey and pollen.

A beekeeper should inspect hives regularly to monitor the progress of the bees. When the bees are making honey you should open the hives once a week. At other times open the hives every month. Simply looking at the hives without opening them can be done almost daily. Observing the bees for a few minutes can tell

you a lot. Simply check if the bees are collecting pollen on their legs. If they are then, it indicates that the bees are feeding the young. It shows that the bees are healthy and have a laying queen. A smell of honey will indicate that the bees are storing it and that a harvest may not be far off!

MODULE 11: POPULATING THE HIVE

Introduction

It often happens that bees do not enter the hive for quite a while. The new hive that you have worked so hard to build and invested money in stays empty - and an empty hive does not produce any honey!

Learning objectives

By the end of the session, participants will be able to:-

1. Define a swarm
2. Describe the methods involved in populating a hive

Target participant:

Existing beekeepers and extension service providers.

Suggested number of participants:

A maximum of 30

Duration:

2 hours.

Materials:

Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, a swarm of bees, a swarm bag or container, bee suit, smoker, smoker fuel, Bee attractant or bait, a queen cage, a prepared hive, catcher box and/or their pictures and hand outs.

Method:

- Lectures
- Brainstorming
- Group work and presentation
- Field exercise

STEPS

Step 1

Write the title **"POPULATING A HIVE"** on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and successes with the various methods of populating a hive.

Step 3

Allocate the participants in 2 groups and assign each group the following tasks:

Group 1:: List down all the materials required in each method to do successful hive populating

Group 2:: Describe steps of each method of populating a hive

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise- engage the participants into practical hive baiting.

HAND OUT: Populating a Hive

What should we do to get bees to enter the beehive?

- Choose a good site for the hive
- Wax the top bars
- Keep the hive clean and pest free
- Catch a wild swarm of bees
- Transfer bees into the hive
- Make a division of an existing colony
- Buy bees

Important things to note

- A hive must be sited in an appropriate place.
- To encourage bees to enter a hive you must make it attractive. Often beekeepers put wax on the top bars and wax, propolis or lemon grass inside the hive. But the wax should be fresh and have a strong smell. Bees are very clean insects and do not like a dirty hive. There should not be any dirt, spiders, cobwebs or insects that might capture a scout bee and prevent it returning to fetch the swarm. If there are any ants, lizards or rats nesting in it, you must clean it out and re-grease the wires.

Swarming

- Swarming happens when the colony gets too big and the bees want to reproduce the colony by making a new queen.
- The old, experienced queen and most of the adult workers leave the hive with the swarm and fly out of the old hive looking for a new home. She needs to find a secure place to mate and start laying eggs. A swarming colony does not have any combs.
- A new queen later hatches out and takes over the old colony and the remaining bees. During the swarming season it is easier for hives to be occupied quickly.
- In some areas, swarming seasons coincide with rainfall when there are a lot of flowers for the bees to feed on. It is a good idea to ask experienced beekeepers in your area when the swarming season is.
- A swarm is a colony of bees clustered in the open and looking for a new home. A swarming colony is easy to catch. The beekeeper can capture the swarm and place it into a temporary or permanent hive. The swarm has a better chance of staying in its new hive if it is captured during a nectar flow.

Catching a swarm

Very simply the steps include:-

- Preparing a new hive first.
- Using a smoker, bee veil and suit.
- Looking for a swarm of bees clustering on a branch or a place where they can be easily caught.
- Spraying the bees with sugar water to wet their wings.
- Catching the swarm in a container that is easy to close, easy to carry and be ventilated - such as a cardboard box, a wide mouthed basket or even a bag made from cloth.
- Smoking the bees.
- Holding the container under the swarm and shaking the swarm directly into the container.
- Finding and caging the queen.

- Placing the cage with the queen in the upper part of the container.
- Leaving the container in a shady place until evening covered with a damp cloth.
- Shaking the bees into your empty hive when evening comes. Placing the caged queen in the hive.
- Giving the bees a comb with some uncapped honey and a brood comb with eggs (but without bees!) from another hive.

Fig. 49: Catching a swarm

- Fixing queen gates or includers in front of the entrance holes.
- Releasing the queen after a few days when the bees have settled down.
- Feeding the bees in the first few evenings to help the swarm to settle during the nights.
- Checking that bees are entering and leaving the hive.

You can also trap swarms in a swarm box or bait hive. You can also use special bait hives or catcher boxes (mini top bar hives) to catch swarms – but boxes, baskets or gourds may also be used as bait hives. The best catcher boxes will have top bars from which the bees can build combs. If so these bars should be the same size as those found in your new permanent hive to make transfer easy.

Very simply the steps include:-

- Preparing the bait hive with empty comb, propolis or aromatic plants.
- Siting the bait hive along a swarm or in a good apiary location.
- Inspecting the hive every few days.
- Transferring the new colony to your empty top bar hive, comb after comb, in the same order.
- Adding 2 brood combs and a food comb from another hive.
- Brushing the remaining bees into the hive and letting the bees settle undisturbed.
- Feeding the bees.

Another way to populate your top bar hives is by transferring bees from a wild nest or from a traditional hive with fixed combs (combs which are not moveable).

Transferring bees

Steps include:-

- Transferring the colony shortly before sunset.
- Using a lot of smoke to drive the bees away from the combs.
- Taking combs out of either wild nests or fixed comb hives by cutting them along the top where they join the container and without breaking them.
- Tying combs with large areas of brood and pollen one by one on to the top bars of the new hive with strips of natural fibre.
- Putting the combs with brood tied onto top bars back into the nesting chamber of the original nest and smoking the bees onto the combs.
- Placing the combs, covered in bees, into the new top bar hive.
- Scooping the remaining bees very gently into the hive.
- Placing the hive close to the previous site or hive so that foraging bees will return to it.
- Closing the entrance to the original site securely or removing the old hive.
- Checking if the queen is present or capturing the queen and introducing her to the hive when the rest of the transfer is complete.

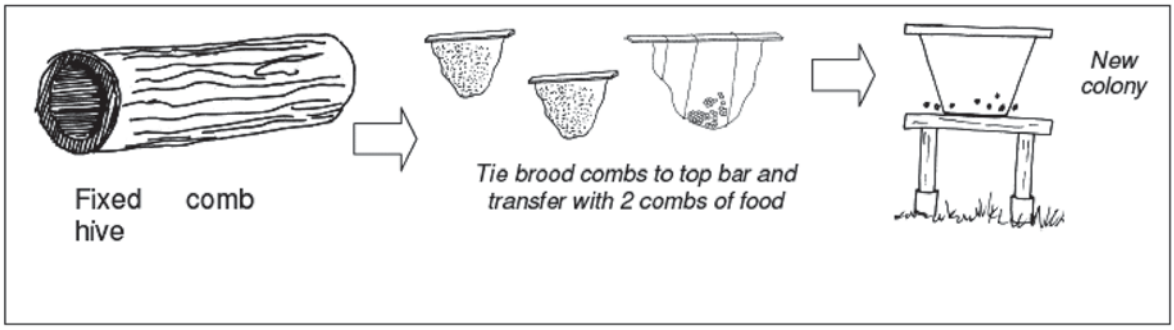


Fig. 50: Transferring bees

Dividing colonies

Steps include:-

- Choosing the most productive, docile colony with brood, eggs, pollen and honey.
- Making divisions after the honey flow to increase colony numbers or
- Dividing a colony when the bees are getting ready to swarm.
- Preparing your new hive first.
- Using a smoker and bee veil and suit.
- Selecting a comb with queen cells and breaking all the queen cells except two.
- Transferring the comb with the queen cells into the new hive. Transferring one or two combs with sealed brood and a little unsealed brood, plus one or two combs of honey and pollen. A new Queen will hatch out in the new colony. The first queen to hatch out will destroy the other queen cell.
- Including bees on all the combs you transfer and brushing in bees from 2 or 3 other combs. Most of the adult bees will remain in the old hive and continue to make honey.
- Checking that you do NOT have the old queen on the combs you move or brush off.
- Remembering to put the brood combs in the middle and the honeycombs on either side to insulate the brood nest.
- Waiting until dark then moving the new hive to a site at 2kms from the old site. Alternatively moving both hives 1m either side of the old location.

- Feeding the bees in the new hive.

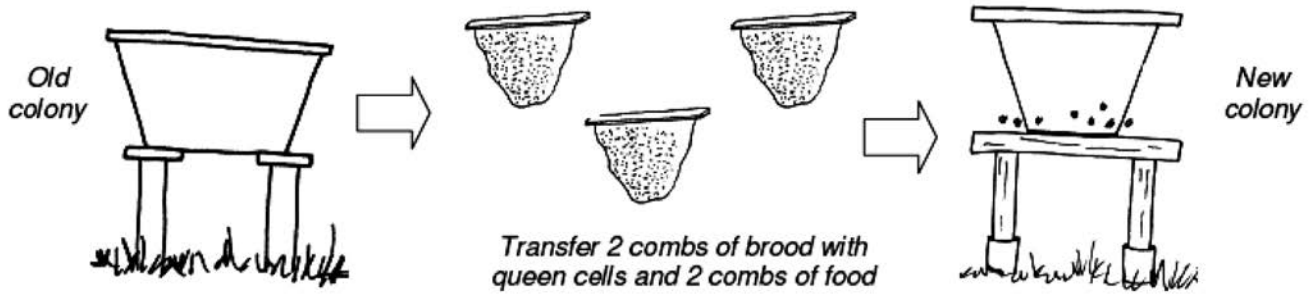


Fig. 51: Dividing a colony

We can also populate a hive by buying bees from a beekeeper. Beekeepers buy and sell bees as a business such as:-

- Swarms.
- **Laying queens only with eggs** - though you must have a queen less colony or a colony with a bad queen.
- **A nucleus hive** - with a small population of bees, 4 or 5 combs and a laying queen.
- **Full hives** – this is less common and difficult to transport.

Catching a swarm

Advantages

- Free
- Common
- Plentiful in season
- Easy to capture
- Gives the bees a home

Disadvantages

- Don't know the bees stock
- Bees may be aggressive
- Bees may be diseased infested with pests or of inferior stock.

Transferring a wild colony into the hive:

Advantages

- Free
- Plentiful with extra wax and honey

Disadvantages

- Established colonies can be aggressive and bees may sting
- Queen could be killed
- The process can be difficult for new beekeepers

Making a division of an existing colony

Advantages

- Free
- Nearby and available

- Can divide the best colonies easily and when you want
- Can supply the bees with everything they need
- Can quickly multiply your bee population

Disadvantages

- Need to already have a bee population
- Can be complicated
- Needs technical knowledge and experience

Buying bees

Advantages

- Easy
- All ages and brood can be obtained

Disadvantages

- Might be costly
- Queen may be old or of poor quality
- Wax comb may have diseases or pests

MODULE 12: CATCHING A SWARM

Introduction

A swarm is a colony of bees clustered in the open and looking for a new home. A swarming colony is easy to catch. A beekeeper can capture a swarm and place it into a temporary or permanent hive. The swarm has a better chance of staying in its new hive if it is captured and introduced between the beginning and the peak of a main nectar flow. Otherwise they won't settle easily and may abscond soon after the introduction into a hive.

Learning objectives

By the end of the session, participants will be able to:-

1. Define a swarm
2. Describe the steps involved in catching a swarm

Target participant:

Existing beekeepers and extension service providers.

Suggested number of participants:

A maximum of 30

Duration:

2 hours.

Materials:

Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, a swarm of bees, a swarm bag or container, bee suit, smoker, smoker fuel, a queen cage, a prepared hive, catcher box and/or their pictures and hand outs.

Method:

- Lectures
- Brainstorming

- Group work and presentation
- Field exercise

STEPS

Step 1

Write the title "Catching a swarm" on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and successes with catching a swarm.

Step 3

Allocate the participants in 2 groups and assign each group the following tasks:

Group 1:: List down all the materials required to do successful swarm catching

Group 2:: Describe steps of swarm catching

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise- walk with the trainees to the site of a swarm within the local area to participate in swarm catching exercise.

HAND OUT: Catching a Swarm

A swarm is a colony of bees clustered in the open and looking for a new home. A swarming colony is easy to catch. A beekeeper can capture the swarm and place it into a temporary or permanent hive. A swarm has a better chance of staying in its new hive if it is captured and introduced between the beginning and the peak of a main nectar flow. Otherwise they won't settle easily and may abscond soon after the introduction into a hive.

For this operation it is best to seek help from an experienced friend rather than trying to do it alone.

Steps of catching a swarm and putting the swarm inside a hive

Catching a swarm

(i) **Prepare your new hive first** – clean it and by rub it with some beeswax or propolis so it smells familiar for the bees. Both propolis and beeswax, can be softened in hot water, near fire or in the sun before using them.

(ii) Use your smoker and bee veil and suit when catching a swarm, as some swarms may be hungry and difficult to manage. Generally swarming bees are docile as they have no brood to protect but always be careful with strange bees, as they may be aggressive! Keep your smoker alight nearby in case you need it.

(iii) Check where the swarm is located. Bees clustering on a branch where you can catch them are easy. A natural swarm hanging from a tree is normally docile and can be easily removed and hived. If the swarm is in an awkward place then use your smoker (or any smell they instinctively move away from, such as squashed marigold leaves) to move the swarm to a place where you can get underneath and catch it easily.

(iv) Check the size of the swarm. Don't waste time with very small swarms (smaller than a person's head), as they are more trouble than they are worth.

(v) Spray or sprinkle the bees with water (preferably with sugar added) to wet their wings. This will stop them flying away and they will lick each other and become more satisfied. Also blow smoke gently and repeatedly over the swarm without arousing it.

(vi) You can catch a swarm in a container such as a cardboard box, a wide mouthed basket or even a bag made from cloth. The container needs to be easy to close, easy to carry and be ventilated. Do not use a plastic bag as the bees will suffocate! Bee veils that are tied at the bottom can also make good swarm catchers.

(vii) Hold the container under the swarm. Now shake or brush the whole swarm of bees with a feather or brush made from soft leaves, directly into the container. But never brush bees without smoking before hand. If the swarm is hanging from a branch then a firm blow on the branch (or one or two hard shakes) will make the bees drop into the container. Alternatively you may cut the branch if it is thin and carry the swarm to the container.

(viii) Now observe the bees, if most of the bees have entered, you can be certain you have got the queen. If you have the queen, you automatically have the swarm.

(ix) Close the container and quickly but gently turn it upside down so the entrance is at the bottom. The bees will sit or hang from the top of the inside of the container. Wait for about 20 minutes for all the bees to settle.

(x) BUT if you are not sure that you have the queen and want to be on the safe side, then shake the swarm on to a white sheet or cloth and find the queen bee. Seize her gently by the chest or wings (NEVER her abdomen) - she will not sting.

