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Visual manual on good beekeeping practices for small-scale beekeepers in Africa



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Visual manual on good beekeeping practices for small-scale beekeepers in Africa

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Preparation of this document

This publication is a visual, practical manual on sustainable beekeeping for small-scale beekeepers in rural areas in Africa. It has been designed to be used as a beekeeping training tool and to serve as a reference document on basic good beekeeping practices for small-scale beekeepers. Its objective is to provide people involved in honey harvesting with the necessary knowledge to sustainably keep bees and produce and harvest honey. This manual does not intend to be exhaustive and is intentionally concise to provide small-scale beekeepers in Africa with the most essential and relevant information on beekeeping. As such, it does not provide in-depth information on post-harvest activities, which should ideally be carried out in a specialized facility (honey house).

This manual was developed by the Animal Production and Genetics Branch (NSAG) of the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Istituto Zooprofilattico Sperimentale del Lazio e della Toscana [Experimental Zooprophyllactic Institute of Lazio and Tuscany - IZSLT] and the International Federation of Beekeepers' Associations (Apimondia).

This manual is part of the Technologies and Practices for Small Agricultural Producers (TECA) series of the Research and Extension Unit (OINR) of FAO. Additional details about the TECA Platform are available from <https://teca.apps.fao.org/teca/en>.



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Preface

Throughout Africa, honey is appreciated for its sweetness, cultural value and nutritional and medicinal properties. Unfortunately, honey is often collected in an unsustainable manner, with the bees and their nests destroyed, or in a way that is difficult to gather quality honey. This visual manual aims to share knowledge on good beekeeping practices for small-scale beekeepers in Africa, collating all the necessary information to harvest honey and keep bees sustainably.

The first section of the manual presents illustrations of common unsustainable honey harvesting practices and their negative impact on bees and the environment. The second section provides an overview of beekeeping equipment and how beekeepers can make and use the equipment to harvest honey in a sustainable manner, without harming bees. It also briefly explains the characteristics of quality honey and how to properly extract it. The section is illustrated with images of different types of beekeeping equipment used in various parts of Africa, along with figures which are intended to inspire and help beekeepers make their own equipment suited to their local conditions. Links are provided to the Technologies and Practices for Small Agricultural Producers (TECA) Platform of the Food and Agriculture Organization of the United Nations (FAO), which provide detailed step-by-step instructions on how to make the beekeeping equipment. The third section details the main good beekeeping practices that will help beekeepers keep happy bees and produce quality honey.

This manual aims to offer a practical, visual training tool for small-scale beekeepers in Africa, supporting their knowledge in one concise reference document.





1

Why good beekeeping practices are needed?

Wild honeybee colonies are not always located in the most accessible locations, they are sometimes difficult to find and to harvest the honeycombs is not easy. Harvesting honey from wild honeybee colonies may jeopardize their survival and allows collecting only a small amount of honey, frequently too humid and mixed with brood or wax.

What follows is the visual story of a group of men in a village in Africa going out for honey hunting. It illustrates the damaging effect that certain commonly adopted harvesting practices may have on the honeybee colony. The story ends by suggesting the application of good bee-keeping practices as a sustainable solution for the beekeeper, the rural population, the bees and the environment.

The story is developed to be used in African rural areas for small-scale beekeepers' trainings with the purpose to raise awareness on the effect of unsustainable practices and trigger interest in how bees can be kept and managed sustainably. To facilitate the use of the story during trainings and maximize visibility, it is presented in landscape format.





