



Supplementary Educational Materials for Agricultural and Veterinary High Schools and Institutes

Core Skills Training – Beekeeping Agricultural Education Program People in Need (PIN) Czech Republic 2016

These educational materials, including charts, are used as supplementary subject-specific content in classrooms of agricultural and veterinary high schools and institutes in Afghanistan, especially designed for scientific use by students engaged in beekeeping

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Introduction: Basic Beekeeping Skills

Basic Beekeeping Skills is a new educational material created for teachers and students of agricultural and veterinary high schools and institutes in Afghanistan, as well as for farmers. These basic beekeeping skills—and other similar basic skill sets—have been developed by the agricultural education team of the organization *People in Need (PIN)*.

Other basic skills developed include:

- Basic Orchard Management (grafting and pruning)
- Basic Business Skills
- Basic Poultry Farming
- Basic Greenhouse Management

These basic skills are presented through information sheets and banners. Trainers use them during training sessions, and teachers also use them to teach their students.

Target Group

- Male and female students of agricultural and veterinary high schools and institutes
- Farmers and their families
- Unemployed rural families

General Goal

To increase the skills and knowledge of agricultural and veterinary teachers in the field of beekeeping—so they can start small and medium-sized honey production farms in their areas or elsewhere. It also aims to encourage students to learn through practical teaching.

Specific Learning Objectives

After completing the training, participants will be able to:

1. Understand the importance of beekeeping – including honey production and the role of bees in pollinating trees and plants. They will also learn about the current status of beekeeping in Afghanistan, and how both small and large beekeepers can use modern technology.
2. Recognize suitable conditions for keeping bees – such as the need for flowers and proper temperature for feeding and caring for bees.
3. Know the importance of artificial feeding for bees, and why it may be necessary.
4. Understand how to grow strong bee colonies and how to combine weak ones.
5. Know the seasonal schedule of beekeeping activities in Afghanistan.
6. Identify flowering times of various trees and plants that bees need to collect nectar and pollen in the selected regions.
7. Identify the tools and equipment used in beekeeping, and how to extract honey using machines.
8. Learn about common bee diseases and problems in Afghanistan, and how to prevent, diagnose, and treat them.



Training Outcome:

By the end of the training, participants will also be able to:

1. Choose the right area for collecting flower nectar that bees need.
2. How to feed bees artificially – Participants will learn how to prepare and give sugar syrup when natural food sources are not available.
3. How to add new wax frames into the hive and use the honey extractor machine.
4. How to move bee hives from one area to another, how to divide bee colonies, and how to create a new bee family (colony).
5. How to identify bee diseases by observation, how to use the smoker (smoke pump), and how to apply medicines.
6. How to check the colony's health, diagnose diseases, and use the smoker in a practical way.
7. How to prepare the bee colony for winter so that the bees survive the cold season.

Basic Beekeeping Terms:

- **Bee:** An insect belonging to the *Apoidea* family. In beekeeping, this usually refers to the honeybee.
- **Brood:** This refers to the young, developing stages of bees: eggs, larvae, and pupae.
- **Brood Nest:** The part of the hive where the queen lays eggs and the worker bees raise the young.
- **Bee Colony:** A social unit of bees living together as one family. It includes a queen bee, worker bees, and drone (male) bees.
- **Comb:** Small hexagonal (six-sided) structures built by worker bees to store honey and for the queen to lay eggs.
- **Bee Wax:** A natural material produced by bees, used to build combs in the hive.
- **Apis:** A Latin term referring to the genus of honeybees.
- **Apiary:** A place where beehives are kept, usually near flowering fields for nectar collection.
- **Bee Hive:** The man-made structure where bees live, raise young, and produce honey.
- **Frame:** A rectangular wooden structure placed inside the hive to hold the wax sheet (foundation) in place.
- **Foundation:** A thin wax sheet with small hexagon patterns, placed inside the frame to help bees start building combs.
- **Feeder:** A container placed inside the hive to feed the bees with sugar syrup during times when natural food is scarce.
- **Super:** A box placed on top of the brood box, used to store excess honey produced by the bees.



Introduction and Purpose of Beekeeping

What is Beekeeping?

Beekeeping is an important part of Afghanistan's agriculture. It can have a positive effect on farmers' economic conditions, especially in a country where more than 80% of the population depends on farming. Any farmer can keep bees—it doesn't matter if they own land or not, because beekeeping is easy and low-cost. Even landless farmers can raise bees.

Beekeeping is a simple activity that can start producing honey in the first year. Honey has good market value worldwide. Besides that, beekeeping supports gardening by helping with pollination, which improves both the quantity and quality of fruits. It also has positive effects on other farming activities and increases their productivity. Afghanistan is a suitable country for beekeeping because it has the right climate and a good market for honey. Today, beekeeping is one of the livelihood options for rural families, helping them earn a living.

Unfortunately, beekeeping is not supported by the government, but some non-governmental organizations (NGOs) provide limited equipment support. In recent years, beekeeping has grown in Afghanistan. Some beekeeping cooperatives have been formed in provincial centers, and now it is expanding to other parts of the country. Beekeepers move their bee colonies to different regions to collect more honey. In winter, they even send bees to Pakistan, and bring them back in warmer months. Afghan honey has high quality and is popular in Arab countries, which motivates beekeepers even more.

Major Challenges in Beekeeping in Afghanistan

- Frequent outbreaks of contagious bee diseases in beekeeping farms
- Lack of access to proper beekeeping equipment for most farmers
- Unfair competition in the honey market – where some sellers try to discredit others' products, claiming they are low-quality

These challenges create tension among beekeepers in the market.

Types of Honey Bees in Afghanistan

Afghanistan has a long history of beekeeping and honey production.

Two native bee species are:

- *Apis cerana*
- *Apis dorsata*

Both are found mainly in the eastern zone of Afghanistan.

- *Apis dorsata* is not suitable for farming, while
- *Apis cerana* is small in size, producing about 5 kg of honey per year, and is very helpful for pollination.

In recent years, beekeepers have turned to raising the European honey bee:

- *Apis mellifera*: This species produces more honey—about 10 kg per year, and if moved to areas with more flowers, it can produce up to 40 kg of honey in a year.

For example, some beekeepers move their bees to Pakistan during the cold season and bring them back to Afghanistan during the warm months.