(xi) Place her in a queen cage such as a matchbox. You can also use an old hair roller blocked at either end by wax or wood or a roll of wire mesh (queen excluder size). Slightly open the matchbox so the bees can communicate with her and feed her but she cannot escape.

(xii) Place the cage with the queen in the upper part of the container. The bees will follow the queen and cluster around the cage.

Putting the swarm in a hive

(i) Once you have the swarm of bees, leave or hang the container in a shady place or dark corner until evening. Make sure the bees do not become hot in the container - covering it with a damp cloth can help.

(ii) When evening comes, take the bees to the apiary.

(iii) Remove half of the top bars from an empty hive, with the remaining top bars covering one end of the hive.

(iv) If you have other hives give the bees a capped brood comb and a brood comb with eggs (but without bees!) to encourage them to stay. The swarm will feel at home with brood to look after. Also give the swarm a comb with some uncapped honey and pollen and frame the brood combs with these.

(v) If you have caged the queen then fix the cage to a top bar.

(vi) Lower the swarm into the hive and with a sudden jerk, shake the bees into your empty hive. They will gather under the bars near the queen.

(vii) If the queen is caged then release her after a few days when the bees have settled down. Push the matchbox open near a cluster of bees and the queen will quickly creep among the other bees. Do not cage the queen for longer than 3 days.

(viii) If no brood comb and food combs are available for your newly hived swarm you can fix queen gates or includers in front of the entrance holes with soft wax. Use paper clips with the inner measurements of 4mm. This prevents the queen and the rest of the swarm escaping. (But only use queen excluders if you are sure the queen has mated).

(ix) Initial feeding in the first few evenings will help the swarm to settle during the nights. It is best not to open the hive during the next 4 weeks, as the colony has to settle undisturbed. But remember if you caught the swarm during a poor flowering season it is better continue feeding sugar water for 2 weeks.

(x) Check that bees are entering and leaving the hive. If the bees are carrying pollen this is a good sign, as it means they are making and feeding new brood and are happy in their new home.

Trapping swarms in catcher boxes

You can also use special bait hives or catcher boxes to catch swarms. These are like mini short top bar hives with about 4 bars - but boxes, baskets or gourds may also be used as bait hives.

The steps of trapping a swarm in a swarm box:-

(i) A few pieces of empty comb (without brood or dead brood) taken from an established colony and stuck in the catcher box increase its attraction. Rubbing beeswax, propolis or aromatic plants such as lemon grass, can also make them more attractive. Lemon grass has a similar smell to the queen bee. Honey should not be used as this will attract ants and wax moths.

(ii) The ideal locations to site bait hives are the same as those where an apiary could be set up. It should be hung in a tree close to the place where you want to put the top bar hive. In some areas, swarms fly along the same route during the same season each year. These routes make good locations for bait hives. You may find out the routes by asking local people or beekeepers.

(iii) The best catcher boxes will have top bars from which the bees can build combs. These bars should be the same size as those found in your new permanent hive to make transfer easy.

(iv) Catcher boxes must be inspected every few days as a new swarm quickly builds comb and becomes established. It is then difficult to transfer it into a more permanent home.

(v) In the evening take the swarm box next to the empty top bar hive that you want to populate and smoke the bees. Avoid breaking combs!

(vi) Put the swarm box next to your hive, smoke the bees and transfer the new colony to your empty top bar hive, comb after comb, in the same order.

(vii) Add 2 brood combs and a comb with open honey and pollen from another hive with a strong colony if you have one. Smoke and brush the remaining bees into the hive, close the hive and let the bees settle undisturbed. There will probably be enough food in the combs.

(viii) Suspend the swarm box again as it should always be ready to help you to increase your colonies!

Why bees abscond

- Use of insecticides and chemicals.

How you may avoid absconding

- Use of chemicals with short residual effects e.g. pyrethroids.
- Shifting hives with colonies from an area targeted for spraying and returning them after flowering.
- Demarcate areas for bee keeping.
- Encourage those near gazzeted areas e.g. national parks to site their hives there.

MODULE 13: TRANSFERRING BEES

Introduction

It is possible to transfer bees from a wild nest or from a traditional hive with fixed combs (combs which are not moveable) in order to populate a hive. Transferring is not easy for the beginner. Transferring bees from a fixed comb hive is much easier than transferring bees from a wild nest.

Learning objectives

By the end of the session, participants will be able to:-

1. Explain the purpose for transferring bees
2. Describe the steps involved in transferring bees

Target Participant:

Existing beekeepers and extension service providers

Suggested number of participants:

A maximum of 30

Duration:

2 hours.

Materials:

Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, an existing traditional occupied hive or wild colony, an empty prepared hive, top bars, natural fibre, bee suit, smoker and smoker fuel, a queen cage and/or their pictures and hand outs.

Method:

- Lectures
- Brainstorming
- Group work and presentation
- Field exercise

STEPS

Step 1

Write the title “Transferring bees” on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and successes with transferring bees.

Step 3

Allocate the participants in 2 groups and assign each group the following tasks:-

Group 1:: List down all the materials required to do successful transfer of bees to populate a hive

Group 2:: Describe steps of transferring bees

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise- walk with the trainees to the site of a colony or an apiary within the local area to participate in the exercise of transferring bees.

HAND OUT: TRANSFERRING BEES

It is possible to transfer bees from a wild nest or from a traditional hive with fixed combs (combs which are not moveable) in order to populate a new hive.

Transferring is not easy for the beginner. Transferring bees from a fixed comb hive is much easier than transferring bees from a wild nest.

Steps of transferring a colony:-

(i) The best time to do this transfer is shortly before sunset NOT in the middle of the day. In the middle of the day, many worker bees would have been out of the hive foraging but in the evening they will have come back.

(ii) In some cases wild colonies may not be easily accessible and may be difficult to transfer. Holes may have to be carefully cut in trees.

(iii) Use a lot of smoke to drive the bees away from the combs. Harvest the honeycombs into a bucket for processing. Make sure the bucket has a cover!

(iv) It is essential that combs be taken out of either wild nests or fixed comb hives by cutting them along the top where they join the container and without breaking them.

Combs with large areas of brood and pollen are tightly tied one by one on to the top bars of the new hive. The combs should be touching the top bar. Strips of natural fibre such as cloth, cotton string, banana stem fibre or acacia bark, can be used in to hold the combs in place. Tie the combs to the top bars in 2 places for security. The bees will join the comb to the top bar and then break these down in time. Rubber bands and plastic string can be used but may cause problems because it is very difficult for the bees to cut them and they may damage the comb.

(v) Put one or two combs with brood tied onto top bars back into the nesting chamber of the original nest, from where you cut the comb. Leave it for 20 minutes. Smoke the bees onto the combs and let them settle.

(vi) Now place the comb, covered in bees, into the new top bar hive. If the bees are not stinging scoop the remaining bees very gently by hand (or using a pot) and put them in the hive with the combs.

(vii) It is good to place the hive as close as possible to, or on the previous nest site or old hive site, so that foraging bees will return to it. But close the entrance to the original site securely with rags, sacking or newspaper to stop any bees returning there. Or remove the old hive, close it and put it indoors where the bees will not be able to find it.

(viii) Check the bees. If the bees have their tails in the air showing their white stripe then they are communicating to the other bees that the queen is there. If the bees are sitting in one place in the new hive then it is likely that you have the queen- it is not in the new hive.

(ix) If the bees are doing this fanning behaviour with their tails in the air in the old site then you must capture the queen in queen cage and introduce her to the hive when the rest of the transfer is complete. Place her close to the brood. Any remaining bees will come to the new hive if the queen is present.

(x) Alternatively is to take several brood combs with sealed brood, eggs and pollen to the new hive. Take as many bees as you can scoop in your hands also to the new hive. Take the new hive 3 kms or so away from the old nest site. This is a good method if you have trouble finding the queen as the new hive will simply make a new queen cell and form a new colony. This method is best tried near swarming season when drones are available.

It may not be necessary to take the new hive 3 kms away, just change the direction of the entrances of the old hive 180°, while maintaining the new hive in the former position of the old hive.

(xi) Alternatively you can make wild bees swarm by smoking or hitting the tree in which they are nesting

with a hammer continuously. The bees will leave and cluster outside. They can then be caught in a swarm bag and installed as a swarm. You may also place a bait hive near the site at swarming time and catch the swarm at the right time. However the main problem with these methods is that the honey, pollen and combs from the nest will be wasted.

You can also use the above method to transfer a wild colony into a box or other traditional hive. After removing the brood comb from the old site you simply lean the combs against the inside of your new hive or prop it up with a stick. You must be careful that both sides of the comb are accessible - the brood on the underside will rot if the comb is lying down and the bad smell will cause absconding.

MODULE 14: DIVIDING AND UNITING COLONIES

Introduction

You can make a division of an existing healthy colony in order to populate a new hive but always choose the most productive and docile colony. By dividing it you are spreading its good genetic characteristics. Sometimes we may also need to unite colonies. Beekeepers unite colonies in order to enlarge a colony and improve their yield of honey or to survive the dearth.

Learning Objectives

By the end of the session, participants will be able to:-

1. Explain the purpose for dividing and uniting colonies
2. Describe the steps involved in dividing and uniting colonies

Target participant:

Existing beekeepers and extension service providers.

Suggested number of participants:

A maximum of 30

Duration:

3 hours.

Materials

Flip chart or chalkboard, masking tape, marker pens or chalk, notebooks and pens, an existing occupied hive, an empty prepared hive, bee suit, smoker and smoker fuel, and/or their pictures and hand outs.

Method:

- Lectures
- Brainstorming
- Group work and presentation
- Game (of dividing a colony)
- Field exercise

STEPS

(a) Dividing colonies

Step 1

Write the title “Dividing an overcrowded colony” on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and successes with dividing colonies.

Step 3

Allocate the participants in 2 groups and assign each group the following tasks:-

Group 1:: List down all the materials required to do successful colony division

Group 2:: Describe steps of dividing colonies

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes.

(b) Uniting colonies

Step 1

Write the title "Uniting a colony with another colony" on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on their experiences and successes with uniting a colony with another colony.

Step 3

Allocate the participants in 2 groups and assign each group the following tasks:-

Group 1:: List down all the materials required to do successful uniting of a colony with another colony.

Group 2:: Describe steps involved in uniting a colony with another colony

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise- walk with the trainees to the site of an apiary within the local area to participate in the exercise of dividing and uniting colonies.

HAND OUT: Dividing and Uniting Colonies

A- Dividing a Colony

You can make a division of an existing healthy colony in order to populate a new hive.

You should avoid making divisions during the honey season because it will reduce the amount of honey produced and to be harvested. Make divisions after the honey flow to increase colony numbers. The best time to divide a colony is when the bees are ready to swarm and the bees are trying naturally to reproduce.

How to know if the bees are getting ready to swarm

Between the beginning and the peak of the flowering seasons strong colonies can suddenly become overcrowded with clusters of bees near the entrance, and large numbers of drones.

To check if a colony is getting ready to swarm and wanting to divide itself we must look for signs that the colony is overcrowded and the queen has run out of cells to lay eggs in. A colony can fill between 9 and 15 brood combs with brood of all stages, including a lot of drone brood and sometimes there is even little surplus honey. There will be clusters of bees outside the hive and lots of drones flying. Also the bees will be producing queen cells (the long thumb shaped cells protruding from the edge of the combs).

Dividing stops them from swarming and saves the beekeeper from losing the bees or the trouble of catching a swarm.

Ways of preventing bees from swarming

- Making sure that the queen has enough room to lay eggs. Make extra space around the brood nest by removing honeycombs and putting in empty combs near the brood nest.
- Weakening the strong colony can prevent its urge to swarm. Destroy all the queen cells in the colony then switch the hive location with a weaker colony. The foraging bees from the strong colony will return to the original site of the hive and strengthen the weak colony. You may also give brood comb (without bees) from the strong colony to a weaker colony and thus weaken the strong one. Artificially swarming the bees for swarm control by making a division
- Making divisions is also a great way to increase your colonies but always choose the most productive and docile colony. By dividing it you are spreading its good genetic characteristics.

The steps of dividing a colony:-

(i) Prepare your new hive first – clean it and by rub it with some beeswax or propolis so it smells familiar for the bees.

(ii) Put on protective gear and have the smoker lit.

(iii) Always choose a big healthy colony to divide and check it has brood, eggs, pollen and honey.

(iv) Put the new hive next to the overcrowded hive.

(v) From the big healthy colony, select a comb with queen cells, remove it from the hive and break all the queen cells except the biggest capped two. You need two just in case one gets damaged.

(vi) Now transfer the comb with the 2 queen cells into the new hive.

(vii) Also transfer one or two other combs with a lot of sealed brood and a little unsealed brood. The number will depend on how many you have in the original hive. The sealed brood is very important because more brood means adult bees will emerge very quickly in the new hive. Also sealed brood are stronger and can survive better than unsealed brood.

(viii) Also transfer one or two combs of food comb with lots of sealed honey and pollen.

(ix) You can make a division without queen cells as long as the new colony has female worker eggs and larvae in the combs transferred. From the very young larvae they will be able to make new queen cells within a few days and raise a new queen.

(x) Include bees on all the combs you transfer and brush or shake in bees from 2 or 3other combs as well. Include the bees sitting on the brood combs as these are nurse bees that will soon produce royal jelly for the new queen. These are very important to feed and warm the brood also.

(xi) Check very thoroughly that you do NOT have the old queen on the combs you move or brush off. She must remain undisturbed in the old hive or mother colony. If you are in doubt then make sure you leave eggs and at least leave one big capped queen cell in the old hive in case you have taken her by accident. The bees will destroy the queen cell if the queen is present.

(xii) Remember to put the brood combs in the middle and the honeycombs on either side to insulate the brood nest. The framing combs feed and help the bees to keep the brood warm.

(xiii) These bees will become a new colony. Most of the adult bees will remain in the old hive and continue to make honey.

(xiv) The bees will look after the queen cells in the new colony and a new queen will hatch out. The first queen to hatch out will destroy the other queen cells.

(xv) Wait until dark then move the new hive to a site at least 2kms from the old site if possible.

(xvi) If you don't have a place to put the new divided colony 2 kms away then you must move both hives 1m either side of the old location. This will ensure that some returning bees go into the old hive and some into the new.

(xvii) You will need to feed the bees in the new hive, as they will not know where to go and get food in their new place. A small colony can become weak very quickly.

(xviii) If you see the queen or brood after 3-4 weeks then this has now become an established colony.

(xix) Alternatively, place one hive on top of the other but with different direction of entrances.