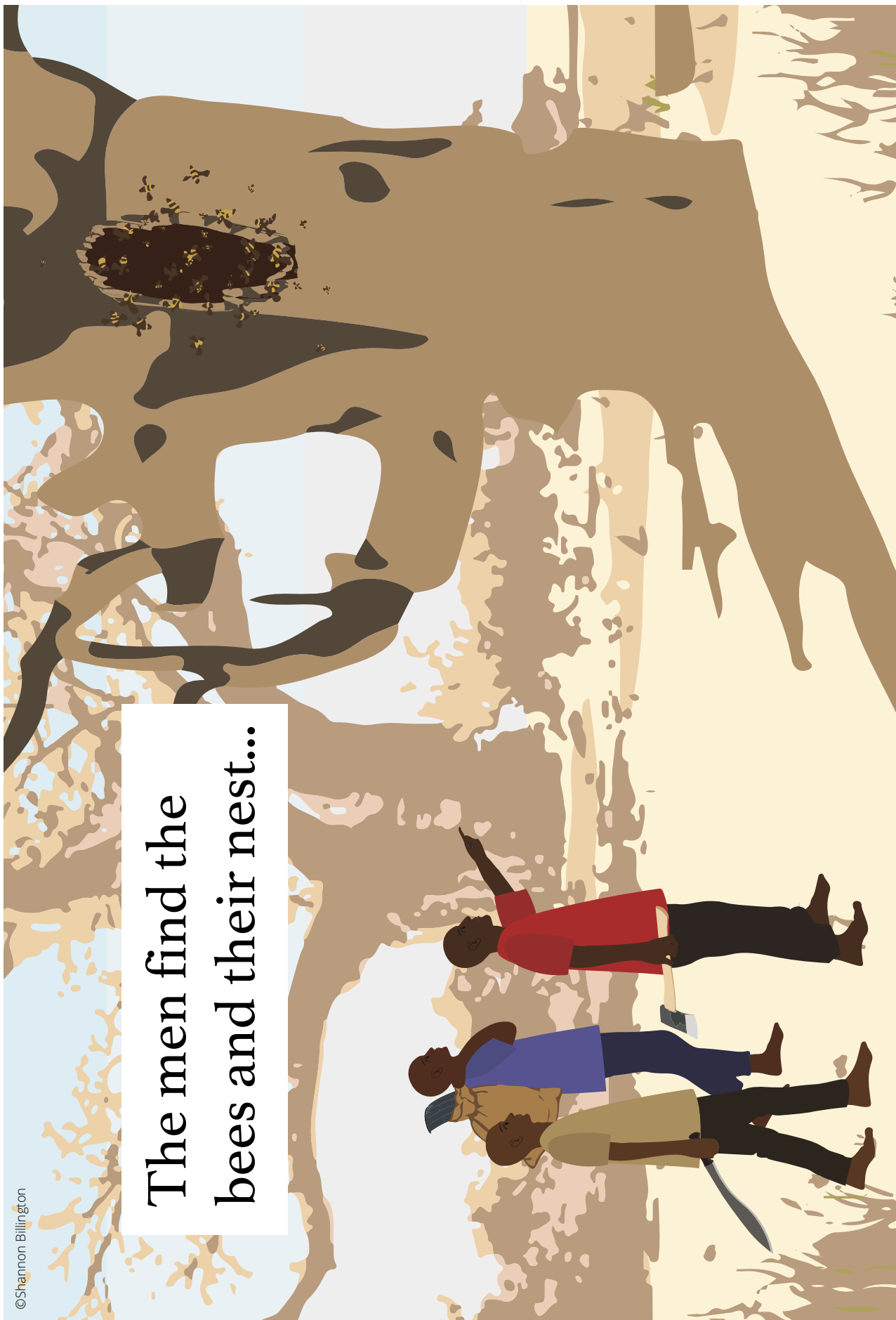
A small village in Africa...

©Shannon Billington

Men of the village go out honey hunting



©Shannon Billington



The men find the bees and their nest...

©Shannon Billington

...and they cut down the tree



©Shannon Billington



The men produce smoke
to drive the bees away...