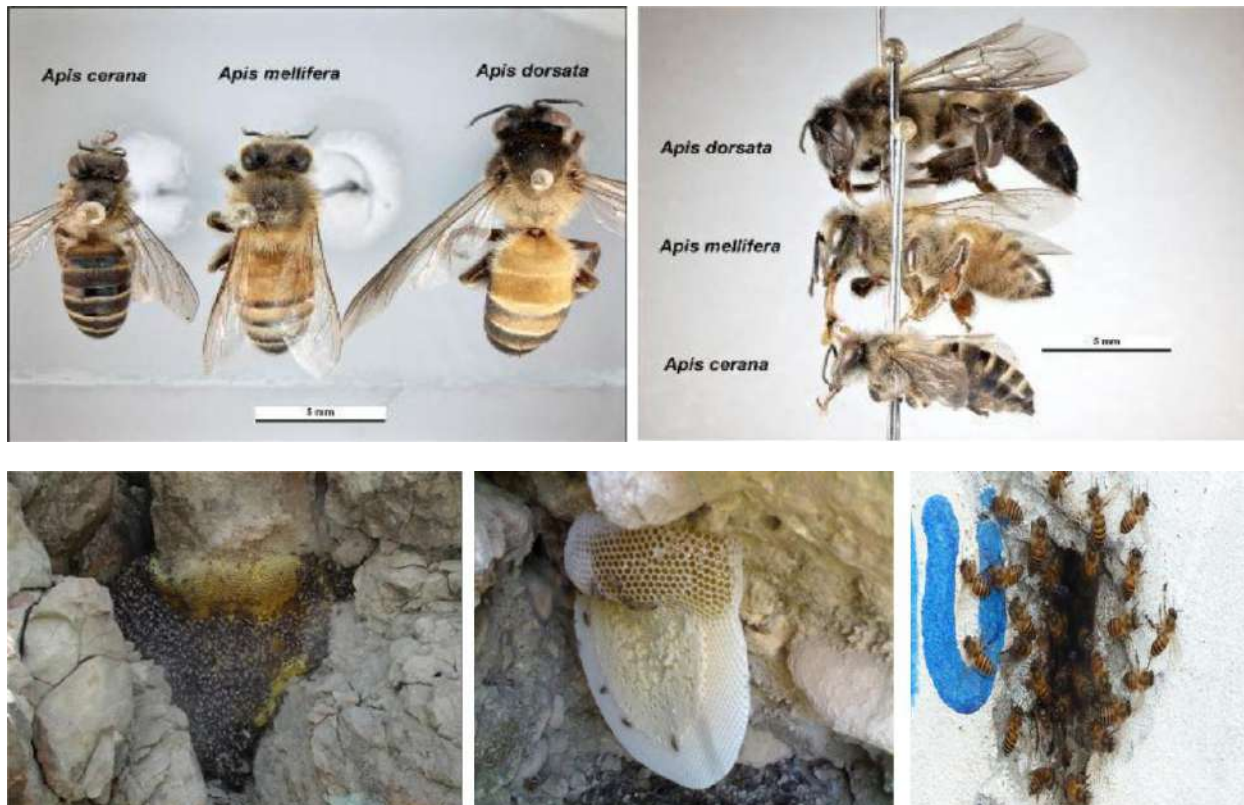


Figure 1: A colony of *Apis Cerana* living between rocks

Figure 2: an example of an *Apis cerana* colony

Figure 3: A family of *Apis cerana* living inside a wall hole.

Classification and Roles of Honey Bees

The honey bee is a useful and social insect. Bees live together in a family (colony). A strong bee colony usually includes:

- 1 queen bee
- Around 100 male bees (drones)
- Around 5,000 female worker bees

Each bee family includes eggs, larvae, and pupae (nymphs), and each member of the colony has a specific role, explained below:

Queen Bee

- The queen bee is a fertilized female bee.
- Usually, there is only one queen in each hive.

- She looks similar to worker bees but has a longer abdomen.
- Her main role is to mate with a male bee (drone) and then lay eggs.
- The queen has a large abdomen and can lay a large number of eggs each day.
- In spring, especially in March (Hamal month), she lays up to 2,000 eggs in 24 hours.
- The queen is fed and cleaned by worker bees.
- A queen can live and lay eggs for up to 6 years, but her egg production reduces after 2 years.
- Therefore, beekeepers are advised to replace the queen every 2 years.



Figure 4: In the image, the queen bee is marked with color for easy identification among the bees.

Queen Bee Development Stages

The following table explains the stages of queen bee development, from egg to full maturity:

Stage	Duration
Starts Egg Laying	Around 25 days
Mating flight	20 – 24 days
Mergence from cell	Day 13 – 14
Uncapped Pupa (early)	1 to 1.5 days
Capped Pupa	6 days
Larva	5.5 days
Egg	3 days

Worker Bees

Worker bees are unfertilized female bees. Their lifespan depends on how much they work. In spring, their activity increases, so their lifespan is usually shorter due to higher workload. When a bee colony is very active and has many broods (young bees), the worker bees live up to 6 weeks.

But during winter rest or rainy seasons (when there are no broods in moderate climate regions), or when there are few broods in tropical regions, the lifespan of bees becomes longer - up to 6 months. Worker bees do different tasks inside and outside the hive during their life. From birth to 21 days old, they do inside-the-hive tasks, and after 21 days, they perform outside activities, which are explained below:

Work Schedule of Worker Bees

Place of Work	Activities	Worker Bee Age
Inside the hive	Cleaning the hive and combs	Day 1 to 3
Inside the hive	Feeding the broods	Day 3 to 5
Inside the hive	Making food for the queen and feeding larvae	Day 5 to 12
Inside the hive	Building combs, storing honey, raising broods	
Inside the hive	Learning directions for outside work, honey processing, guarding the hive	Day 13 to 21
Outside the hive	Collecting water, nectar, and pollen	From day 21 until end of life

Male Bees (Drones)

Male bees, also called drones, are wider than worker bees but shorter than the queen. Their abdomens are not pointed. They have large heads, and the ends of their eyes meet at the top of their heads. Drones do not have stingers and cannot collect food on their own. They are fed by the worker bees.

The main job of drones is to mate with young queen bees. They also help regulate the temperature inside the hive. However, when there is not enough food in the hive, the worker bees stop feeding the drones. As a result, the drones die, and the workers throw their bodies out of the hive.