Game:

In order to check your understanding of dividing a colony, you will play a simple game. Use the following paper combs provided: 5 combs with honey, pollen and brood; 3 combs with sealed brood, unsealed brood and honey; 4 combs of honey alone; 2 combs with honey, pollen brood and queen cells; 1 comb with honey, pollen, brood and queen. These combs will be stuck onto a sheet of paper with blutack and taped onto the wall of the training room to represent the overcrowded colony that needs dividing. Another blank piece of flip chart will be taped up onto the wall to represent a new hive that is waiting to be colonized.

Two people are required to play this game. The task is to divide the colony and place the right combs into the right hives in the right order.

Ensure that the new colony has combs with queen cells plus more sealed brood combs framed by plenty of food combs. The queen should have remained in the old hive with enough brood and food. The combs should be roughly divided equally between the hives or with more combs left in the old hive. You must also shake off lots of young bees into the new hive - they will give royal jelly to the new queen.

B- Uniting Colonies

We have seen how to divide a colony but sometimes we may also need to unite colonies.

Beekeepers unite colonies in order to enlarge a colony and improve their yield of honey or surviving the dearth. A colony can produce surplus honey only if it is strong enough and contains 6-8 combs with plenty of brood and sealed honey and covered well by bees. This very much depends on the colony having a productive queen. If a colony fails to produce surplus honey for 2 seasons, or if it weakened by repeated swarming, then it can be strengthened.

Two weak colonies can be combined to make one strong colony. One large colony collects more honey than two smaller colonies. A colony can be united either with another colony or with a swarm.

Uniting a colony with another colony

The steps of uniting a colony with another colony:-

(i) In the late afternoon, check which colony has the youngest and healthiest queen. Remove and kill the queen from the worst, most aggressive or least productive colony.

(ii) Leave this colony for 24 hrs, they will now be missing the queen and ready to accept a new one. They will also be less likely to fight as there will be no smell on them of the dead queen after 24 hours.

(iii) In the evening catch and cage the queen from the other colony in a queen cage and place the hive near to the queenless colony. You will have to move it slowly and gradually over a number of days (1m per day) so as not to lose any foraging bees. Alternatively always choose the location of the stronger colony.

(iv) Smoke both hives thoroughly so that their familiar smells are covered.

(v) The cage will protect the queen should any fighting start. BUT to prevent bees fighting also dust them with flour or spray with sugar water – they will be busy cleaning themselves and will not fight!

(vi) Place the queen in her cage in the queenless hive next to the brood nest.

(vii) Transfer all the top bars with combs and bees into the hive. Smoke each comb as you do so. Alternate combs from the different colonies as you do so until all the brood combs are united and then add the honeycombs at the sides.

(viii) Completely remove the empty hive.

(ix) Release the queen when you see that there is no fighting between the 2 united colonies.

(x) Close the occupied hive and leave the united colony undisturbed for the next few days. Any further disturbances may cause the bees to abscond.

(xi) If you did not find either queen or do not which one is the best then you can still unite the colonies. Leave both queens in the hive and the stronger one will kill the weaker one. But remember fights are likely to happen and bees may fly away, so smoke heavily and flick the bees with water to separate them. Watch them and keep smoking them for an hour or so until they settle down.

Beekeepers may also unite a colony with another because one queen has died or has got lost.

If a colony becomes lazy when others are busy then the young queen may be lost during her mating flight. There will be no brood to raise a new queen and workers will start to lay unfertilized eggs. You will notice that many brood cells are crammed with eggs - this is called “Worker Laying”.

It is often too late to give the bees some brood from another colony so they can make a new queen. Workers will often be too old to produce milk to raise her. So unite the colony by removing all the combs, brushing off the bees and adding the combs to a healthy colony. Smoke the bees out of the old hive and carry it away. Most of the homeless bees will be welcomed by the colony as they have honey to offer.

Uniting a colony with a swarm

The steps of uniting a colony with a swarm:-

(i) In the evening time catch a swarm and if you can find the queen then cage her.

(ii) Open the hive, remove the old queen in a cage and kill her later.

(iii) Smoke the bees and place the new caged queen from the swarm near the brood nest.

(iv) Shake the swarm into an empty part of the hive.

(v) You may leave both queens in the hive to fight and the stronger one will survive.

You can also increase a honey producing colony by partially uniting it. Top bars with capped brood (without bees) can be added from other colonies but the receiving colony must be able to occupy the combs and keep the brood warm or they will die.

Fig. 52: Opening an old weak colony for uniting with a swarm

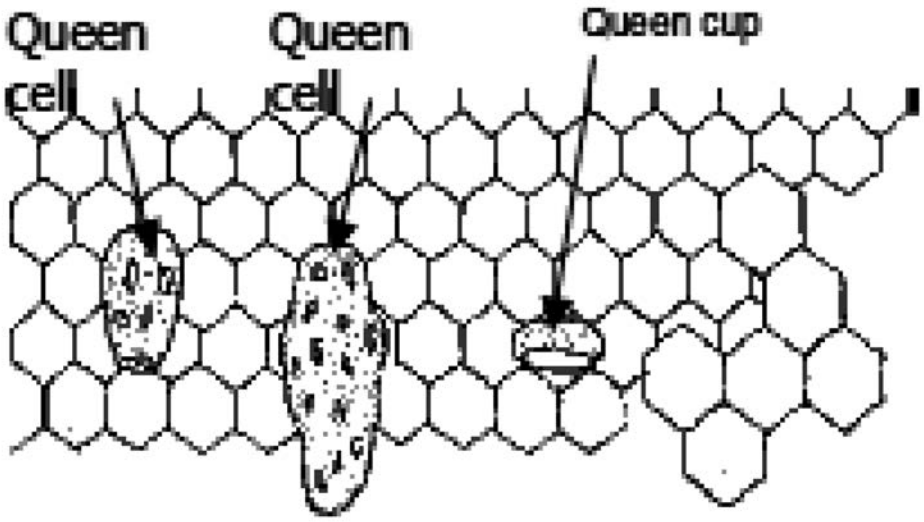


Fig. 53: The appearance of Queen Cells and Queen cups

MODULE 15: FEEDING OF BEES

Introduction

In general feeding bees is not recommended unless you are sure of why you are doing it. Bees do not need to be fed regularly like other livestock. As long as there are flowers then bees will feed themselves. You can waste a lot of money buying sugar to feed bees when you need it for yourself and your family. Feeding bees is time consuming, messy and expensive. Often people feed when it is unnecessary and get no return for their money. Furthermore if the bees can fly away or abscond then your money is wasted. But there are some occasions when it is important to feed bees.

Learning objectives

By the end of the session, participants will be able to:-

1. Explain the occasions when it is necessary to feed bees
2. Describe the steps involved in feeding bees

Target participant:

Existing beekeepers and extension service providers.

Suggested number of participants:

A maximum of 30

Duration:

2 hours.

Materials

Flip chart and masking tape or chalkboard, notebooks and pens, marker pens and chalk, an occupied hive, a feeder box or jam or plate or lid of a milk tin or bowl, water, sugar, dry sticks or grass and/or their pictures and hand outs.

Method:

- Lectures
- Brainstorming
- Group work and presentation
- Field exercise

STEPS

Step 1

Write the title “Feeding bees” on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the occasions when it is important to feed bees.

Step 3

Allocate the participants in 3 groups and assign each group the following tasks:-

Group 1:: Describe how to prepare the feed for the bees

Group 2:: Describe the methods for getting the feed ready to go in the hive

Group 3:: Describe how to put the feed in the hive

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Field exercise - walk with the trainees to the site of an occupied hive within the local area to participate in the exercise of feeding bees.

HAND OUT: FEEDING OF BEES

Bees do not need to be fed regularly like other livestock. As long as there are flowers then bees will feed themselves. You can waste a lot of money buying sugar to feed bees when you need it for yourself and your family. It is time consuming, messy and expensive. But there are some occasions when it is important to feed bees:-

(i) Bees should be fed in times of food shortage when there are no flowers. They should also be fed during drought or excessively wet, windy and cold periods when the bees cannot get outside. Feed bees when activity is low and in poor flying weather. If you see that traffic to and from the hive is slow then the bees might need feeding. If the combs are dry and there is no honey then the bees are hungry.

Feeding at such times may prevent the bees absconding and migrating away from the area or even prevent starvation.

(ii) Bees should be fed to replace the honey harvested from them at the end of the season, especially if a lot of honey has been harvested. Remember that a colony from which you have already removed a lot of honey cannot bridge a dearth period without being fed with sugar solution. A colony is fed to stimulate development during dearth periods and in preparation for the honey flow.

(iii) Regular feeding with very small quantities of sugar solution (or diluted honey) stimulates the development of brood. Bees should be fed for about 6-8 weeks before a nectar flow when flowers are plentiful. The queen will then lay her eggs and the colony will build up in numbers before the honey flow. It takes 6 weeks from egg to adult foraging bee, which is ready to fly outside the hive and collect nectar. There will then be a large number of bees ready to go out and collect nectar thus more honey to harvest!

(iv) Bees can be fed to assist them when establishing a new colony. Initial feeding when establishing a new colony will help a swarm or divided to settle down during their first nights. This will help to prevent them from wanting to abscond during their first few days.

(v) Bees should also be fed at times of stress such as disease, sickness or after spray damage from insecticides. If the bees have been sick, remove any rotten, dry and dead larvae from the hive and then feed the bees.

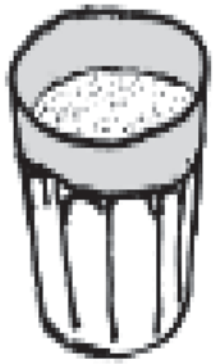
(vi) If you can sell honey for a good price then it is good to be generous with feeding in times of poor honey flow. It is possible then to recover the cost of the sugar, and make a good profit, because the colony and honey yields will increase due to the feeding. But be aware that if you feed very close to the time of harvest, sugar syrup may be mixed into the honey, which spoils its quality. How much you feed the bees and how often will depend on the bees, the site, the number of colonies, the available forage and the weather. The most convenient food to give bees is stores of sealed honeycombs and pollen. These can be transferred at any time in the active season from prosperous colonies to those in need. If you have many colonies then you can transfer a co from one hive to another. However honey stores are not always available and sugar syrup is the food that most people associate with feeding bees.

Preparing the feed:-

(i) Take some sugar, some hot boiled water and a container.

(ii) Dissolve one part quality white crystal sugar and one part hot water together. Use boiled water to avoid disease but do not boil the mixture.

(iii) It is better not to use raw sugar or brown sugar as it may cause sickness among the bees.



(iv) Stir until the sugar is dissolved, as it is difficult for the bees to eat if there are whole crystals. Add a teaspoon full of honey if available.

(v) Never prepare more sugar solution than the bees can take up in 2 days to minimize intrusion by robber bees and fermentation of the feed inside the hive.

Method 1

- Place the solution in a small container and cover with a large lid. You can use a large jam jar for this.
- Quickly turn the jar upside down and wait for it to cool.
- Push a match carefully between the jar and lid, so that the sugar water can trickle out for the bees to drink
- Alternatively use a nail to knock a large number of tiny holes in the lid of a large jam jar and turn it upside down.

Method 2

Put the sugar solution into a bowl or jar and place some broken twigs/grass to float on the surface of the syrup to prevent the bees from drowning. The bees will sit on the grass to drink.

Method 3

Use a specially designed feeder box for a top bar hive.

Putting the feed in the hive:-

(i) Remove one or two top bars or frames from the hive and put the feeder in the place close to the cluster of bees so that they will find it quickly. Remove the feeder bottle as soon as it is empty.

(ii) Place the feeder bottle close to the cluster of bees so that they will find it quickly. Once the first 2 or 3 bees find the syrup the word soon goes around and there will be a steady movement of syrup out of the feeder. Remove the feeder bottle as soon as it is empty.

(iii) It is better to place the feed at the opposite side of the hive from the entrance which will make it easier for the bees to protect from robber bees. Ensure sure that only the bees in the hive have access to the syrup.

(iv) Avoid spillages of sugar syrup or honey around the apiary as this can attract ants or start robbing. Robbing is where bees attack each other to rob stores of honey. Weak colonies are prone to robbing by the strong and hundreds of bees can be killed. Try to keep all colonies equal in strength and unite small units to strong colonies.

(v) Hive entrances should be reduced and all other entrances and holes plugged so the hive is easier to defend. Beekeepers should make sure that there are no openings through which bees, wasps, ants etc can steal the sugar and NEVER offer food outside of the hive.

(vi) Feed bees in the evening so the bees can get used to the presence of food during the night and will have settled down by morning. Never feed in the middle of the day. If you have several colonies always take the food out of the hive during the day to prevent robbing and replace it at night. Alternatively feed all the colonies together during a one-time feed.

(vii) Stop feeding as soon as the bees no longer immediately take up the sugar or if it remains untouched for a day. This means they either don't need the food or are too weak to eat it. How much the bees will eat will depend on how many bees there are in the hive.

MODULE 16: BEE PESTS, PREDATORS AND DISEASES

Introduction

A number of bee pests, predators and diseases occur and affect to a significant degree the health and productivity of bee colonies world over. It is therefore very important to know the different bee pests, predators and diseases that may occur in your area and how to combat them.

Learning Objectives

By the end of the session, participants will be able to:-

1. Identify different bee pests, predators and diseases
2. Explain the effects of pests, predators and diseases on beekeeping
3. Suggest methods to control various bee pests, predators and diseases

Target Participants:

Beekeepers, extension service providers, artisans, individuals and organizations/Institutions

Suggested Number of Participants:

A maximum of 30 persons

Duration:

3 hours.

Materials

Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, pictures of disease symptoms, samples of pests and predators, TVs, Projectors, generators, films about bee pests and diseases, hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Field or practical exercise to identify the different bee pests and diseases

STEPS

Step 1

Write the title "Bee pests, predators and diseases" on the chalkboard or flip chart and introduce it.

Step 2

Engage every participant to give examples of bee pests and predators and their control within in their locality.

Step 3

Guide the participants in describing the common bee diseases affecting bees and their control

Step 4

The trainer clarifies, summarizes and gives out the hand out on bee pests, diseases and predators.

Step 5

Field or practical exercise for trainees to participate in identifying the different bee pests, predators and diseases. Feedback on field excursion.

HANDOUT: Bee Pests, Predators and Diseases

Examples of Bee pests and predators

- Wax moth
- Hawk moths
- Baboons
- Birds
- Spiders
- Robber bees
- Acarine (tracheal) Mite
- Cleptoparasitic drone flies **(flies that look like bees)**
- Ants including safari ants
- Man
- Termites
- Wasps and hornets
- Lizards
- Pesticides
- Varroa Mite
- Honey badgers
- Cattle
- Hive beetles
- Louse
- Mice
- Mould and fungus
- *Tropaelaelaps* Mite

Man:

People can cause a lot of damage to hives and are usually considered the worst enemy of bees. Honey hunters and thieves destroy countless bee colonies and hives. Children often antagonize bees by throwing stones at beehives, which often results in people and livestock being stung.