©Shannon Billington

...to access the
honey combs

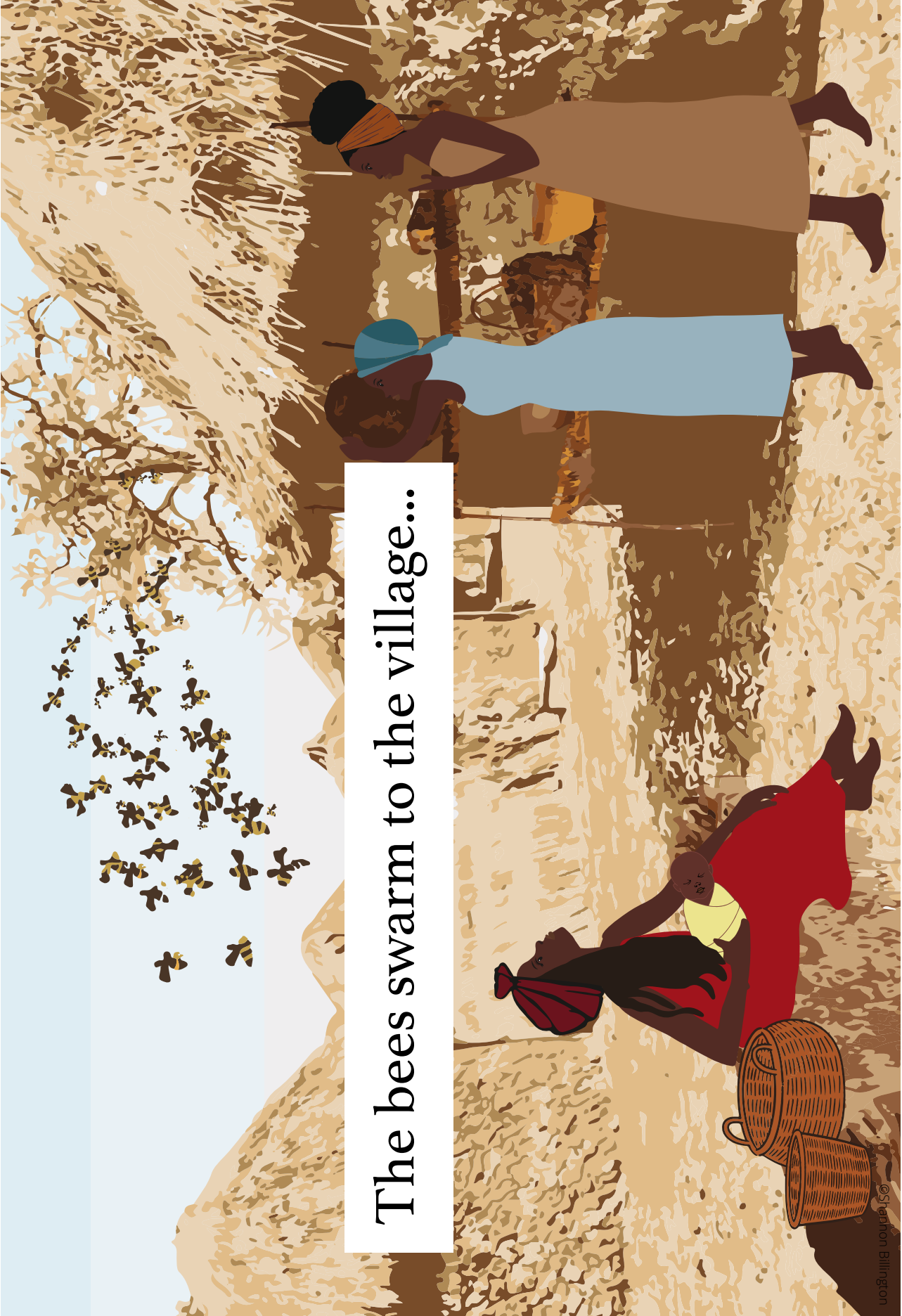


©Shannon Billington

This makes the
bees angry and upset

©Shannon Billington





The bees swarm to the village...

©Shannon Billington



...and the women are surprised
the bees are approaching them

©Shannon Billington



The women calm down when they see the bees clustering on the roof



©Shannon Billington

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The women discuss what to do
when a bee approaches them





The women listen as a
bee explains what the men
of the village are doing

©Shannon Billington



The women
understand
the tragedy
lived by the bees

The women and bees go to find the honey hunters



©Shannon Billington



They find the men and
the community leader...