When food is plentiful, worker bees collect a lot of it, the hive grows quickly, and the number of drones also increases. As bee families grow bigger, they try to form new colonies. The presence of a queen along with drones in a strong hive makes it possible to create a new colony in a short time—around one week.

Before starting beekeeping, it is important to consider or predict any critical conditions that may affect the success of the activity.

Important Conditions for Beekeeping

Before starting beekeeping, it is necessary to consider or predict the critical conditions:

- Weather Study: Weather has a direct effect on beekeeping. So it's important to assess:
 - Presence of flowers
 - Temperature
 - Water sources
 - Flower blooming stage
 - Wind direction and speed
 - Birds and wild bees

These all have a big role in the health and production of honey bees.

- Market Study: Once you are sure the environment is good for beekeeping, it's also necessary to check if the market nearby can meet your needs such as:
 - Sugar

- Supplementary bee food
- Beekeeping tools
- Medicines
- Honey sales
- Choosing and Buying Good Bee Families: To succeed in beekeeping, it's important to choose and buy a healthy and strong bee family.

Cost Estimation: Starting beekeeping needs little investment, but you still need to estimate your costs, especially for buying colonies, transporting food, and essential tools should be assessed and calculated. Interest and passion for beekeeping are key. For someone starting beekeeping for the first time, it is important to learn from experienced beekeepers and gain hands-on experience. They should use the knowledge and experience of others in the field of beekeeping, attend beekeeping training sessions, and are advised to begin with only 2 to 3 beehives.

Flowering Times of Trees and Plants in Afghanistan

Afghanistan has different climate zones, meaning that the weather conditions vary from one region to another. Some areas have long winters, which directly affects the flowering time of trees and plants. These changes can cause flowering to start about 10 days earlier or later. Other regions have short winters and hot summers, which also affect the flowering and growth of plants. In short, each area's climate is different, and this has a direct effect on when trees and plants flower. So, it is very important for beekeepers to have good knowledge about the trees and plants in their own areas - especially the areas where they plan to move their bees to produce more honey.

To better understand this, below is information about the flowering times of different trees and plants in Samangan Province, which has a moderately cold winter and is very suitable for beekeeping.

Tree Name	Flowering Start Time	Flowering Duration (days)
Almond	Early March (Hoot)	30 days
Apricot	Mid-March (Hoot)	15 days
Cherry	Mid-March (Hoot)	20 days
Peach	Late March (Hoot)	15 days
Apple	Early April (Hamal)	20 days

Plant Name	Flowering Start Time	Flowering Duration (days)
Stone Flower	Early May (Sawr)	30 days
Marigold	Mid-May (Sawr)	60 days
Cumin	Mid-May (Sawr)	20 days
Camel Thorn	Early June (Jawza)	60 days
Wild Shrubs	Early July (Saratan)	60 days

Plant Name	Flowering Months
Clover	From Hamal to Jawza (March–May)
Alfalfa (Rashqa)	From Sawr to Sunbula (April–August)
Melon, Pumpkin, Watermelon, Cucumber	From Sawr to Saratan (April–June)
Okra	From Saratan to Asad (June–July)
Sesame	From Asad to Sunbula (July–August)

Images of some wild and useful plants:



Figure 5: A honeybee feeding on a marigold flower.



Figure 6: Marigold plants in a valley.



Figure 7: Stone flower, a well-known wild mountain plant used by bees for feeding.



Figure 8: Sesame

Starting Beekeeping Activities

People who have no prior experience in beekeeping should first work with experienced beekeepers, learn from them, and take notes.

They should also:

- Attend beekeeping trainings
- Practice hands-on work during training



- Ask questions during practical work
- Read beekeeping books and magazines
- Watch beekeeping videos

People with no experience (or very little experience) should start beekeeping with only 2 to 3 hives. This helps them avoid losses due to lack of knowledge or unexpected problems. Later, once they learn more and gain experience, they can expand their beekeeping activities.

Choosing a Suitable Location for Beekeeping

Choosing the right place to set up beehives is very important for getting more honey.

Hives should be placed where:

- There are plenty of flowers (for nectar and pollen)
- There is permanent access to water
- The area is away from other beekeeping farms

Even though bees can travel up to 3 kilometers, it's best to place the hives in the center of the flowering area. This reduces the flying distance, saves energy, and increases honey production.

Guidelines for selecting a proper site:

1. The area should have abundant flowers and a constant water source.
2. Keep enough distance from other beekeeping farms:
 - If the area has many flowers, keep at least 6 km between farms.
 - If flower resources are limited, increase the distance to 10 km to reduce bee competition.
3. Choose a quiet place, not near graveyards.
4. Avoid placing hives near roads or railways.
5. Do not place hives in very hot locations.

When hive temperatures rise, bees—especially worker bees collecting nectar—get busy bringing water to cool the hive instead of collecting nectar and pollen. When temperatures go back to normal, they resume their work.

To prevent overheating:

- Protect hives from direct sunlight
- Place them under trees during hot weather
- If there are no trees, build artificial shade covers
- The ideal hive temperature is around 35°C



Figure 10: If there is no water source nearby, you must provide water artificially.



Figure 9: Choose a location that has plenty of natural flower sources

If you plan to keep bees in the same area for a long time, place no more than 10 hives there. For short-term beekeeping, placing more than 10 hives is acceptable—but only if flowers are available. The number of hives depends directly on the flower resources and the beekeeping method used.

Providing Water Artificially for Bees

Drinking water plays an important and vital role in beekeeping. Beehives should be placed in areas where enough drinking water is available. If water sources are not available, it is recommended to provide sufficient drinking water for the bees artificially. There are two methods we can use to provide water for the bees:

1. First, placing a container of water in the shade near the beehives and putting clean pieces of wood inside it. This helps bees access the water more easily and prevents them from drowning, while also allowing them to fly easily. Water should be provided according to the needs of the honeybees. The bees' water container should be cleaned every 15 days and filled with fresh water.
2. Put water inside a barrel and connect it using a thin pipe to a surface that is already covered with plastic. Place small stones and pieces of wood on the plastic-covered area, and allow water to drip slowly so that bees can easily collect the water they need. The need for providing water to bees depends on the season. If the weather is very hot, bees need more water and bring water instead of pollen. On the other hand, if the weather is cold, they need very little water. According to the writer's experience, providing water near the beekeeping farm and placing beehives in the shade during hot seasons increases honey production by 50%.