However, always try and keep your hives where they can be supervised. Hives must be maintained and protected against harsh weather, natural enemies and fires. Hives can be placed in a bee house or a strong fence placed around the apiary.

Wax Moth (greater and lesser):

This moth looks like the moth that eats grain and destroys woolen clothes. It lays eggs in the hive and the larvae looks like a worm or maggot. Both the larvae and adult feed on the combs. The greater moth's larvae feed on the brown combs and destroy the wax. It burrows through the combs and leaves a white web or mesh in a long line in the comb. The lesser moth tends to attack processed wax so always use clean wax on starter strips! Scrape away any eggs, wax moth faeces or pupa. Kill any larvae or adult wax moths. Seal any holes and cracks in the top bars and the hive body. Remove old combs during times of food scarcity when the colony size shrinks. Keep the hive clean and free from bits of comb and debris.

Control of wax moth

Wax moth can be controlled by a strong colony. Unite weak colonies with stronger ones. Smoking the hives will expel adult wax moths from hives. Avoid littering of apiaries with beeswax.

Safari and other ants:

Ants go for bees, brood and honey during any season or when the hives smell of honey. It is advisable that you hang hives and grease hanging wires regularly. If hives are on stands, place the legs of the stands in tins of old engine oil. Alternatively tie rags soaked in diesel around the supports or smear the posts with a ring of grease or creosote. Clear the ground under the hive stand and spread dry ashes around the posts– the ants will not walk on the ashes. Keep the grass short and stop the branches from touching the hives. Make hive parts fit together without gaps. Also keep the hive bottom clean and be careful not to spill honey or sugar syrup when feeding.

Termites:

Termites will not attack the bees themselves but will destroy your hives, hive stands and equipment. Suspend hives between trees instead of poles. Alternatively treat the posts with used engine oil and place the supports in tins of old oil. Also avoid using unburnt bricks as hive supports.

Hive beetles (large and small):

Beetles may enter through gaps and cracks but also through large entrance holes. The large black beetle feeds on brood and is most numerous during the rains. Others with distinct markings feed on small amounts of honey and pollen. The smaller hive beetles lay eggs in pollen cells, which can be turned into a stinking mess by the maggots within a few days. To prevent the beetle, use holes instead of slits for the entrance and reduce the size of the entrance holes (8-10mm). Hand pick or destroy them if found in the hive. Disinfecting the ground in apiaries will help kill the pupae. Smoking is equally very effective in the control of hive beetles.

Honey Badger or horr:

The honey badger can break into hives to eat honey and brood. Hang the hives securely 1.5 metres from the ground to prevent the badger knocking them down, tie lids on securely with wire and put heavy stones on the covers, to prevent the badger breaking them open. Alternatively use a pulley system and suspend hives over 2 meters from the ground by means of a rope.

Pirate Wasp (lion of the honeybee):

These are slender wasps, yellow-brown with black cross stripes. They will molest colonies, attack and eat worker bees. Fill any gaps and holes in the hive and make the entrance small enough for the bees to defend. Cut a bottle with a narrow mouth in half and invert the top, put some water and jam in, the wasps will enter and drown (do not bait with honey). They can also be controlled by setting a water trap by the hive entrance.

Moulds:

These are fungi that grow on the inside of the hive and are caused by excess moisture. Moulds may indicate that the hive is sited in a damp place. This is a problem mainly during and shortly after the rains but is generally not a major problem. To prevent this, avoid siting hives in damp places and remove any unattended empty combs from the edges of the nest if bees fail to fan any surplus moisture out of the hive. Increase the number of entrance holes to improve hive ventilation and air passage.

Birds, such as honey guides and bee eaters:

Some birds sit on the hive and eat worker bees coming out. Others e.g wood peckers make holes in the hive while the honey guides eat bees and bee brood. Honey guides on the other hand lead other predators to the hive. Don't leave any brood combs exposed and scare the birds away or use traps. Alternatively place your hives in a bee house. Do not use soft wood to make bee hives. Do proper hanging of the hives.

Bee Louse:

This is a small light brown insect with 6 legs (3 pairs). It is seen on the backs of the bee but causes negligible damage to the colony. Smoke the hive regularly to control them.

Varroa mite:

This is a flat, reddish brown mite and is a relative of the spider with 8 legs (4 pairs). It is similar to the bee louse but smaller. This mite feeds on the bee's blood, making the bee weaker and weaker. It is mainly found on the developing drone bee pupae and emerges with the adult bee. Varroa causes deformity on bees and slowly kills the colony. It is a major devastating parasite for ***Apis mellifera*** bees throughout Europe, North America and elsewhere. It should not be confused with the bee louse. This is a parasitic mite causing wide spread damage worldwide. Uganda beekeepers should be on the look out for varroa as it is an extremely serious pest. Know the difference between bee louse and varroa! Do not import bees to avoid the spread of Varroa and other pests!

Acarine mites (*Acarapi woodi*):

These live in the breathing tubes of young bees and prevent breathing.

Tropilealaps:

These are smaller than varroa but also feed on the bee's blood.

Lizards:

They sit by the hive entrances and eat worker bees as they move in and out. Unoccupied hives often attract squirrels, mice, dormice and lizards. The smell of their droppings will discourage swarms from occupying the hive and may even damage it. Protect unoccupied hives against pests and keep them clean and baited. Avoid having landing boards on hive entrances. Put rat guards on hive stands.

Bee diseases:

- American Foul Brood
- Sacbrood
- Nosema
- Chalkbrood
- Paralysis

Brood diseases affect the developing brood. A beekeeper must always check the brood for abnormalities. Larvae should be fat, shiny and white and the sealed brood should be even.

Chalkbrood:

A fungus infecting and killing larvae that then dries and shrinks to a chalk like mummy. The house bees expose and then remove these mummies. Only occasionally does the disease affect so many larvae that

the mummies are seen. It weakens but does not usually kill the colony .Remove the infected combs, control the disease and keep stresses on the colony (insecticides, pests, etc.) to a minimum. Unite the colony with a stronger one. This disease is found in Uganda.

European Foul Brood:

This bacterium affects the unsealed brood. It causes larvae to die and seem to 'melt down' in the cells. They turn brown and cause a sour smell in the hive. Combs are removed and new combs are added from unaffected colonies. The queen is caged for a few days so workers can remove diseased larvae and then released.

American Foul Brood:

This bacterium causes bees to die in the larvae or pupa stage. It is very serious and very contagious. Cappings are indented, the sealed brood becomes sunken and it looks like there is glue in the cells. The brood nest becomes irregular and there is a smell of glue in the hive. All bees and top bars must be burnt and the hive scorched and washed. Do not feed honey or exchange top bars and combs. Remember do not import bees and used beekeeping equipments into Uganda.

Sacbrood:

This disease affects brood at the pre pupae stage. The sealed brood will have lots of holes and pupae may be unsealed. The pupae will be found dead, pointed and underdeveloped. It is similar to European Foul Brood but without smell.

If you suspect that you have a brood disease you should:

- Remove and destroy all the affected brood combs.
- Cage the queen for 7 days to stop the disease cycle
- Feed the bees each day.
- Use a queen gate after releasing the queen to prevent absconding.
- Never exchange combs and top bars between hives.

Other diseases that affect adult bees. These are easier to detect, as you will find dead bees in and outside the hive and include the following:

Nosema:

This is a disease of adult bees that causes poor brood nest development and is often accompanied by diarrhea. You will often see yellow diarrhea outside and at the entrance of the hive. It has to be detected by microscope and treated with medicines.

Paralysis:

A virus that causes death. The bees shake when they are born and cannot fly. Sometimes infected bees exhibit no specific signs and specialist techniques are needed to identify it.

Black Queen Virus (BQV) disease *(reported in Uganda)*:

It mostly affects housed apiaries and those in damp places. Prevention of BQV is by removing the bee colony from the apiary and removing the dead bee. Avoid siting hives in damp places.

Insecticides and pesticides:

Pesticides poison bees. A colony can die within 3 hours of exposure to insecticides as they quickly pass it in the nectar to other bees and brood in the hive. A bee spinning on the ground outside the hive is a sign of insecticide poisoning. Also bees often die with their tongues sticking out. Keep in touch with other farmers and know when they are spraying. Ask them to spray at night when the bees are not flying. When spraying is taking place close your colonies using mesh wire to allow ventilation. **NEVER** totally block up the holes or the bees may die of suffocation! Feed the bees with sugar syrup whilst they are enclosed. Research and

suggest alternative less toxic alternatives, such as tobacco in soap powder or neem leaves crushed in water. As a last resort move the hives from the area either temporarily or permanently.

Note:

1. We must always be on the lookout for diseases as they can spread quickly and may adversely affect bee keeping in the area.
2. The apiary should be kept clean as a general control strategy for most pests and diseases.
3. For effective control and management of pests and diseases, an intergrated approach should be used.

MODULE 17: MAKING BIO-PESTICIDES

Bio pesticides are organic substances used as alternatives to pesticides to deter and eliminate crop pests, especially insects. Farming involves wide use of pesticides that also kill bees and make beekeeping impossible if they are sprayed heavily in bee forage areas. It is therefore advisable that farmers look for alternative insecticides such as bio pesticides.

Learning Objectives

By the end of the session, participants will be able to:-

1. Understand what bio pesticides are.
2. Explain the importance of using bio pesticides
3. Demonstrate the use and application of bio pesticides in pest and disease control

Target Participants:

Beekeepers, extension service providers, farmers, individuals and organizations

Suggested Number of Participants:

A maximum of 30 persons

Duration:

4 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, bio pesticide materials, videos, pictures and hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Field or practical exercise

STEPS

Step 1

Write the title “bio pesticides” on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on what bio pesticides are and their importance.

Step 3

Divide the participants into 2 groups and assign them the following tasks:

Group 1: Discuss the disadvantages of insecticides

Group 2: The importance of using bio pesticides

Step 4

In plenary, participants present findings, the trainer clarifies, demonstrates and summarizes, gives out the hand outs.

HAND OUT: Making Bio-pesticides

Bio pesticides are organic substances used as alternatives to pesticides to deter and eliminate crop pests, especially insects. Farming involves wide use of pesticides that also kill bees and make beekeeping impossible if they are sprayed heavily in bee forage areas. It is therefore advisable that farmers look for alternative insecticides such as bio pesticides.

Most common materials used for making bio pesticides include the following among others:-

- *Lantana camara* - **'Kapanga'**
- Red paper
- *Solanum incanum* - Sodom apple
- *Phytoloca dodecandria* - **'Omuwoko'**
- *Gynodropsis gynandra* - **'Ejobyo'**
- Ash
- Neem tree
- Mexican marigold

The dangers and disadvantages of inorganic insecticides.

- Insecticides poison bees and reduce production from beekeeping.
- Insecticides kill beneficial insects like pollinators and predatory insects.
- As a result of years of insecticide application, fruit and vegetable yields may suffer because of lack of pollinators.
- Insecticides kill micro-organisms in the soil, reduce soil quality and make plants more prone to attack.
- Insecticides are toxic to humans and livestock and could result in death if consumed in large quantity by accident.
- Many insecticides are available in the market but often the health warnings and instructions for use are not printed in a language that people understand. This means there is a high risk of misuse and wrong dosages.
- Traders sell insecticides in small quantities in unlabelled containers increasing the danger of misuse even further.
- Insecticides can adversely affect human health even when consumed in small quantities in our food or inhaled when we are spraying! Insecticides have been shown to affect childhood development and have been linked to cancers and other diseases.
- Insecticides are expensive and may not be available just at the time you most need them.

Note:

Application of inorganic pesticides should be restricted to evening hours and during non flowering period.

Since insecticides kill bees their use can make beekeeping impossible if they are sprayed heavily in bee forage areas. An entire colony of bees can be destroyed in as little as 3 hours if foragers bring insecticide contaminated honey loads back to the hive. Bees poisoned with insecticide are often found dead outside the hive with their tongues sticking out. They might behave strangely flying round and round in circles on the ground before they die. If you want to keep bees and also produce fruits, vegetables and other livestock, then you need to look for natural alternatives to insecticides such as bio-pesticides.

Bio pesticides help:-

- Bio-pesticides may not kill beneficial insects (insects that are predators to pest insects and help to control them).
- To prevent pest insect infestation - they are usually not harmful to humans but are toxic or distasteful to pest insects.
- To get rid of insect pests after they have attacked the crop.
- To act as fertilizer - they can also have the double benefit of acting as fertilizers as well as deterring insects.
- To save money on insecticides and fertilizers - because bio-pesticides can be made using the locally available plants in an area, they are cheaper than using insecticides.
- To protect the environment from chemical pollution.
- To be independent and not have to wait for chemical pesticides to be available.
- To help maintain soil quality.
- To avoid the toxic effects of insecticides on our families.
- To save our bees and our livelihoods!
- Bio chemicals do not contaminate honey.

An effective bio-pesticide - cum - liquid manure can be made by composting different plants that are bitter, strong smelling, hot to taste, toxic to insects and not eaten by livestock. These may include: cow dung, ash, urine, waste materials, etc you may know in your local area.

Follow steps 1 to 3 to prepare your bio-pesticide:

1. Collect as many leaves and roots from the list of plants given above as possible, enough to fit into the big drum or bucket that you have chosen.
2. Cut up these plants very finely, if you have a pestle and mortar you can grind the chilies, onions, garlic, coriander and cloves. Put all the cut up plants into the drum and then cover the plant material with water.
3. Take raw fresh cow dung and ashes and tie them up into the piece of sack or old cloth. Put this into the drum on top of the cut up leaves and cover with water. The cow dung will act as a 'seed' of microorganisms to help the leaves to rot in the water and the ashes help provide the right environment for the composting process.
4. Allow the leaves to rot completely in the water. This should take about a week in very hot weather and a maximum of about 3 weeks in the rainy seasons. The mixture should smell strong and should look a little like liquid manure (cow dung).
5. The smelling liquid, with the leaves strained off, is your completed bio-pesticide.

How to apply bio pesticides

The method of application of the bio-pesticide is the same for both young and established plants but the dilutions are different. It can be put into a clean sprayer (not one which contains remnants of insecticides) and sprayed onto the plants. Alternatively, it can be mixed in a bucket and a broom or leaves used to sprinkle it onto your crops to stop the insects from attacking. Apply it regularly to your crops just before the usual season that insect pests cause problems. Spray your plants with bio-pesticide all through the crop cycle. The regularity of spraying depends on how susceptible the plants are to insect attack and how much in need of extra fertilizer the soil is. The less fertile the soil and the higher the risk of insect attack, the more regularly you should apply the bio-pesticide.