...and the women explain
what the bee told them



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The men understand their mistakes and why the bees are angry at them

The community leader has a solution...



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2

Beekeeping equipment

2.1 INTRODUCTION

Beekeeping equipment is a set of tools that enable beekeepers to work more comfortably with bees, without fear of being stung or attacked, regardless of the type of hive used. Bees only usually attack and sting when they feel threatened or are defending their colony, though sometimes they attack when they see dark colours, which they associate with predatory animals. Bees can also interpret loud noises (for example, from a group of children playing), vibrations (for example, from the engine of a machine) and certain smells as threats, which may trigger them to attack the source. For this reason, beekeepers should avoid using any products with a strong smell (such as perfume or aftershave) before going to the apiary and when in the vicinity of hives or when working with bees, wear light-coloured clothes, and not make loud noises or quick movements around hives or wild swarms.

*Gentle movements – No noise –
No perfume – Light-coloured clothes
when working with bees*

This section introduces the main beekeeping equipment needed and explains how to use each piece. It also explains how to make equipment or have it made by a local craftsperson.

2.2 ESSENTIAL BEEKEEPING EQUIPMENT

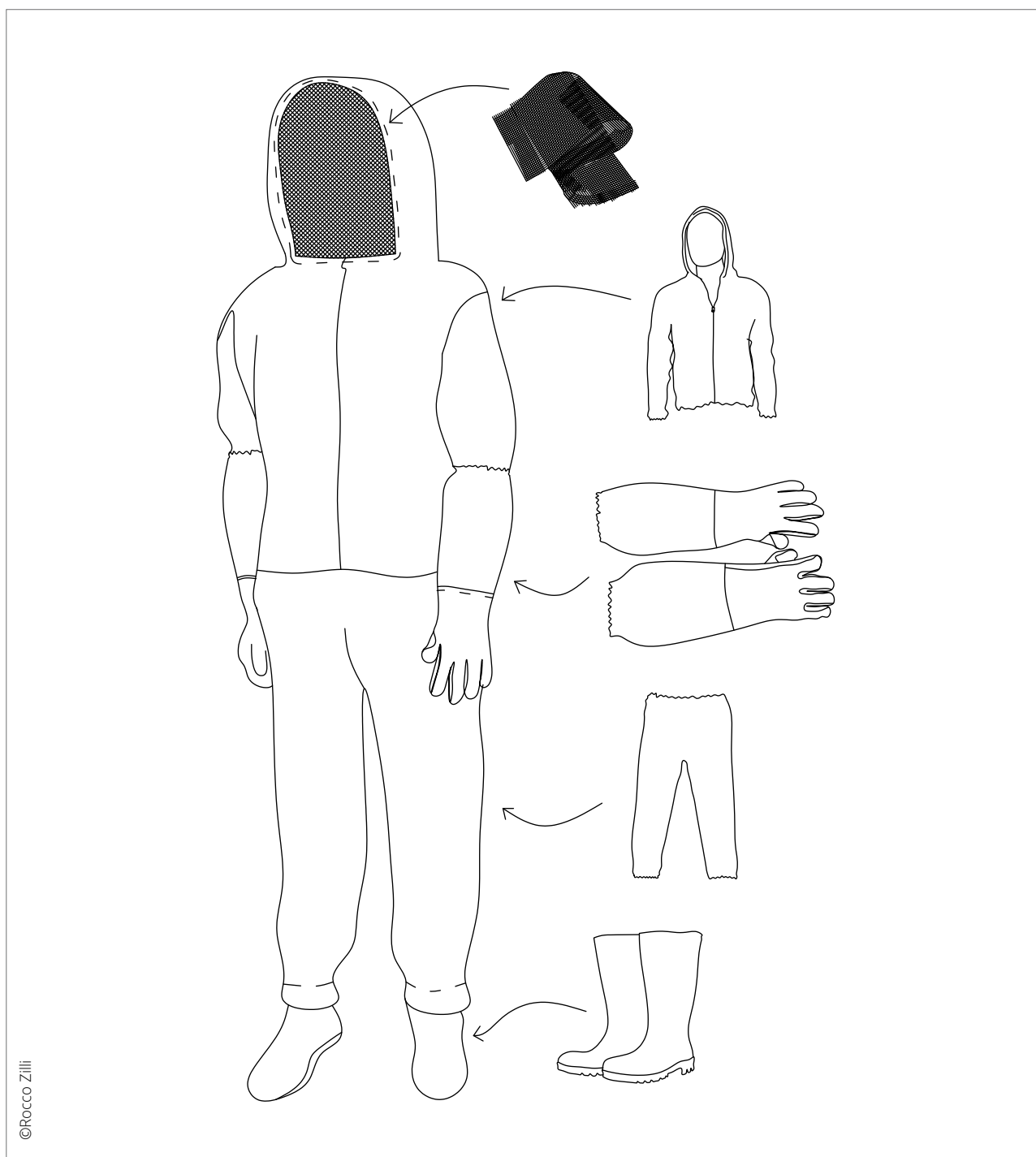
2.2.1 PROTECTIVE GEAR

Protective gear are items of clothing that protect the beekeeper's body from bee stings, allowing the beekeeper to work peacefully without fear of being stung. These items include a bee suit, gloves and rubber boots or other high-top boots (Figure 1).

2.2.1.1 The bee suit

The bee suit can either be a jacket fitted with a protective veil that fully protects the head and upper part of the body or an overall that covers the entire body. The fabric used to make the suit should be a strong cotton cloth, ideally thick enough to prevent the bees' stingers from reaching the beekeeper's skin, while remaining comfortable to wear even in very hot weather conditions. Loosely fitted trousers will protect the lower part of the body. Elastic