Figure 10: Providing artificial shade above the hives during hot weather.



Figure 11: Placing the beehive under the shade of tree.



Inspecting the Hives

Before opening the hive, it is important to observe the health and activity of the bee colony, such as worker bees bringing nectar during the flowering season, the normal movement of bees in and out of the hive, and also to detect any problems such as robbery, attack by wild bees, or other issues that could destroy the colony within a week. Timely inspection and observation allow necessary and suitable measures to be taken to save the bee colony from destruction.

Before starting the inspection of the honeybee colony, it is recommended that beekeepers wash their hands and wear protective gear. It is also important to use clean equipment and consider the weather conditions (not too cold, too hot, or very windy). Stand beside or behind the hive (not in front of the entrance). Carefully remove the hive cover and occasionally apply smoke using a smoker.

Always remember, during the removal of frames from the hive, avoid dropping or injuring the queen bee. When opening the hive, consider the following points.

During the inspection of the hive, the presence of eggs, larvae, sealed pupae, and honey inside the frames indicates a healthy bee colony.

1. Observe the entrance of the beehive: are the worker bees going out to collect nectar, pollen, and water and bringing them back into the hive?
2. Inspect the frames: check whether eggs, larvae, open and sealed pupae are present or not.
3. Check for food: is there enough honey available to feed the bees?
4. Look for the queen bee: is the queen present in the hive? Is she active? Is she young or old?
5. Check the hive for diseases such as wax moth larvae, mites, etc.
6. Examine inside the frames: are the brood (developing bees) healthy?

Note: After inspecting the hive, all the equipment used must be disinfected so it is ready for future use. During health inspections of honeybees, a short report should be prepared to help resolve possible future problems.

Beehive Inspection and Registration Table

Inspection Date	Box	Bee Population			Queen Cell		Queen's Egg Laying			Honey Storage		
		Low	Medium	Low	Yes	No	Excellent	Moderate	Weak	More	Moderate	Low
	1											
	2											
	3											
	4											
	5											
Recommendations for future inspections:												

Feeding the Honeybee Colony

The natural food of honeybees in early spring consists of pollen, nectar or honey, and water. When pollen and nectar are not yet available - or during other times of the year when these materials are not present in the area or in the hive - artificial feeding can help keep the honeybee colonies alive. It can also help increase the bee population, improve honey production, or enable bees to pollinate plants and fruit trees.

Beekeepers are advised to feed bees natural food (honey) rather than other types of food because honeybees prefer natural food.

Artificial feeding can be done for the following purposes:

1. To stimulate the bee colony to raise brood (young bees), especially at the end of winter or early spring when collecting nectar or honey is important.
2. To prepare the colony for early pollination of fruit trees.
3. To prevent food shortage or starvation.
4. To return the frames whose honey was taken by the beekeepers back into the hive.
5. To prevent robbing and absconding of honeybees.
6. During treatment of the bee colony.

Feeding Honeybees with Sugar

Sugar is a suitable food for feeding honeybees. It is easily found anywhere and is economical and cheap for beekeepers.

First: Preparing Sugar Syrup: This syrup can be made from clean boiled water and granulated sugar, as explained below:

Amount of Sugar	Amount of Boiled Water	Purpose and Proper Timing for Feeding Honeybees
2 parts	1 part	Using thick syrup: Generally recommended in early autumn or after the flowering season ends in the area. This is the best time for artificial feeding with thick syrup to ensure that enough food is stored for winter. This type of feeding is done when honey and flowers are no longer available in the area and bees do not have enough food to survive the winter.
1 part	1 part	Using medium syrup: This type of syrup is recommended in early spring. It acts like nectar and stimulates bees to raise brood during this season. It means that worker bees prepare the comb, and the queen lays eggs in it.
1 part	2 parts	Using thin syrup: Although this syrup is not commonly used, some beekeepers use it in spring or early summer to stimulate brood development.



Figure 12: Amount of sugar and water for preparing thick syrup.



Figure 13: Amount of sugar and water for preparing medium syrup.



Figure 14: Amount of sugar and water for preparing thin syrup.

Method 1: First, open the beehive and remove the empty frames. Pour the sugar syrup directly into the cells of the comb. This pouring can be done using a water container or a sprinkler. Then return the frames into the hive. In general, this process is done during spring and autumn.

Method 2: Wash waxed frames and place them near the beehives. Pour the syrup directly into their cells. After the frames are filled, place them near the hives. It is recommended to carry out this feeding method early in the morning on warm and windless days. The amount of syrup prepared depends on the activity of worker bees and how much they can carry into the hive.

Method 3: Put the prepared syrup into a special bee feeder, as shown in the image, which is designed like a frame. Place all feeders filled with syrup into the hive instead of the empty frames. Place a few thin sticks inside the feeder so the bees don't drown while feeding.

Method 4: For large beekeeping farms, pour the prepared syrup into an open barrel and place several clean sticks inside it so that the bees can easily collect the syrup and avoid drowning. Finally, place the barrel in the middle of the beekeeping area so all the bees can use it.



Figure 15: Honeybee feeder.

Preparing Sugar Candy:

First, heat one cup of sugar with one cup of water until the sugar dissolves. After the first cup dissolves, add a second cup of sugar to the solution, and after that dissolves, continue adding sugar gradually, cup by cup, until the solution becomes well saturated and thick. Then remove the mixture from the heat. Pour the prepared solution onto paper or a plate and wait for it to cool. After it cools, transfer it to the beehive and place it on top of the frames.

However, during feeding with sugar candy, make sure the bees have access to enough water. This type of food should be used in cold weather when the colony faces a food shortage, as we do not want to open the hive multiple times due to the cold.

Bee Colony Relocation

There are various reasons for relocating beehives, such as for pollination of trees and plants, increasing honey production, or protecting bees from unfavorable weather conditions. The relocation of beehives can take place either over a short distance within a garden or courtyard, or over



Figure 16: Transporting beehives to a new location by vehicle.