Note:

Bio-pesticide Treatments if the bio-pesticide cum liquid manure fails to work

If insects attack the crop despite the use of bio-pesticide try using the bio-pesticide slightly less diluted but only apply it to affected areas. You can also try using another bio-pesticide treatment recipe such as:

- **Tobacco water** - Soak tobacco leaves in water over night with some ashes and some cow's urine. Add a little soap powder and sprinkle this on the affected plants.
- **Neem Water** - Soak neem leaves and fruits in water over night and sprinkle this on the affected areas. The mixture should be concentrated and taste very bitter. If it does not taste bitter try boiling the leaves in water.
- **Ashes** - Apply ashes around the affected plants.
- **Myrrh water** - Soak about 250g myrrh in 7 litres of water for 6-7 days and spray this on the plants.
- **Datura** - Mix together about a half (½) kg of dried powdered leaves in 10 litres of water and soak them for 24 hours. Beware that Datura is toxic! Spray on plants but avoid bees and do not spray anything you will eat in the next week.

Another method of controlling insect pests especially on vegetable crops is to use integrated vegetable growing techniques or intercropping. This method of vegetable growing involves mixing up different shapes, smells and types of plants in your vegetable plots, so that it is more difficult for the insect pest to locate its preferred plant and to move from one plant to another. Combine leaf crops and root crops together and to mix up different shapes of plant. Mix garlic, onions, coriander, marigold, basil and any other strong smelling plants amongst your vegetable crops to help mask the smell of any plants that attract insect pests.

Everyone should try and prevent the unnecessary use of pesticides by using natural bio-pesticides made from locally available plants. We should all try to educate farmers about chemical insecticides and their negative impact on both bees and the environment.

CHAPTER THREE

HIVE PRODUCTS AND PROCESSING

MODULE 18: HIVE PRODUCTS

Introduction

In the hive, bees produce a number of products useful to man and to the bees. These products may be used directly or may act as raw materials for making other by-products.

Learning Objectives

By the end of the session, participants will be able to:-

1. List and describe the different bee products
2. List and explain the uses of the different bee products
3. Explain how the different bee products are extracted

Target Participant

Beekeepers, extension service providers, individuals and organizations/Institutions

Suggested Number of Participants:

Maximum 30

Duration:

2 hours.

Materials

- Flip chart and masking tape or chalkboard, notebooks and pens, marker pens or chalk, hive products, by-products and/or their pictures, any other relevant materials and hand outs.

Method

- Lectures
- Brainstorming
- Discussions
- Practicals (demonstrations)

STEPS

Step 1

Write the title “Hive products” on the chalkboard or flip chart and introduce it.

Step 2

Engage the participants to brainstorm on the different hive products in their areas.

Step 3

Allocate the participants in 3 groups and assign them the following tasks:

Group 1: List and describe the different bee products

Group 2: List and explain the uses of the different bee products

Group 3: Explain how the different bee products are extracted

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

HAND OUTS: Hive Products

- Honey
- Pollen
- Royal Jelly
- Propolis
- Bee venom
- Beeswax

(i) Honey

Honey is the sweet, viscous juice usually collected in the largest quantities from the beehive. It is found in cells of the honeybee comb. Mature (ripe) honey is usually found in sealed combs and can be kept indefinitely; unsealed honey is not mature (unripe) and therefore ferments shortly after it is harvested.

Honey is used as food, medicine (constipation, duodenal ulcers, liver problems, burns, etc) and as ingredients in medicine (added in cough syrups), food (confectionary industry), making beverages and cosmetic creams.

Fig 54: Farmers selling Honey Wine at a show

Fig 55: Hoima Natural Honey on display

(ii) Pollen

Pollen is the principle food of bees and is collected from the anthers of flowers on the legs of the bees. The hairs on the bee's legs act like a hair comb. As the bees collect the pollen, they moisten it with a little nectar when packing it into pollen loads on their hind legs. Part of the pollen serves to pollinate flowers, and part is brought back to the hive in their pollen baskets. Bees then store pollen in the combs but not in great quantities. Pollen comes in many different colours from red, yellow to brown, depending on the flower source. All are different, some can be bitter while some can be sweet and all these varieties can be mixed together.

Beekeepers collect it for medicinal needs as it contains high quality nutrients and is richer in protein than eggs, meat and milk. It contains most of the vitamins and proteins that the body needs. It can be eaten dry but is primarily used in food, traditional medicines, as nutritional supplements and in cosmetics such as shampoos, creams and even perfume. As a food, it aids digestion, builds energy, strengthens immunity, improves concentration (it is good for the brain!) and helps to balance the metabolism (so aids weight loss or gain). It also has some antibiotic properties.

Many beekeepers eat pollen in the comb (beebread). It is easier to digest than dry pollen and can help people live longer lives, for example, one tribe in Pakistan is known only to survive on nuts, berries and beebread – their average age is 140 years. Both bee bread and pollen should not be eaten in large quantities as it is hard to digest and can cause stomach upset. It is better to eat small amounts, especially at first to allow the body to become accustomed to it.

How pollen is collected

It is easy. The beekeeper puts a pollen trap in the hive entrance. The pollen trap looks like a metal sheet full of holes or a 5mm wire mesh. A simple pollen trap can be made locally, cheaply and easily. As the bees pass through the holes the pollen pellets are knocked from the bees' legs and fall into a drawer or tray covered by a finer mesh. However, in order not to harm the colony, collections must be limited to every other day to 2-3kg per hive per year from a strong colony. Remember the bees need pollen stores to feed the brood so traps should be removed at regular intervals or the colony will be short of food. Pollen must not be collected from a weak colony. The pollen must be immediately dried out of the sun, as the sun will destroy the vitamins in the pollen. It should be spread in a thin layer in the shade where a breeze is felt. Pollen itself is moist as it mixes with nectar but well dried pollen will crack between a person's teeth like rice. It must be stored in a dry cool place in sealed containers and protected against moisture. Pollen collection is more successful in dry areas as humidity increases the danger of contamination of collected pollen with mould and fungi.

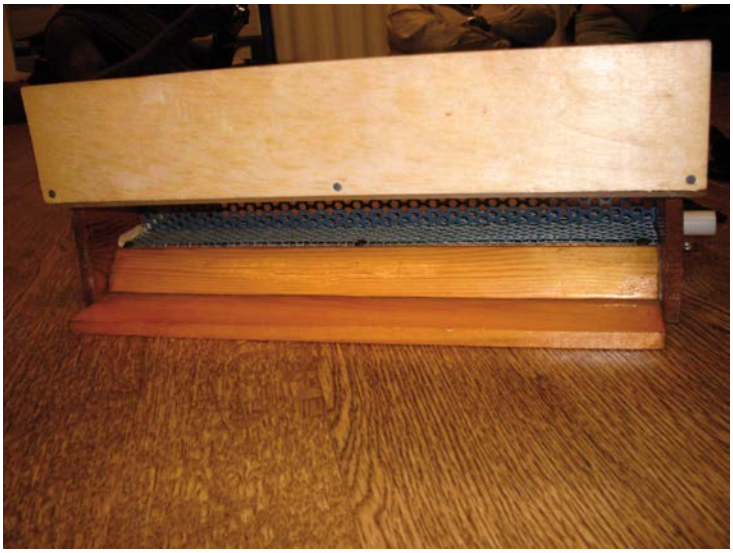


Fig 56: A pollen trap

(iii) Royal jelly

Royal Jelly is a whitish fluid, secreted by the young bees and used to feed the queen bee in large amounts. Young bees that have just hatched out produce it just within their first 6 days. Royal jelly does not come from flowers. A queen bee can live between four and five years if she is fed exclusively on royal jelly, lays about 1,500 eggs a day, and has a healthy life protected from bacteria and parasites. Without royal jelly she cannot be a queen bee. It is the rich nutrition in royal jelly that makes the queen fertile and strong. It contains vitamins and hormones for increasing fertility, which is why she can lay so many eggs over so many years. Other female worker bees that do not feed on royal jelly are sterile and cannot lay eggs.

Royal jelly also has nutritional, energetic and metabolic advantages for humans. It is so special but not many beekeepers collect it. It is rich in proteins and all B vitamins and increases overall mental and physical well-being. It can be taken pure or blended with honey (5 parts royal jelly to 120 parts honey). It is also used as a dietary supplement and fertility stimulant. In skin preparation such as soap it is known to prevent wrinkles.

How royal jelly is collected

It needs specialized equipment and refrigeration. The method involves removing the queen from the hive so the bees make new queen cells. When the quality and the quantity of the royal jelly are at its peak, the beekeeper extracts the queen bee larvae with tweezers and removes the precious substance by suction. 250-500g can be collected from each hive every year. It must be kept below 4 degrees centigrade from the

point of collection as it goes rotten very quickly, if it is to be sold for commercial value. This may be a good income opportunity for beekeepers in Uganda to explore.

(iv) Propolis

Bees gather resin from around the new buds of certain living trees and plants. They collect it in their mouths, pack it in their legs and use it for making propolis. It is used by bees for repairing the hive and also serves as protection to the hive from bacteria, fungi and viruses. Bees use it as medicine in the hive because it is a powerful natural antibiotic and is both antifungal and antibacterial. Interestingly, if a pest or predator dies in the hive and can not be removed, the bees will wrap it in propolis so that it does not rot or smell. Humans also use propolis to prevent infection. Propolis is helpful for preventing coughs and colds; and treating stomach ulcers. If eaten in its natural state, it is better to suck a small piece as it sticks to the teeth if you chew it! It also helps to treat wounds and skin disorders. Raw propolis can be taken and stuck over a cut just like sealing plaster! It also helps to stimulate the body's own immune system to fight disease for itself. Propolis can be used in many applications and is used to produce creams, mouthwash, toothpaste, and throat syrup. It is also used in animal feed to treat some disorders and as the basis for fine wood varnishes.

How to collect propolis

The beekeeper collects it by scraping the bars and walls of the hive with a knife or hive tool. To increase collection, many beekeepers will put a piece of mesh inside the top of the hive. The bees will fill the holes of the mesh with propolis as they will consider this to be the boundary of the nest. It is sticky and soft when warm but hard and brittle when cold. The propolis can then be scraped off or the mesh can be put in the freezer for 24 hours. This will make it easier to knock or scrape off the hardened propolis. 100-200g a year can be collected from each hive. It should be stored in dark, clean sealed buckets, away from excessive heat and must be protected against contamination such as chemicals. Generally speaking, most uses require it to be in liquid form and it has to be dissolved. This extraction however requires some care and skill.

(v) Bee venom

Bee venom is the poisonous, colorless liquid contained in the venom sac of the bee, used to sting predators or enemies. It is an anti-inflammatory and is used by humans to relieve pain. It is effective in treating the symptoms of rheumatoid arthritis, neuralgia, high blood pressure, high cholesterol and even multiple sclerosis. Bee venom therapy can also help with infertility problems.

Applying bee venom medicinally can be easy. This is done by holding both of the bee's wings and applying the tip of the abdomen to the painful area and allowing the bee to sting the area. The bee then dies as the sting is left in the skin. The number of stings and length of treatment required depends on how old and severe the disease is. However it must be remembered that it is dangerous to sting people who are allergic to bee stings. Always ask the person first if they are allergic to bee stings. A small, localized swelling with redness is normal. Itching all over the body and shortness of breath is not.

Bee venom is widely used in creams, soaps, liniments and ointments. It may also come in capsule form.

How to collect bee venom

An electric shock method is used to stimulate the bees to sting a collector frame or cloth where it dries and is then scraped off. This powder is very dangerous to handle and it must be freeze-dried and protected from moisture and light. If done correctly it can be collected without killing the bees.

(vi) Beeswax

Beeswax is not a plant product but a bee secretion and bees do not collect it from outside of the hive. Worker bees make regular hexagonal wax cells and cappings in the hive to store new honey. These honeycombs are made from beeswax produced by wax glands on the underside of the abdomen of

a worker bee between 12 and 15 days old. Tiny scales of wax are secreted and knead (softened) and then use their legs to construct the cells of the honeycomb.

Note:
Bees eat between 8 and 22 kgs of honey to produce 1 kg of wax.

Humans most commonly use wax in candle making as it makes drip less, smokeless and long lasting candles. It is the base for lipstick and rouge and is used in lip balm, skin creams, deodorants and hair creams. It is also used in drugs (as the outside coating of pills), modeling and statue making, cosmetics, printing, food processing and furniture polish.

How to collect beeswax

The beekeeper gets the beeswax from the honeycombs having first extracted the honey. Beeswax can also be got from old empty combs. It can then be melted and sieved and sold as a raw commodity. However most beekeepers do not know the benefits of beeswax and throw combs away. But many small businesses can be developed from beeswax production.

MODULE 19: QUALITY HONEY HARVESTING

Introduction

It is important for a beekeeper to identify, harvest, grade and handle excellent quality honey for marketing purposes. The quality of honey can be judged from its cleanliness, taste, smell, colour and moisture content.

Learning objectives

By the end of the session, participants will be able to:-

1. Identify , harvest, grade and handle excellent quality honey
2. Explain the different methods used to check water content in honey

Target Participants:

Existing beekeepers, extension service providers, honey traders, individuals and organizations interested in harvesting, processing and selling honey.

Suggested Number of Participants:

A maximum of 30 persons

Duration:

3 hours.

Materials

- Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, capped honey and/or the picture, 2 air tight buckets, bee suits, smokers and hive tool set (hive opener, bee brush and stainless steel knife), water, spoon, refractometer (if available), honey samples – a range from other regions and other countries and hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Field or practical exercise to identify, harvest, grade and handle excellent quality honey

STEPS

Step. 1

Write the title "Quality honey harvesting" on the chalkboard or flip chart

Step 2

Introduce the topic and engage the participants to brainstorm on what materials bees use for making honey and why different honeys have different tastes and smells.

Step 3

Allocate the participants in 3 groups and assign them the following tasks:

Group 1: What affects the good quality of a honey product?

Group 2: How do we know when honey is ready to be harvested?

Group 3: What should you consider when actually harvesting honey from the hive?

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Give out the hand out on bee diseases and discuss each disease one by one using the notes and pictures on the handout.

Step 6

Field or practical exercise for trainees to participate in honey harvesting in a nearby apiary, while following the steps of the harvesting process in the hand out.

- What about the other bee products.
- Include propolis and wax harvesting.
- Pollen be looked into for tapping resources.