Figure 1: Beekeeper's full protective gear: bee suit, gloves, boots



©Rocco Zilli

bands around the wrists, waist and/or ankles are important to avoid bees crawling into the suit. A mosquito net or fine mesh can be used to protect the face.

The bee suit's fabric should be a colour that does not excite or attract the bees, such as white, yellow or beige, which are the preferred colours. Red and dark colours should be avoided. The suit should be made using quality materials to guarantee its long-term use. Simple veils or protective jackets can be made at home (Images 1 and

2), but considering how frequently these items are used, it is worth investing in a well-made, high-quality bee suit (Image 3). A skilled local tailor can help with this.

The bee suit must be worn with appropriate clothing underneath to stop the beekeeper from being stung. However, when working during the daytime and in hot weather, the beekeeper might prefer to wear underwear and a T-shirt under the suit.

Image 1: Home-made bee suits (the suits on the right are made from flower bags)



Image 2: Beekeepers in Cameroon wearing the *voile casquette*, a protective veil attached to a baseball cap



Image 3: A beekeeper in the Democratic Republic of the Congo wearing full protective gear



The following links to the Technologies and Practices for Small Agricultural Producers (TECA) Platform provide step-by-step detailed descriptions of how to make different bee suits.

- Bee suit that can be made at home with locally available material:
 - i. Veil: <https://teca.apps.fao.org/teca/en/technologies/7242>
 - ii. Suit: <https://teca.apps.fao.org/teca/en/technologies/7243>
- Bee suit made by a tailor:
 - i. Top part of the suit (blouse and veil): <https://teca.apps.fao.org/teca/en/technologies/10121>
 - ii. Full suit: <https://teca.apps.fao.org/teca/en/technologies/10122> and <https://teca.apps.fao.org/teca/en/technologies/10123>