Long-distance Relocation of Bee Colonies:

When relocating beehives over long distances, it is better to consider the following points before the move:

- Evaluate the new location in terms of the availability of flower sources and permanent water.
- Beekeepers should wear protective clothing when transferring bees.
- Ensure that none of the bees are outside the hive or near the entrance before closing the hive entrance with a mesh in the evening.
- When transporting the hives, all holes in the hive, except the ventilated entrance covered with mesh, must be sealed to prevent bees from escaping during the move.
- Make sure that all beehives have 10 frames. If the hive does not contain enough frames, fill the gap with empty frames or secure the surrounding frames with nails to prevent them from shifting or shaking during transport.
- It is recommended that the vehicle engine be started before loading the hives so that the bees become familiar with the sound.
- When arranging the hives, the hive entrances should face the direction of the vehicle's movement.
- If there are abundant flower sources and permanent water at the new location, the beehives should be relocated at least 3 kilometers away from the old site.
- However, if the area lacks sufficient floral resources, the hives should be moved at least 5 kilometers away.
- This is because if the distance is less than this, many worker bees may return to the old site.
- Thus, we can say the relocation distance has a direct relationship with the availability of flowers and water in the area.
- The relocation should be done after sunset or before sunrise when all the bees are inside the hive.
- Use of a smoker pump before moving each colony will calm the bees and help prevent flying and stinging.

- The relocation process should be planned in such a way that the hives reach the new site before sunrise.
- It is better to move them after sunset since bees are less active at that time.
- After arriving at the new location, do not open the hive entrances for 20 to 30 minutes to allow the bees to settle.
- When placing the hives at the new location, always place them on stands or stones. to protect it from ground moisture, as moisture is one of the major enemies of honeybees.

Short-Distance Relocation of Bee Colonies:

If you have decided to move your beehive from one side of the garden or courtyard to the other, proceed as follows:

First method: Move the beehives a maximum of one meter per day toward the new location. In this way, the bees gradually become familiar with the new surroundings and can find the entrance of their hive. By repeating this daily, you can eventually relocate the colony to the desired location.

Second method: To implement this method, observe the following points:

- Before sunrise or after sunset, when all bees are inside the hive, close the entrance in a way that allows fresh air to enter - for example, using a mesh that lets air in but prevents bees from getting out.
- After sealing the entrance, move the hives to a dark, cool room.
- After spending three full days in the dark and cool environment, relocate the hives to their new site and open the entrances.
- After spending three days in darkness, the bees recalibrate their internal GPS and start working from the new location. Although this method is not very economical because the bees lose three days of nectar and pollen collection, we often have no other choice.
- After completing this period, we can move the hive wherever we want, as the bees will have forgotten their previous location and become familiar with the new one.

Third method: We can move the hives to a location 3 kilometers away, keep them there for 3 weeks, and then move them to the new desired location.

Formation of a New Group or the Emergence of a New Colony

During the flowering season, especially in spring, when bee colonies begin to grow and space inside the hive becomes insufficient, the worker bees, in the presence of the mother queen, begin to raise a new queen. This leads the bee family or colony to split into two groups, each with its own queen. The separated group of bees along with one queen is referred to as a “new group” or “new colony.” Generally, there are two methods of colony reproduction: natural and artificial. We aim to discuss each of them separately, as explained below.



Figure 17: The number of bees in the colony has increased and they are ready to reproduce.

Natural Colony Division (Swarming)

In spring, strong colonies usually form new groups. During this season, the queen bee typically begins laying eggs on the combs of the frames and continues doing so until all the cells or combs are filled with old larvae, young larvae, and eggs. At this time, the population of the honeybee colony increases day by day, and no empty space remains in the hive. Meanwhile, worker bees begin constructing a queen cell, and when the new queen is born, the mother queen leaves the colony with about 50% of the colony members. Or, if the mother queen leaves, the new queen emerges within approximately 12 days. It is very important for beekeepers to understand the process of new queen production and colony division.



Artificial Colony Division (Splitting)

To form a new colony artificially, we can follow two simple techniques, which are described below:

First method: In spring, select a strong hive containing 10 frames of honeybees. This hive is called the “mother hive,” and the hive into which the frames are transferred is called the “daughter hive.” Place an empty hive close to the mother hive and remove all its frames. Attach wax sheets to all the removed frames and use the smoker as needed.

- First, take a frame containing young bees and open brood from the mother hive and place it in the daughter hive.
- Second, take a frame containing young bees and capped brood from the mother hive and add it to the daughter hive.
- Third, place another frame filled with young worker bees in the daughter hive.
- Fourth, select a frame from the mother hive that contains worker bees along with pollen and nectar and add it to the daughter hive.
- Finally, choose a frame full of bees, shake the bees into the daughter hive, and return the empty frame to the mother hive.

Note: During the entire operation, always make sure that the queen remains in the mother hive and is not transferred to the daughter hive. Fill the empty spaces in the mother hive with frames containing built-out wax and provide sugar syrup. Within three days, the daughter hive will produce a new queen. You should add empty frames to the daughter hive based on the number of bees present.

Second method – Required equipment:

1. Three relatively strong mother hives
2. Two empty hives
3. Several frames with built-out wax
4. A smoker with smoke-producing materials
5. Rosewater (rosewater solution)

- We select three mother hives and bring two empty hives near them. From each mother hive, we take one frame containing young bees and open brood and place it inside the two empty hives. Before doing this, spray rosewater on all three mother hives so that they smell the same and the bees do not fight each other.
- Second, from two of the stronger mother hives, take one frame each with capped brood and place it into each daughter hive.
- Third, take one frame from each hive that contains honey and pollen and add them to the new daughter hives. In this way, two new hives are created from three mother hives.

Within 10 to 20 days, new queens will be produced in these two hives without significantly weakening the mother hives. The frames that were removed should be replaced with frames containing built wax. During this process, it should be ensured that the queen is not transferred from the mother hives to the daughter hives.

Merging Honeybee Colonies

Afghanistan's winter brings cold weather. With the arrival of this season, it is better to have strong beehives and to ensure they survive until spring. Strong bees are more resistant to the cold compared to weak bees. Therefore, weak hives should be merged either with other weak hives or with strong hives. Weak honeybee colonies have fewer bees, meaning they only occupy about three frames full of bees. Hives that are queenless in autumn are also considered weak and need to be merged. However, strong hives contain about six frames full of bees.