HAND OUT: Quality Honey Harvesting

What do bees make honey from?

Honey is the primary product of the hive. Bees make honey from nectar which is a sugary secretion of flowers. Nectar contains 70-80% water. To make honey the bees add enzymes and reduce the water content of the nectar to that of honey (good honey contains less than 19% water).

Bees transfer nectar from their stomachs to other bees that in turn pass it on to other bees. As it is transferred, the water content is reduced and the bees add enzymes from their honey sacks, which prevent fermentation of the nectar. The bees then place this into the cells of the honeycomb and continue to reduce the water content further by warming the honey to about 35 degrees centigrade (the temperature of human blood). The bees fan their wings to take any warm damp air out of the hive and to allow cooler dry air in. This evaporation process eventually reduces the water content to 19% and the bees then cap the honey. This process helps the honey to be kept for a long periods in the hive.

Why do different honeys have different tastes and smells?

The different tastes, aromas and colours of honey are a result of the different flowers that the bees have collected nectar from. Colour is also affected by the age of the combs – old combs give darker honey than new combs.

Honey mostly contains different kinds of natural fruit sugars (80-85%) that are easily and immediately absorbed by the body, are high in carbohydrates and give the body energy. The sugar in honey is not the same as refined granules (sucrose), which can have a negative effect on the health. Refined sugar is more difficult for the body to break down and can lead to diabetes in later life.

Honey also contains many vitamins and minerals from the pollen. Honey has medicinal properties and is used to help cure coughs, ulcers, wounds and sore throats. Generally bees do a very good job of making honey and it is the beekeeper that tends to spoil the quality of the honey with poor harvesting, processing and marketing techniques. It is essential that the product being sold retains its properties, is of good quality and well presented.

What affects the good quality of a honey product?

- Honey must be clean and clear - no dirt, dead bees, wax, dust, splinters of wood or ashes.
- Honey must have a good taste. It should not be too smoky or have a fermented taste. Chemicals and insecticides can affect the smell and taste of honey.
- Honey must have a good smell. Harvesting old dark combs and brood combs can affect the smell and colour of the honey. Over smoking the combs can also affect its smell.
- Honey must have a good colour – this depends upon the nectar source and age of the combs. Usually dark honey has stronger flavour and light coloured honey a more delicate flavour.
- The Presence of pollen can make the honey appear muddy or cloudy but is in fact highly nutritious and good for the body.

Honey must be ripe and have a low water content – moisture should not be greater than 19% or the honey is likely to ferment. Harvesting incompletely sealed combs can result in excessive water content in honey. This is measured using a refractometer

Honey buyers and traders often use a refractometer to check the water content of honey samples from hunters and beekeepers. They will avoid buying honey with high water content, as it is likely to ferment. They will select only honey with a water content of around 19%, as honey with a water content of over 20% must be used too quickly for marketing in other regions or countries. However they will not be wary of honey with very low water content. If it is too low then they know the honey has probably been heated to evaporate off more water or may have even been adulterated with sugar water.

There are some very simple methods that you can try to check the water content without a refractometer.

- Put a matchstick in the honey and if the water content is too high then the head will be damp and will not burn.
- Drop a droplet of honey on dry soil. If the honey spreads into the soil and disperses then the water content is too high. The honey should sit on the soil as a globule.

How do we know when honey is ready to be harvested?

Honey is ready for harvest when the hive becomes heavy, smells of honey and bees may have become more aggressive and noisy than usual as they protect their stores. Look for ripe sealed honey with an even layer of sealing on the honeycomb. Regular inspections of the hives during the honey flow period will ensure that you harvest as soon as the honey is ready. Generally harvesting is related to the rains and harvesting should be done after the flowers have withered and fallen.

What should you consider when actually harvesting honey from the hive?

- The ideal harvesting time is in the cool of dusk, just before dark. Don't harvest during the day time unless apiary is located far away from public places.
- Do not crop honey during rainy weather as the honey draws moisture from the air and gets too watery.
- Use a bee suit and a smoker when harvesting, as usually the bees get upset!
- 2 people are better than one and 2 smokers are better than one. Don't harvest alone.
- Harvest combs that are at least 2/3 capped or sealed full of honey. Uncapped honey contains too much water and will start to ferment.

- Using a clean knife cut away the light-colored combs leaving about 2cms of comb for the bees to use to rebuild a new honeycomb.
- Leave the combs with brood, pollen and some honey for the bees to eat to enable future production of honey. In fixed comb hives only take away the combs at the sides of the hive.
- Always carry 2 clean and dry containers with airtight lids. The containers should be plastic or wood and NOT metal unless the metal contains stainless steel. Honey is corrosive and if put in a metallic container that is not coated, it will react with the metal. The metal dissolved in the honey may present a health hazard to the consumer. Place the honeycombs into a pot or bucket that can be closed to avoid robbing.
- Put combs with little or no capped honey into the other container. Keep this 2nd grade honey for local or home consumption, as it cannot be stored for a long period – eat it quickly!
- Make sure there is no dirt in the honey.
- Sometimes more money is paid for certain kinds or colours of honey than for a mixture so harvest this kind of honey separately. Separate the light and dark combs.
- Avoid propolis and too much pollen in honey if you are marketing your honey widely. These make the honey cloudy and many customers prefer clear honey.
- Honey presented for sale in the comb is seen to be pure and can fetch a good price. Select undamaged white sealed comb to sell as cut comb as dark combs do not taste so nice.

The steps of the harvesting process:

1. Light the smokers and put on the bee suits.
2. Smoke the bees and check for combs that are at least 2/3 capped or sealed full of honey. Honeycombs are usually at the back of the hive opposite the entrance. Always leave the combs with brood, large portions of pollen and some honey for the bees.
3. Always hold the combs in a vertical position to avoid breaking.
4. Lift the comb, blow smoke on both sides and quickly brush the bees back into the hive with a feather or bee brush.
5. Cut away the light-coloured combs with a knife leaving about 1 cm of comb. This will serve as an orientation line for a new comb.
6. Place the capped honey in a clean and dry container with a sealed lid to keep the bees out. Return the top bar to the hive.
7. Put combs with little or no capped honey into a separate container.
8. Make sure there is no dirt or bees in the honey and avoid propolis and too much pollen in the honey.
9. While harvesting also scrape the propolis off the top bars before replacing them and keep this for future baiting of hives.
10. Continue cropping all the ripe combs in the same way but do not crop too much or the bees may abscond. Leave at least 8 combs for the bees.
11. Before closing the hive push the unripe combs behind the last brood or pollen comb and put the cropped top bars behind these.
12. Carry the containers out of reach of the bees still buzzing around.

MODULE 20: PROCESSING HONEY

Introduction

There are a number of methods for processing honey, namely floating, pressing and centrifuging.

Learning objectives

By the end of the session, participants will be able to:-

- State the different uses of honey
- Describe the various methods of processing honey
- Process honey for sale or use.

Target participants:

Existing beekeepers, extension service providers, traders, individuals and organizations interested in selling or using of honey.

Suggested Number of Participants:

A maximum of 30 persons

Duration:

3 hours.

Materials:

Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, combed honey, clean honey sieve cloth, honey refractometer, clean air tight buckets, clean honey jars, honey warmer, uncapping fork or knife, honey press, centrifugal honey extractor and hand outs.

Methods:

- Lecture
- Brainstorming
- Group discussion
- Practical exercise to process quality honey

STEPS:

Step 1

Write the title “Processing Honey” on the chalkboard or flip chart

Step 2

Engage all the participants to brainstorm on what is honey, how it is processed and what is it used for.

Step 3

Allocate the participants in 3 groups and assign them the following tasks:-

Group 1:: Describe the steps involved in using floating method for processing honey.

Group 2:: Describe the steps involved in using pressing method for processing honey.

Group 3:: Describe the steps involved in using centrifugal method for processing honey.

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Practical exercise to process quality honey

HAND OUT: Processing Honey

Honey is the sweet product of the honey bee. Honey can be processed into comb honey, chunked honey, cream honey, pressed honey and strained honey.

Methods of processing honey

There are three methods of extracting honey:

1. Floating Method

Floating is the simplest, but takes the longest, which is especially disadvantageous in the rainy season (honey is hygroscopic and will absorb water from the air in times of high humidity) unless you work with closed containers.

This method requires a clean airtight container, a clean cloth or special honey sieve and an uncapping fork or knife.

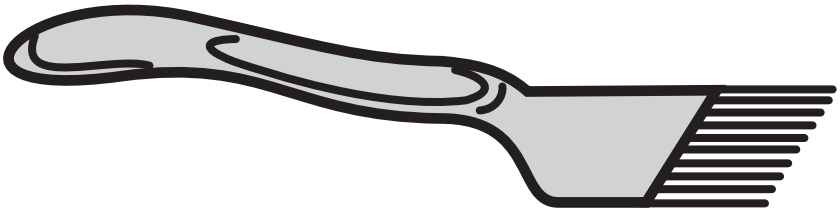


Fig. 57: Uncapping fork

Steps:

1. Remove the wax caps of the capped honey cells with an uncapping fork or knife. Uncapping knives must be well filed and razor sharp. At temperatures of less than 25 °C you can make uncapping easier by holding the uncapping tool in a basin of hot water for a short while (but do dry it before use).
2. The combs are broken into small pieces and placed in an airtight bucket or other container.
3. After a few days the wax which has floated to the top can be skimmed off.
4. The honey is strained through a clean cloth, nylon stocking or special honey sieve and is again put away for 3 days to settle.
5. Any foam and wax particles which have floated to the surface can be skimmed off and the honey is now ready for storage and packaging.

2. Pressing

Pressing honey is more work, but takes less time. There are various press constructions.

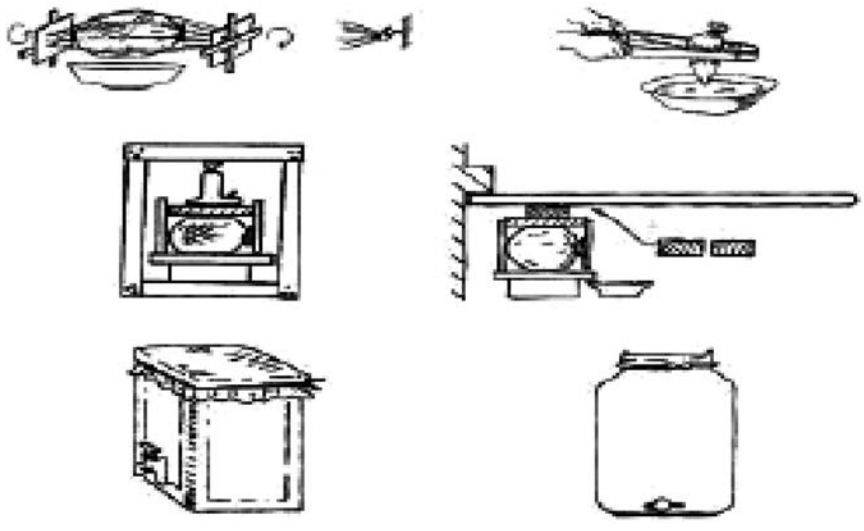


Fig: 58: Different types of Honey Press and locally made bottling containers

Steps:

1. Scrape open the combs, break them into pieces and tie them up in a clean porous cloth in the shape of a pillow case.
2. Knead the combs in the cloth and then press the honey through the cloth.
3. Twist out the cloth (you need two people for this, or one person and a fixed point), but it is faster to work with a wooden press. There are various press constructions.
4. Pour the honey through a clean cloth or sieve into a pot or maturing vessel and leave it to stand for a few days. Any remaining wax particles and pollen grains will float to the top and can be skimmed off.

3. Centrifuging Method

The centrifugal honey extractor consists of a cylindrical container in which a cage made of a frame covered with strong wire mesh turns on an axle.

The advantage of centrifuging is that you can extract the honey very quickly and that you can use the combs again.

Fig. 59: A sketch and picture of a honey centrifuge extractor

In this kind of centrifugal honey extractor 2, 3, 4, 6 or 8 frames can be extracted at the same time. The cage in which the frames are placed is turned by means of a handle with gears. The honey is thrown out of the combs against the inside walls of the container.

A handy blacksmith can make these centrifugal honey extractors using, for example, some cogs from an old gear box. It is even possible to centrifuge parts of the comb or top bar combs into a centrifugal extractor. In that case you must make wire baskets in which the comb pieces are tightly enclosed. The baskets are handled as though these are frames. The pieces of comb can be used again in the hive, re-attaching them to top bars with pieces of string or straws. Alternatively, the remaining comb can be used for wax processing.

Steps:-

1. Beneath the tap at the bottom of the container place the honey sieve or clean cloth through which the honey runs into a bucket or straight into the vessel.
2. Place honey frames into the cage (one on each side of the cage). In case of top bars, place the wire basket.
3. First, turn the handle slowly, otherwise the weight of the honey inside the comb will press the comb through the wire mesh of the cage.

4. Then place the frames in reverse and turn the handle until the cells on this side of the combs are completely empty.
5. Finally turn the combs once again and turn the handle until the cells on the first side of the combs are also completely empty.
6. The empty combs are put into a honey super and given back to the colony, so that they can lick the cells clean. If there is no longer any honey flow the old combs must be removed. New ones can be stored.
7. Leave the honey in the settling vessel for a few days so that air bubbles and wax particles can float to the top. Skim these off and pour the honey into airtight containers.

NOTE:

Honey should be processed in a space where bees cannot enter (all openings must be closed with fine wire mesh). It is also possible to work in the evening. You can also spin honey in a tent which seals well with the ground so that there are no gaps. If necessary you can store well-capped frames in a well-sealed container. If your honey contains too much water, you can dry your uncapped honey by making a chimney of the honey supers and blowing air through them with a ventilator. If you place newspapers on the floor of the room you can easily remove spilt honey.

Table 6: Forms of honey and how they are made:

Liquid Honey	Some honey remains in liquid state naturally if they have glucose to water ratio of less than 1:8.
Chunk honey	This is where 1 or 2 strips of cut comb are placed in a transparent wide mouthed jar, which is then filled with light-coloured liquid honey.
Creamed honey	Homogeneously stable crystallized honey with a pleasant creamy appearance obtained by the addition of a small quantity of already crystallized honey to liquid honey.
Comb honey	Small section of completely sealed comb built of virgin (new/white) bees wax, preferably with light coloured honey.
Crude honey	Combination of honey, pollen, bee broods and other impurities like sticks, tree leaves …etc.
Semi-refined honey	Skimmed honey after removal of comb after several days of settling. It needs to be further sieved to remove impurities.
Granulated honey	Honey is a super saturated solution i.e. it contains more dissolved substance than the solvent can normally retain in solution at any specific temperature. Such a solution is unstable and will in time revert to the stable saturated condition by crystallizing the excess solute.