Merging bee colonies does not mean simply shaking bees from one hive into another. This act can harm the bees. Merging bee colonies requires care and caution, and the process should be carried out with great skill. Bees should be fed with sugar syrup to help the process go smoothly. The best time to merge bee hives is late summer and early autumn. When merging two honeybee colonies, the following points should be considered:

- Identify the weak colony, use a smoker, and open the hive. Select the high-quality frames containing eggs, larvae, pupae, and honey from the weak hive.
- Use a smoker and open the strong hive.
- Compare the queens of both hives and remove or eliminate the older queen.
- Spray rosewater on both hives.



Figure 18: Merging two colonies in a box.

Image from CARD-F

Merging Two Colonies in a Stacked (Super) Format: Remove the top cover of the queenright hive and the bottom board of the queenless hive. Place a newspaper sheet on top of the queenright hive. Poke holes in the newspaper using a nail so the scent can mix. Then place the queenless hive on top of the queenright hive and close the lid, as shown in the image.

Merging Two Colonies into One Hive: First, remove all the empty frames from the strong hive. Arrange the remaining frames on one side of the hive in such a way that the middle frame is aligned with the entrance of the hive. Place newspaper on top of it and poke holes in the paper using a nail. In the second step, place the quality frames along with bees from the queenless hive are taken and placed into the strong hive, as shown in the image. These activities are carried out in the autumn season because a weak colony cannot successfully survive the winter—it is likely that all of them would perish due to extreme cold.

Adding a Super to the Beehive

The upper box (super) is a box in which honey is stored in the frames inside. It is important for beekeepers to understand when to add a super on top of the hive to collect the maximum amount of honey. Spring is a very suitable season for this task because, in this season, a colony produces up to 6–5 brood frames.

Before placing the super, make sure that it is free from diseases, pests, and organic materials. Remove the lid of the brood chamber and place the super directly on top of it, and follow the instructions below:

1. Do not install the queen excluder board for a few days so that the queen can move up to lay eggs in the super and the worker bees can begin working on the frames there. Once the bees start building comb, install the queen excluder and make sure the queen remains inside the brood chamber.
2. If the brood chamber frames are not completely full, assess the condition during inspection. If necessary, add more frames; otherwise, 5 to 6 frames are sufficient.
3. Sprinkle a little sugar syrup on the super's frames to encourage the bees to go up and begin working.
4. Feed the colony with diluted sugar syrup. If there is not enough food, the bees will not produce wax. We do not want the upper combs to be filled with sugar, but a small amount of sugar will give them enough energy to continue their work.
5. When the upper frames are filled with honey, they should be removed immediately. Remove the super and close the lid of the brood chamber.
6. After extracting the honey from the removed frames, if needed, place them back into the hive and place the super again on top of the brood chamber; otherwise, store them in a suitable place for future use.



Winter Preparation

Afghanistan has a long and harsh winter, so it is necessary to have sufficient preparation to ensure the survival of the bees so that they can pass this season successfully. Below are some recommended suggestions for winter preparation:

1. Check the honey reserves of the hive. If your hives are very light in weight, provide artificial food. Feeding the bees must be done before the weather gets cold; otherwise, the bees will not have enough time to store food. If feeding happens too late, the fermentation process of syrup by the worker bees will not occur properly, and the syrup will spoil. Therefore, bee feeding should be done in early autumn.



Figure 19: Inspecting the inside of the hive for winter food storage.

2. Before winter arrives, clean the inside of the beehives. If the number of bees is not large, remove the upper box and arrange the frames in the remaining box.



Figure 20: Removing the upper box and arranging frames inside the box.



Figure 31: Cleaning beehive boxes.

3. Fill the empty spaces in the beehive with cotton cloths that absorb moisture and are not harmful to the bees.
4. Reduce the size of the hive's entrance and avoid moving the hive from a warm area to a cold one.
5. The wintering location for honeybees is very important. The hive entrance should be opposite the wind direction. Bees can cope with cold air, but they cannot withstand or resist the northern wind. During winter, beehives should be protected from wind, rain, and moisture.



Figure 22: Bee colonies in a suitable place for wintering.



Figure 23: Place prepared for the winter – image source: CARD-F

6. Moisture is considered a serious problem for bee colonies. To prevent dampness and cold air, filling the empty spaces inside the hive with cloths and providing ventilation should be taken into account. Air should enter from the bottom of the hive and exit from the top.
7. If you need to feed your bees during the winter months, carry out this activity on normal sunny days when the temperature is around 10 to 12°C. Open the hive cover slightly and quickly feed the bees. The faster this activity is done, the better it will be to avoid excessive cooling inside the hive.



Figure 24: Opening the hive during winter for feeding.



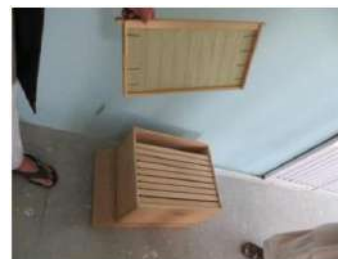
Figure 25: Pouring sugar syrup inside the frame for feeding.

Beekeeping Equipment and Their Uses

Beekeeping equipment is considered one of the important parts of beekeeping. All tools and instruments should be economical, locally available, and have high usability. Below is brief information about some important beekeeping tools.

Beehive

In general, beekeepers in Afghanistan use 10-frame hives with removable frames. These hives consist of two parts: one part is for brood rearing, known as the *brood chamber*, and the second part is for honey production, known as the *upper small super*. The height of these hives is shorter compared to their width. In these hives, the spacing between frames is considered, and when placing them on the ground, a 5 cm elevation on a stand should be ensured.



Queen Excluder Board

Beekeepers usually use a fixed queen excluder board between the brood box and the super (second layer) to prevent the queen from passing and laying eggs in the super. The benefit is that worker bees are given the opportunity to produce clean and pure honey in the combs of the second layer. The holes in this board are designed to be large enough for worker bees to pass through but small enough to prevent the queen from passing. The surface and openings of this board are designed in such a way that they do not harm the worker bees during passage and allow them to pass easily.



Smoker

The smoker is one of the tools that can be used to repel bees. In this case, the bees go into the hives and fill themselves with honey, which causes them to become less defensive. If you want to inspect one or more hives and deal with bees, it is recommended to use a smoker. Cow dung, horse dung, and also some plants can be used as smoke-producing materials.



Honey Extractor

Beekeepers often use steel honey extractors, which are available in different sizes. In Afghanistan, 4-frame honey extractors are used, but this depends on the number of colonies in the beekeeping farm. This type of honey extractor can extract honey from 2 frames or more at the same time.



Protective Clothing

While working with honey bees, it is necessary to use protective clothing. In general, when working with honey bees, it is essential to wear a hat, boots, and long gloves because honey bees react differently in different situations. These clothes protect you from bee stings. When working with bees, proceed very carefully and slowly to avoid problems among the bees. Always wear light-colored clothing because bees will stay away from you. It is a natural habit of honey bees to attack black clothing. Always wash your gloves thoroughly because diseases can easily be transmitted from one colony to another through gloves.



Seasonal Beekeeping Operations

It is not important what type of hive or beekeeping equipment we use, but rather the condition of the beehive during the month. If the bees have successfully passed the winter, their honey production will be higher, and they will not be affected by any diseases or food shortages. This means that beekeepers must always take care of their hives during different conditions and seasons.

Spring Season:

- a) In early spring (15 days before flowering), during warm days, feed the bees with sugar syrup so that the queen becomes ready for egg-laying and the worker bees are stimulated to collect pollen and nectar and raise the brood. Additionally, the worker bees are busy collecting water and regulating the temperature of the hive.
- b) Remove damaged frames from the hive and replace them with new frames along with wax. Previously used frames should be disinfected with fire, and the hive along with the frames should be kept dry and clean.



Figure 26: Disinfecting frames with fire and cleaning the hive



Figure 27: Removing damaged wax frames.

- c) In late spring, the bee population inside the hive increases, and the number of young bees also rises. As the population of honey bees grows, the number of worker bees increases as well. The worker bees are busy collecting nectar and pollen, which are in higher demand. Therefore, additional wax frames or upper supers become necessary, as explained in previous lessons.

Note: In early spring, if not necessary, we should never open the hive. As much as possible, the hives should be kept warm in early spring. If the hive is opened in cold weather, the cold can kill the brood. Inspecting hives for the presence of the queen and food is a very important matter. Sometimes, the queen bee dies during winter or early spring, and since brood has not yet been produced, the worker bees cannot rear a new queen. In such a situation, the bee colony becomes orphaned without a queen. These types of colonies are usually weak and inactive, and they cannot collect pollen and nectar. If the hive is opened and no queen bee is found and the bee population is low, the colony should be merged with another, or two frames with eggs, larvae, and pupae should be taken from a strong colony and added to the orphaned hive. In this case, the worker bees will raise a new queen from the young brood.

Summer Season:

In late spring and early summer, it is necessary to add a new super to strong colonies because bees need more space to perform their duties inside the hive. Otherwise, external activity will decrease, and within a few days, a new queen will be raised and prepare herself for a new swarm. It is best to inspect the hives, and during inspection, when the five central frames are filled with ripe honey, all the ripe honey frames should be extracted. The bee colony should also be moved to a suitable place with plenty of flowers and water resources. Since the weather becomes hot in summer, the colonies should be moved under shade so they can visit more flowers, resulting in higher honey production.



Figure 28: The central frames filled with honey become ready for extraction within a week.

Autumn Season

Autumn management plays an important role in beekeeping. In fact, autumn management is about preparing for the cold season. We must inspect the hives to ensure there is enough food stored, the presence of the queen, and other seasonal activities similar to winter tasks previously described.

Beekeeping Problems and Diseases

Protecting honey bees from attacks by wild bees: Strong colonies can protect themselves from wild bees and other insects. However, weak colonies can easily be attacked by wild bees. These wild bees, which are in search of food and honey, are yellow in color and can destroy your colony. They can consume everything inside the hive, such as eggs, larvae, and stored honey, and they will remain in the hive until it is emptied. Therefore, it is necessary to take appropriate measures, some of which are mentioned below:

1. Reduce the hive entrance according to bee activity: Reducing the entrance size of the beehive with the help of guard bees makes it easier to prevent the entry of wild bees. In late autumn, there is no need for large hive entrances. It is better to adjust the entrance so that only a single honey bee can pass through, and ensure there are no other openings in the hive that would allow wild bees to enter.
2. Try to find the nests of wild bees in the area. Most wild bees build their nests near water sources — among rocks, in the ground, in walls, etc. We can locate their nests during the day and destroy them at night since all the wild bees will be present in their nests during the nighttime.
3. Using plastic traps is an effective method for preventing wild bees. These traps can be hung on walls or trees but should not be too close to the honey bee hives. This method attracts wild bees, not honey bees. To apply this method, use raw meat in the spring and sugar syrup or honey in the autumn. Meat or sugar syrup attracts wild bees toward the trap, and they easily enter it through the hole, but they cannot find their way out and eventually die. The process of making a plastic trap is very simple, as shown in the images.



Figure 29: Step 1 and 2 of building plastic traps for wild bees.



Figure 30: Step three of building plastic wild traps for bees.

Figure 31: Simple plastic trap and bees caught in it.

Varroa mites: Varroa mites are external parasites of honey bees, which attack honey bees around the world — particularly *Apis cerana* and *Apis mellifera*. The disease caused by these mites is called Varroosis. These mites feed on the hemolymph (blood-like body fluid) of adult bees, pupae, and larvae. They are extremely dangerous for bees and, if not treated promptly, can destroy a bee colony within 1 to 2 years. These mites

weaken the colony by feeding on the bees' blood, resulting in economic loss for the beekeeper. The life cycle of these mites is similar to that of honey bees.



Figure 32: Varroa mite feeding on the blood of adult bees and open pupae.

Disease Transmission

As mentioned earlier, bee colonies infected by the Varroa mite become weakened. These weakened colonies are then robbed by stronger and healthier bees. In this way, the mite disease is transmitted to healthy bee colonies as well.

Treatment of the Disease

Before treating the bees, the number of mites in the colony must be determined. It is best to first identify the mite count. Therefore, beekeepers must regularly monitor their hives for signs of disease during the spring season. If only a small number of bees are infected, treatment may not be necessary. However, if many bees are infected, treatment must be carried out immediately. Additionally, if mites are observed in the hives during autumn, treatment is essential. The treatment should be consistent to ensure the mite population is reduced or completely eliminated.