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Granulated honey

Honey is a super saturated solution i.e. it contains more dissolved substance than the solvent can normally retain in solution at any specific temperature. Such a solution is unstable and will in time revert to the stable saturated condition by crystallizing the excess solute.

Storage of honey

Honey should be stored in clean glass jars, food grade plastic airtight buckets or plastic coated metal containers immediately after extraction.

NOTE:

The honey can start to ferment during storage if the water content is too high (>19%).

Heating the honey will cause both the taste and smell of the honey to deteriorate. Heated honey is of an inferior quality as the enzymes are broken down.

MODULE 21: BEESWAX

Introduction

Beeswax is often the second most valuable product after honey. Unfortunately in Uganda many beekeepers throw away wax combs on harvesting or after honey extraction. So it is important for our beekeepers to have the knowledge and skills on the uses of beeswax and how to process it at local level.

Learning objectives

By the end of the session, participants will be able to:-

- State the different uses of beeswax
- Describe the various methods of processing beeswax
- Process beeswax from the combs for sale or use.

Target participants:

Existing beekeepers, extension service providers, traders, individuals and organizations interested in selling or using of beeswax.

Suggested Number of Participants:

A maximum of 30 persons

Duration:

3 hours.

Materials:

Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, solar wax melter, wax combs (from honey refining session) – soaked overnight in clean water, large aluminium cooking pot, additional pot, fire and water, old rice sack or cloth bag (not too fine a weave), 2 long clean sticks (1 Inch diameter), selection of beeswax, beeswax products such as lip balm, soap, cream and candles, and hand outs.

Methods:

- Lecture
- Brainstorming
- Group discussion
- Practical exercise to process quality beeswax from the combs

STEPS:

Step 1

Write the title "Beeswax" on the chalkboard or flip chart

Step 2

Engage all the participants to brainstorm on what is beeswax, where it comes from and on what is it used for.

Step 3

Allocate the participants in 2 groups and assign them the following tasks:-

Group 1: Describe the steps involved in using solar wax melter for processing wax.

Group 2: Describe the steps involved in using hot water bath method for processing wax.

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Practical exercise to process quality beeswax from the combs

Instruction

- Organize the training sessions so that making products from beeswax follows directly after this module. Encourage participants to attend both sessions.
- Prepare all your equipment in good time and do not keep your trainees waiting – soak the combs overnight, put the beeswax in the wax melter at the beginning of the session and put the melter in the sun, start the fire and begin heating the comb mix.

HAND OUTS: Beeswax

What is beeswax?

- Beeswax is the substance used by bees to make their combs to store their honey.
- Beeswax is often the second most valuable product after honey.
- It is harder than other waxes such as paraffin wax and has a low melting point (64 degrees centigrade).
- Beeswax is not a plant product but a bee secretion.

Where does it come from?

- The wax bee (a worker bee aged between 12-18 days) makes perfectly hexagonal wax cells and cappings in the hive to store new honey, pollen and brood.
- These honeycombs are made from beeswax secreted from wax glands on the underside of the abdomen of a worker bee. Wax can be seen as small flakes on the underside of bees.
- Bees are stimulated to produce wax when the queen needs space to lay more eggs when the colony is expanding during the build up.
- Bees are stimulated to produce wax when there is surplus honey to be stored during the honey flow and a lack of honeycomb in which to store it.
- Beekeeping using traditional hives or movable combs can result in high yield of beeswax.

What is it used for?

- The bees use it to make combs.
- Beekeepers use it on 'starter' strips and to bait hives.
- Industries use it for making:
- Cosmetics: it is the base for lipstick and rouge and is used in lip balm, skin creams, soaps, deodorants and hair creams.
- Pharmaceuticals.
- Food processing.
- Candles that are drip less, smokeless and long lasting.
- Polishes for preserving leather and wood such as shoe polish and furniture polish.
- Ointments for skin problems, cuts and grazes.
- Lost wax casting and modeling for statue making.
- Wax printing and batiks.
- Treatment for cracked hooves of livestock.
- Mending cracked pots and water containers.
- For waxing threads in shoe making.

Beeswax can be used as the basis of many small business activities and is a valuable commodity and export crop, which sells for US$3-5 per kg on the world market. In some countries, wax rather than honey is the most valued hive product. Beeswax is valued according to its purity and sometimes its colour - light wax (from new combs) is often more highly valued than dark wax (from old combs). The presence of pollen, propolis and impurities can cause the beeswax to become yellow. It will also darken with age so it is better used or sold as quickly as possible.

Unlike honey, beeswax does not require careful packaging, which simplifies transport and storage. However wax must be stored in a sealed container to protect it from attack by wax moths.

Explain that a simple wax collecting system and bulk selling of wax can result in income from an otherwise wasted resource. Both honey hunters and beekeepers should realize that beeswax is a valuable product in addition to honey.

The beekeeper can harvest combs from the hive that are not being used. The beekeeper can also take the beeswax from the honeycombs having first extracted the honey. The honey is extracted by first removing the wax cappings. The honey is then squeezed and strained through a clean cloth. The combs can then be melted and sieved and used or sold as a raw commodity.

Beeswax is valuable and all old combs, scrapings from the hive and pieces of wax should be kept!

The process by which wax from combs is converted into blocks of clean wax is known as 'rendering'. All methods of rendering involve melting the wax.

Points to note:-

- **Never** use iron, zinc, brass or copper containers as the wax will react with the pot - they discolor wax and make it loose its smell. Use unchipped enamel, galvanized iron, stainless steel or aluminum containers.
- **Never** boil wax or heat it directly on the fire as it damages the wax and reduces its quality. Overheated or burnt wax is worthless.
- Be careful, as wax is flammable!
- Use fresh combs recently removed from hives whenever possible.
- Fresh pale white combs give the best beeswax. Avoid combs with brood, as it will make the wax smell over time.
- New white combs are better than dark combs (as new bees are born out of the comb, they spin cocoons making the combs dark and hard and they hold less wax).
- Always process old comb separately from new light coloured comb as old comb is lower quality and will reduce the value of the end product.
- Ensure all equipment is clean and will not contaminate the wax. Never use containers that have held any chemicals.
- **NEVER** add anything to the beeswax. Some people put stones and sand into the setting beeswax to increase the weight. This is unethical and most buyers will break beeswax into pieces to check the quality.

Methods of wax extraction:

There are 2 main methods of wax extraction.

- Solar wax melter.
- Hot water bath method.

The solar wax melter.

This provides a simple, safe and cheap method using the heat of the sun. It is a box with a glass lid that is tilted at an angle to catch the sun. The sun melts the wax over a period of time.

- There is a sheet of aluminum metal (or galvanized steel) that directs wax into the container
- There is a single or double wall of glass that helps heat absorption.
- The wire mesh prevents debris from slipping into the container.
- The dark painted walls help to heat absorption if necessary.

The melter must not have any cracks or gaps that will encourage heat loss or allow any robber bees inside. The smell of the wax will attract bees and ants. It must be set up in such a way that ants cannot gain access.

Steps:

- Wash the sticky combs out in cold water and let the combs dry out in the sun.
- Place the combs on the metal sheets of the melter.
- Place the box in the direct sunshine for a few hours until the wax has melted, run into the container and formed blocks.
- Strain it through a cloth into a second container

A very simple way to melt small scraps of wax is to place them on a piece of metal aluminum foil (such as from a cigarette packet) and leave them in the sun. Fold the foil carefully so the melted wax cannot run out! In strong sunlight the wax will melt and can be poured into a container. This is a very good way of preparing wax for the starter strips on top bars.

For larger amounts of wax an open box may simply be lined with tin foil and placed in the direct sun. Another simple method is to place a wire mesh across the top of a bucket and place it in the hot sun. The mesh will separate the cocoons from the melting wax, which can then be strained through a cloth.

The hot water bath method:

This method involves heating wax in water over fire. This is much safer than using heat alone as beeswax is very flammable.

Steps:

- Break up comb into small pieces and wash or soak it overnight in clean warm fresh water. Rinse the combs 2 or 3 times to get rid of all the honey and dirt. (Remember don't throw the water away – use it as bee feed!)
- Add water to cover the combs. Be aware that combs will float so ensure there is adequate water in the pot.
- Put the pot on the fire and heat the mixture slowly and gently and stir until the wax melts. Do NOT make the water boil for long or too hard because too much heat will spoil the wax and make it brittle. In fact water boils at 100 degrees centigrade and wax melts at about 64 degrees centigrade so there is no need to boil it. In addition the water must not be allowed to boil over, as wax is very flammable and could burn easily.

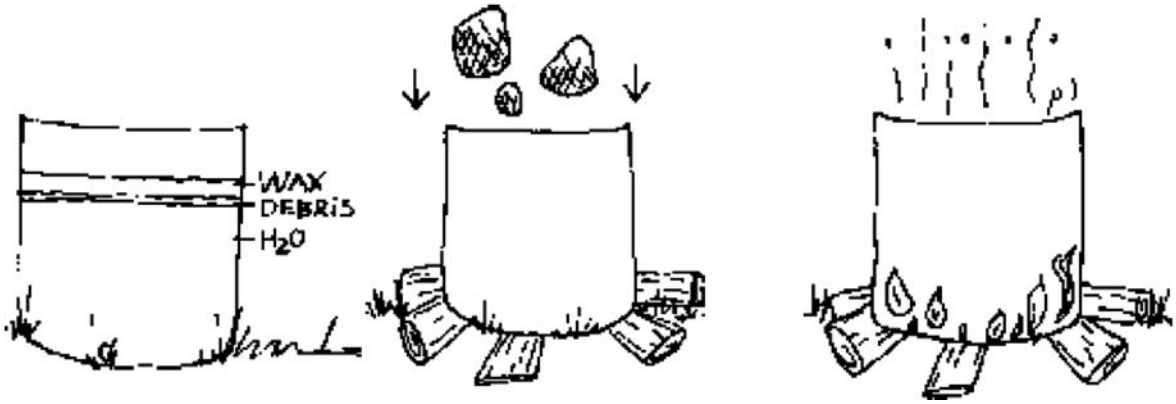

Fig. 60: melting wax

- Smear the sides of a second big wide pot or bucket with non-scented soapy water.
- Once yellow oily liquid beeswax is seen on the top of the water, the mixture is then strained through a wire mesh or cloth bag into the second clean empty container or bucket.
- The ends of the cloth can then be twisted and the mixture squeezed. Or 2 sticks can be used to squeeze the bag from top to bottom. You need 2 people to do this!
- Beeswax is squeezed out of the combs. The black cocoons spun by the larvae (and other debris) remain in the cloth. This residue can be used as swarm bait.
- As it cools the wax separates from the water and rises to the surface of the container like a plate.
- Cover the pot so dust and insects cannot get it. Leave the pot with the water and molten beeswax in a cool dark place. Do not disturb the pot until the beeswax has set hard on the top of the water. This may take 12 –24 hours especially in the hot season.
- Lift the sheet of beeswax from the surface of the water and discard the water.
- Debris is scraped from the bottom of the wax cake once it has hardened.
- To obtain even purer wax melt the wax in a double boiler and strain again.
- The rendered beeswax is now ready for sale or to be made into candles, skin creams or polishes.
- Another method for large amounts of comb can be tried using an oil drum

Combs and rocks are tied in a sack and the sack placed in a drum of water over the fire. The water should be heated but not boiling and the wax will melt and come to the surface. The sack should be removed and squeezed and the wax and water left to cool.

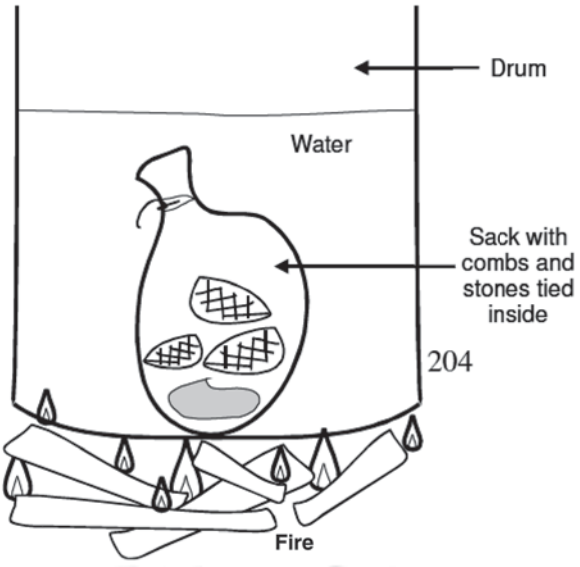

Fig. 61: Wax extraction using a sack and a drum

- Wax should not be stored in the comb form. Combs should be processed quickly as they become brittle. In addition combs may be eaten by wax moth. However putting the container of wax outside for some hours in the sunshine each day can help keep the moths out.
- Wax blocks must be stored in sealed plastic, airtight containers and in a cool dry place.
- Wax blocks should never be stored near pesticides or chemicals as the wax may absorb them.
- Wax should be wrapped in plastic or newspaper in order to store it for long periods of time without damage. Wax can retain its quality and shape for hundreds of years.

Summary:

Beeswax is a valuable commodity and export crop and can be used as the basis of many small business activities. A simple wax collecting system and bulk selling of wax can result in income from an otherwise wasted resource. Both honey hunters and beekeepers should realize that beeswax is a valuable product in addition to honey. In some countries, wax rather than honey is the most valued hive product. Beeswax is valued according to its purity and sometimes its colour - light wax is often more highly valued than dark wax. The presence of pollen, propolis and impurities can cause the beeswax to become yellow and it will darken with age. Unlike honey, beeswax does not require careful packaging, which simplifies transport and storage. However wax must be stored in a sealed container to protect it from attack by wax moths.

Collecting beeswax is easy: the beekeeper takes the beeswax from the honeycombs having first extracted the honey. The beeswax can then be melted and sieved and sold as a raw commodity. The process by which wax from combs is converted into blocks of clean wax is known as ‘rendering’. All methods of rendering involve melting the wax.

During rendering never use iron, zinc, brass or copper containers as they discolour wax and make it loose its smell. Use un-chipped enamel, galvanized iron, stainless steel or aluminium containers. Never boil wax as it damages the wax and is dangerous as wax is flammable. Use fresh combs recently removed from hives whenever possible. Always process old comb separately from new comb as old comb is lower quality. Always process dark comb separately from light comb as this will reduce the value of the end product. Ensure all equipment is clean and will not contaminate the wax. NEVER add anything to the beeswax. Some people put stones and sand into the setting beeswax to increase the weight. This is unethical and most buyers will break beeswax into pieces to check the quality.