For diagnosing the presence and determining the number of mites and performing treatment, a simple test is introduced, which requires the following equipment:

1. Powdered sugar
2. A plastic container with a 1.5-liter capacity or large enough for 600 bees
3. A relatively large shaker bottle made from the mentioned plastic container
4. A small sieve or strainer
5. A piece of white paper or cloth
6. A small bucket
7. A small bottle with a capacity of 70 grams

Testing Procedure

1. First, select a frame of bees and shake all the bees onto a board, as shown in the first image.
2. Collect all the bees from the board and place them into the plastic container, as shown in the second image.
3. Transfer the bees from the plastic container to the shaker bottle, as shown in the third image.
4. Close the shaker bottle tightly, as shown in the fourth image.

5. Add 70 grams of powdered sugar into the top section of the bottle, as shown in the 5th image.
6. After adding the powdered sugar, shake the bottle for about 20 to 30 seconds as shown in Image 6. Then, sieve the contents — during sieving, you will notice that the sugar passes through the strainer into the bucket, while the mites remain trapped with a small amount of sugar. The trapped mites are placed onto the white cloth, their number is counted, and the bees are released back into the hive, as illustrated in Images 7, 8, and 9.



Image 1



Image 2



Image 3



Image 4



Image 5



Image 6



Image 7



Image 8



Image 9

Treatment of the Disease According to the Table Below

Currently, Varroa mites are not considered a serious threat to honeybees and treatment is not deemed necessary. If bees are under threat, it is advisable to proceed with treatment. If honeybees are in serious danger, immediate treatment is required.

Testing Time	Number of Mites	Treatment Suggestion
Hamal	< 10 mites	Low threat, no treatment needed

Saur	> 20 mites	Bees are under threat — consider treatment
Jawza	> 30 mites	Bees in serious danger — urgent treatment
Any month	10–50 mites	Proceed with treatment
Any month	> 50 mites	Immediate treatment required

Treatment of the Disease

Currently, beekeepers use formic acid, Apivar, and Apistan to treat Varroa mites. These medications are imported from Iran. Beekeepers are advised to use these medications based on the dosage recommended by the manufacturer, or to follow the guidance leaflet provided with the product.

American Foulbrood Disease: American Foulbrood is one of the most widespread, destructive, and dangerous diseases of honeybees. Initially, infected colonies appear weak and show no obvious symptoms — a few dead larvae and pupae may appear in the hive. However, over time, the colony becomes gradually weaker and can completely collapse within two years.



Symptoms of the Disease: This disease only affects developing brood. The first sign is that the infected sealed cells appear moist and dark in color. These cells are slightly sunken compared to healthy ones, and sometimes small perforations are visible. In contrast, healthy sealed cells are slightly raised.

In infected colonies, the egg-laying pattern is irregular. If a sulfur-tipped stick is inserted into a cell and then withdrawn, it draws out a glue-like, thread-like substance with a foul odor. Over time, the infected larva dries out, turns black, shrinks, and sticks to the cell walls.



Figure 35: Sealed cells infected with the disease.



Figure 34: Sulfur Stick Test.

Transmission of the Disease: The causative agent of this disease enters the body of young larvae in the form of spores carried along with food by worker bees. These spores grow and multiply in their digestive system. They cannot grow inside developed larvae because the environment is not favorable, but once the larva transforms into a pupa, the environment again becomes suitable, allowing the spores to multiply rapidly and kill the pupa. When worker bees clean the cell and remove the dead pupa, the spores of the disease spread inside the hive.

Prevention: This disease is difficult to eradicate completely, but the best way to prevent it - and any other disease - is to keep the bee colony strong. It is important for beekeepers to consider the following points:

- Maintain hygiene in beekeeping practices.
- Apply preventive treatment using antimicrobial medications.
- Afghan beekeepers are advised to form small local groups to produce their own wax foundation sheets. These imported wax sheets are a source of microbial contamination in beekeeping equipment.
- In general, it is essential that beekeeping tools and equipment be produced domestically.

Treatment: This disease cannot be fully treated. The best method to eliminate it is to burn the infected colonies. This helps in permanent prevention and treatment of the disease. Medications used in treatment start with *Tylosin*. If the microbes are resistant to this drug, the second step is to treat using the antibiotic *Tylosin*.

European Foulbrood Disease: European foulbrood is a contagious disease of open, developing larvae, which closely resembles American foulbrood. However, this disease is less dangerous and less contagious than American foulbrood, and it is also easier to treat. The smell of decaying larvae affected by this disease is different from that of American foulbrood.

Symptoms of the Disease

- Weakening of the colony.
- When opening a diseased colony, a sour odor, like that of spoiled milk, can be sensed.
- The larvae die before the cells are sealed, and dead larvae may be visible in the cells.
- When sulfur is inserted into the cell, unlike American foulbrood, there is no sticky or thread-like substance.
- The dead larvae inside the cells turn black and can be easily removed.



Figure 35: Symptoms of European Foulbrood disease.



Figure 36: Symptoms of European Foulbrood disease.

Transmission of the Disease: This disease is transmitted among brood by nurse bees and to the external environment by worker bees.

Prevention of the Disease: This disease is difficult to prevent completely. For prevention, fire (flame) is used to disinfect some beekeeping equipment, and antibiotics are used as preventive treatments.

Treatment of the Disease: This disease can be treated and its spread controlled using *Oxytetracycline*. However, the honey harvested after treatment contains antibiotic residues from the time of treatment, which can be harmful to humans. A better method is to first collect and burn the frames infected with the disease. The remaining frames, if possible, should be washed with hot water and soap, and then antibiotic treatment can begin.

Wax Moth: The cause of this issue is the wax moth *Galleria mellonella*. It is believed that the larvae of this moth and a few of its other species feed on beeswax. Especially during winter, they typically feed on the wax of stored frames. Also, during this season and in times of flower scarcity, they feed on empty frames from weak colonies that have no bee activity. Because at that time bees continue their activity only in the central frames, the following recommendations are advised to prevent this problem.



Figure 37: Wax Moth Larvae and their damages.

1. Keeping the colony strong throughout all seasons – A strong colony can resist the wax moth and drive them to the outer areas of the frames, where they cause less damage.
2. Unused frames should not be stored too closely together inside the hive box.
3. Empty frames should be stored in a cold place, as larvae reproduction is significantly reduced in cold weather. However, in warm weather, their activity increases.
4. Frequent use of super boxes – Try to reuse super boxes from the first year in the second year. This will help prevent the wax moth problem.
5. Old frames should be removed and replaced quickly. Do not store frames in plastic bags.



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