There are 2 main methods of wax extraction:-

The hot water bath method: involves heating wax in water, which is much safer than using heat alone as beeswax is very flammable.

- Break up old comb into small pieces and wash it in clean warm fresh water.

Fig. 62: Wax extraction with cloth and sticks

- Put in an aluminium pot and water is added to cover the wax.
- The pot is put on the fire and the mixture heated gently and stirred until the wax melts.
- The mixture is then strained through a wire mesh or cloth bag.
- The ends of the cloth can then be twisted and the mixture squeezed.
- The debris remains in the cloth.
- The wax separates from the water and rises to the surface.
- Cover the pot and leave it to cool.
- Lift the sheet of beeswax from the surface of the water.
- Debris is scraped from the bottom of the wax cake once it has hardened.
- A very simple way to melt small scraps of wax is to place them on a piece of metal foil and leave them in the sun. In strong sunlight the wax will melt and can be poured into a container.
- The solar wax melter: provides a simple, safe and cheap method using the heat of the sun.
- The box with a glass lid is tilted at an angle to catch the sun. The sun melts the wax over a period of time. The melter must not have any cracks or gaps that will encourage heat loss or allow any robber bees or ants inside.

Remember:

- Wax should not be stored in the comb form, as it will be eaten by wax moth. However putting the container of wax outside for some hours in the sunshine each day can keep the moths out.

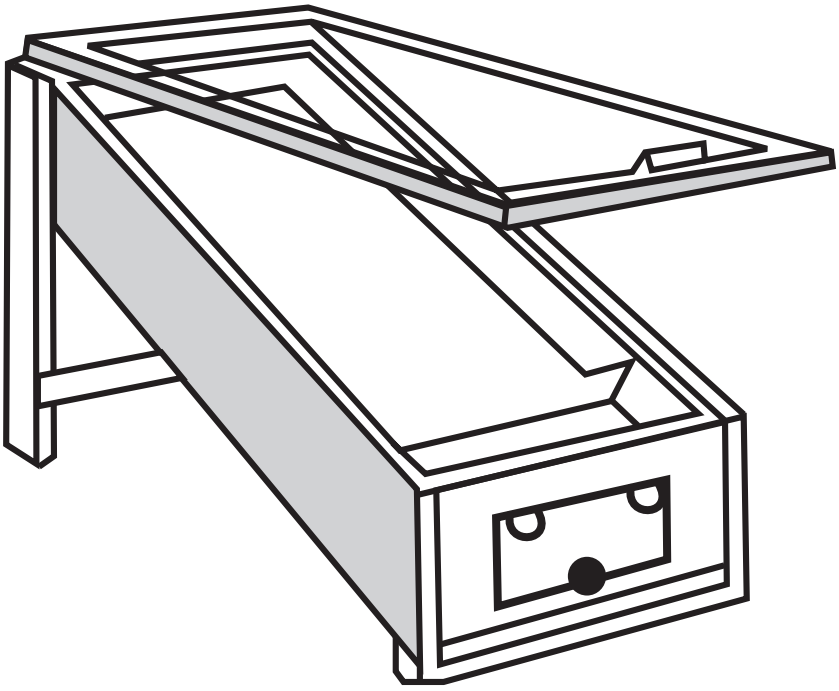

Fig. 63: Sketch of a solar wax extractor

- Wax blocks must be stored in sealed plastic, airtight containers and in a cool dry place.
- Wax blocks should never be stored near pesticides or chemicals as the wax may absorb them.
- Wax should be wrapped in plastic or newspaper in order to store it for long periods of time without damage. Wax can retain its quality and shape for hundreds of years.

MODULE 22: MAKING BEESWAX PRODUCTS

Introduction

Beeswax is good for candle making as it burns with a bright steady flame. Beeswax is the best substance for making skin products such as scented creams and antiseptic ointments.

Learning objectives

By the end of the session, participants will be able to:-

- Make body creams
- Make candles

Target participants:

Existing beekeepers, extension service providers, traders, individuals and organizations interested in selling beeswax products.

Suggested number of participants:

A maximum of 30 persons

Duration:

3 hours.

Materials

Flip chart and masking tape or chalkboard, marker pens or chalk, notebooks and pens, Pure clean rendered beeswax, clean candle moulds (bamboo, cardboard, wood or plastic pipe), soap powder or oil, wick (from paraffin lamp or braided cotton string), bottle tops, matchsticks or toothpicks, cooking pot and small bowl/ tin can, box of clay soil, water, fire and fuel, stick for stirring, containers for cream(Such as film canisters), perfume or other flavouring and hand outs.

Methods

- Lecture
- Brainstorming
- Group discussion
- Practical exercise to make body creams and beeswax candles

STEPS

Step 1

Write the title “Making Beeswax products” on the chalkboard or flip chart

Step 2

Engage the participants to brainstorm on what materials are used for making different beeswax products.

Step 3

Allocate the participants in 4 groups and assign them the following tasks:

Group 1: Describe the steps followed in making basic cream

Group 2: Describe the steps followed in making turmeric cream

Group 3: Describe the steps followed in making propolis cream

Group 4: Describe the steps followed in making scented cream

Step 4

In plenary, participants present findings, the trainer clarifies and summarizes, gives out the hand outs.

Step 5

Practical exercise for trainees to participate in making beeswax products.

HANDOUT: Making Beeswax Products

CANDLES

Beeswax is good for candle making as it burns with a bright steady flame and it has a higher melting point than cheaper candles. The candle will remain upright in hot weather and does not smoke. Candles can be made simply using bought candle moulds or local products like plastic pipe, gourds or hollowed out fruit. Alternatively use a rolled up piece of cardboard (from a soap packet) fastened with rubber bands. Please note that a thick candle will need a thick wick but a thin candle will need a thinner wick.

Follow these steps:-

- Smear the inside of the pipe with oil or soap/detergent mixed with water.
- Thread the wick through the pipe.
- Punch a hole in the middle of the bottle top, thread the wick through and knot it.
- Cover the bottom of the pipe by pushing the pipe onto the bottle top.
- Tie the top of the wick to a matchstick and ensure the wick is in the center of the pipe.
- Stand the mould upright in the firm soil to prevent leakage.
- Break up the wax and melt it indirectly inside a tin can placed in a pot of hot water. Do not boil the wax.
- Pour the melted wax into the moulds making sure the wick remains in the middle of the pipe.
- Leave the candle for 2 to 3 days to become solid and then remove it from the lubricated mould.
- Test the candles to ensure they burn properly. Varying the wick size can alter how a candle burns. If the wick is too thin the candle will go out. If it is too thick the candle will burn very quickly.

Creams

Beeswax is good for making creams and ointments. Adding ingredients such as turmeric, honey or propolis can give the cream antibacterial properties. Adding herbs, gums or bought perfume can give the cream a nice scent of your choice.

To make the basic cream, follow these steps:-

- Heat water in the big pot on the fire.
- Melt the beeswax by placing it inside the small bowl and placing the small bowl inside the pot.
- Remove from the heat and mix 1 tablespoon or cup of molten beeswax to 4 tablespoons or cup of oil into one of the small bowls.
- Add 1 tablespoon of any additional ingredients.
- Return to heat and mix.
- Remove and stir it until it cools. It should have a creamy consistency.
- Spoon it into small containers.
- Cover immediately.

To make propolis cream, follow these steps:-

- Scrape some propolis from your hive into a container.
- Add some water and heat.
- Any wax will melt and float to the surface. The propolis will stick to the bottom.
- After cooling remove the wax, pour off the water and save the propolis mass beneath.
- Place the container in a cool place and let the propolis harden and become dry and brittle.
- Store the propolis in a sealed container.
- Heat water in the big pot on the fire.
- Melt the beeswax by placing it inside the small bowl and placing the small bowl inside the pot.
- Remove from the heat and mix 1 tablespoon of molten beeswax to 4 tablespoons of oil in a small bowl.
- Add 1 tablespoon of propolis granules.
- Return to heat and mix.
- Remove and stir it until it cools. It should have a creamy consistency.
- Spoon it into small containers.
- Cover immediately.

To make turmeric cream, follow these steps:-

- Mix 5 tablespoon of turmeric with 1 litre of oil. (Infuse any smelling herbs or gums in the same way for an alternative cream).
- Leave the mixture for 15 days to allow the turmeric powder to infuse in the cooking oil. Shake the pot each morning and evening.
- Strain the stained oil and throw away the powder debris.
- Heat water in the big pot on the fire.
- Melt the beeswax by placing it inside the small bowl and placing the small bowl inside the pot.
- Remove from the heat and mix 1 tablespoon of molten beeswax to 4 tablespoons of the infused oil in a small bowl.
- Return to heat and mix.
- Remove and stir it until it cools. It should have a creamy consistency.

- Spoon it into small containers.
- Cover immediately.

To make scented cream, follow these steps:-

- Heat water in the big pot on the fire.
- Melt the beeswax by placing it inside the small bowl and placing the small bowl inside the pot.
- Remove from the heat and mix 1 tablespoon of molten beeswax to 4 tablespoons of oil in a small bowl.
- Return to heat and mix.
- Remove and stir it until it cools. It should have a creamy consistency.
- Add a few drop of perfume as you spoon it into small containers.

CHAPTER FOUR

EXPLANATION OF COMMON BEEKEEPING TERMS

Terms	Explanation
Absconding	This occurs when all honey bees leave the hive or nest.
Apiary	The site where a number of colonized hives are kept.
Apiary hygiene	Is keeping apiary clean.
Apiary inspection	Routine observation of what is going on in and around the apiary.
Apiculture	The science and art of bees and beekeeping
Bark hive	Is a type of traditional or local hive made out of the bark of trees which can be built in a cylindrical or other shape.
Basket hive	Is a woven hive made out of various locally available materials.
Bee bread	Is a product of pollen and honey to make a dough stored as food for the bees.
Bee brood	It includes eggs, larvae and pupa in a comb.
Bee brush	Used to brush off bees from the honey comb during inspection or harvesting.
Bee calendar	Is what happens inside the hive all year round.
Bee Forage	Plants which provide pollen, nectar, honey dew and propolis for the colony.
Bee House	A house specifically designed with holes on the walls that are connected to the hive entrances.
Bee keeper's calendar	Is a series of activities carried out by a bee keeper during various seasons.
Bee Protective Wear	Used to protect bee keepers from stings and comprises of an overall, bee gloves, bee veil and gum boots.
Bee Smoker	Is a simple device / tool used to generate smoke during hive inspection or harvesting to calm the bees.
Beeswax	Wax produced by honey bees and used to build combs.
Bee Venom	Is a poisonous substance produced by worker and queen bees for defense.
Build-up	Is a season when there are many bee forage plants and the weather is favourable, the colony expands.
Catcher box	Is a small hive with about 4 to 5 frames / bars used to trap passing swarms.
Centrifuge extractor	It is a machine used to extract honey from combs.
Comb	This is a hangingstructure built by bees out of beewax used for rearing brood and storing honey and pollen.
Comb Knife	Used to cut off honey comb from a top bar or a local hive.
Dearth	Is a season when not much nectar is being collected due to bad weather and poor forage.
Frame hive	A hive which contains frames e.g. Langstroth, Dadant, and Smith. They all recognize the importance of bee space and use movable - frames as shown in figure.

Hive	This is a man-made container or natural cavity or hollow in a tree/ground modified by man in which a colony lives.
Hive Baiting	This is a act of attracting bees into a hive by using be attractants such as beeswax, propolis or any other suitable material.
Hive Inspection	Opening the hive and observing what is going on inside the hive and also what is going on outside the hive.
Hive Tool	Used to open the hive and loosen the bars or frames that are stuck together with propolis.
Honey	A sweet viscous fluid made by bees from Nectar or honey dew and stored in combs.
Honey Bee Colony	A colony is a group of honey bees living together comprising of a queen, drones and workers.
Honey flow	Is a season when many plants provide nectar and flower at the same time.
Honey processing	Is the getting of honey out of the comb.
Honey Refractometer	An instrument used to measure the moisture content of honey.
Modern processing methods	Using equipment (Honey press, Stainless steel tanks etc) to process the honey.
Nector	The sweet fluid secreted by nectaries of plants commonly in flowers that helps attract bees and is the raw material from which honey is made.
Propolis	Is a hive product made by bees from resinous substances picked from plants. It is used to seal cracks in the hive and to reduce hive entrance when necessary.
Pollen	Are grains produced by flowers and are used as food for bees.
Royal jelly	Nutritious substance produced by young worker bees to feed the young larvae and queen.
Siting hive	Is placing hives in a suitable place.
Solar wax extractor	Equipment for extracting wax using sunshine.
Top Bar Hive	A design of a hive with bars on top. Top - bar hives are transitional hives between the traditional hives and the frame hives.
Traditional hive	Is a hive which is made out of local materials available in any location e.g. log hive, clay pot hives, gourd hives, bark hives, or woven twigs and mud basket hives.
Watering bees	This is provision of water in an apiary.
Queen Excluder	A device for convining the queen to a particular section of the hive.

Appendix 1:

The regions and districts where the beekeeping training and extension literature was collected:

Region	N0.	Districts
Northern and West Nile	1	Nakasongola
	2	Lira
	3	Adjumani
	4	Moyo
	5	Yumbe
	6	Arua
	7	Nebbi
	8	Luweero
Eastern	9	Mbale
	10	Sironko
	11	Kapchorwa
	12	Bukedea
	13	Soroti
North Western & South Western	14	Masindi
	15	Hoima
	16	Kibaale
	17	Kabarole
	18	Kasese
	19	Bushenyi
	20	Mbarara
	21	Masaka

Appendix 2:

Attendance list in the retreat to produce the first draft:

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1	Ramsey Owot	Nakasongola Apiculture Centre	Director	0772 495672 rowot@yahoo.com
2	George Ayo Ogwal	Lira District Local Government	Senior Entomologist	0772 872274 Ayowa2003@yahoo.com
3	Kyaligonza Peter	Busia District Local Government	Entomologist	0772 5552280 ategonza@yahoo.com
4	Ndyabarema Robert	TUNADO	Executive Director	0712 417452 mdyaba@gmail.com
5	Agapitus Kato	Mukono District Local Government	Senior Entomologist	0772 985698 agapitus_kato@yahoo.Co.uk
6	Kabbale Fredrick	Kamuli District Local Government	Entomologist	0772 482119 fredrickkabbale@yahoo.co.uk
7	Kaddu John	Wakiso District / Kaddu John Bee Equipments	Technical personnel	0712 567395 / 0784368998 jonebees@yahoo.co.uk
8	Kangave Alice	MAAIF	Principal Entomologist	0712 273059 akangave@utlonline.co.ug
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10	Kanyike Charles	Nakasongola	Senior Entomologist	0772 340468
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