Image 4: Leather beekeeping gloves



2.2.1.2 Gloves

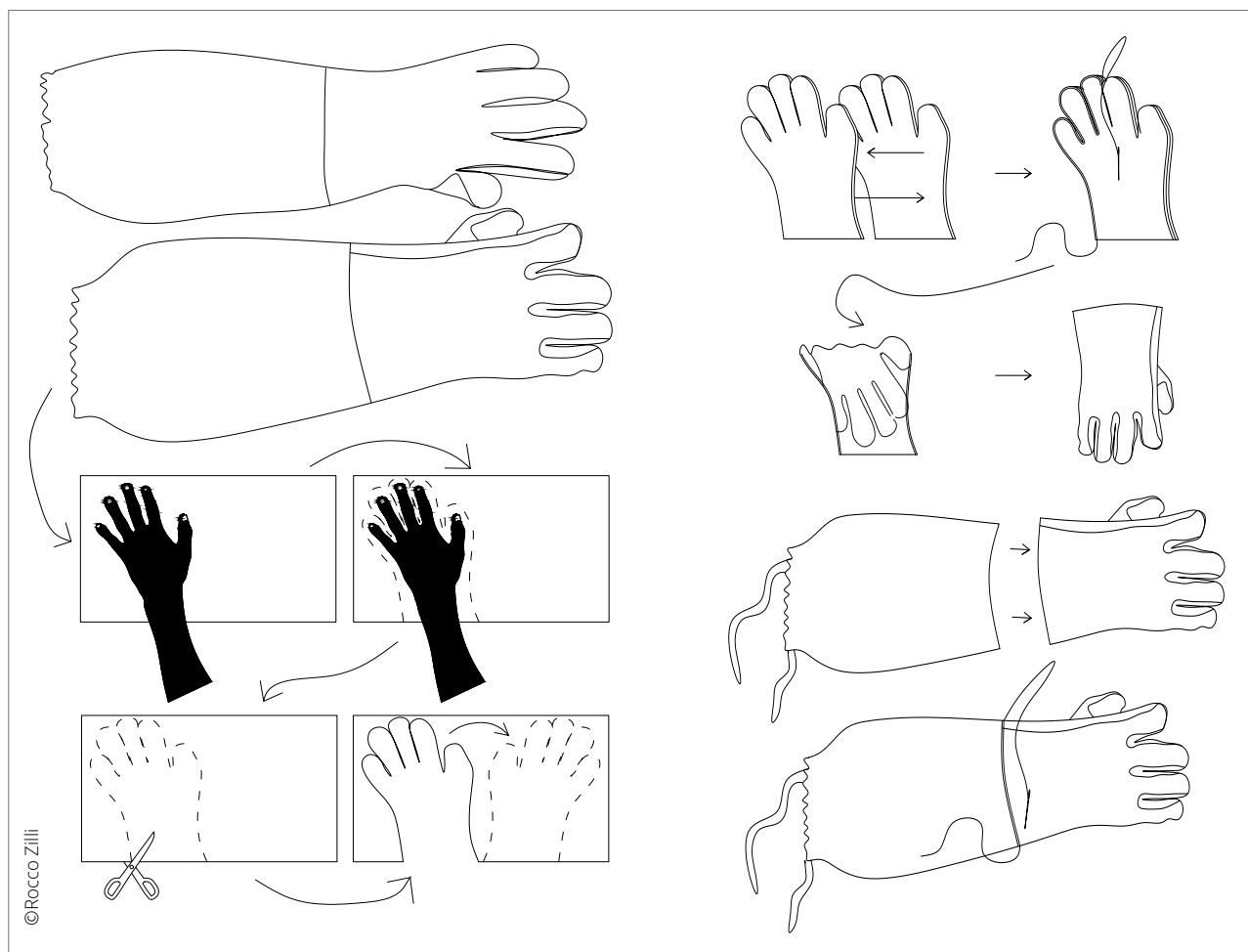
Gloves are an essential part of a beekeeper's protective gear, as they protect the beekeeper's hands from bee stings and enable the beekeeper to work more peacefully. Ideally, beekeeping gloves should be made of flexible leather (Image 4) or thickly woven cotton so that they cannot be penetrated by a bee's stinger. The gloves should not be too big, should be light in colour and should include an elastic band at the end of each sleeve to prevent bees from crawling inside the gloves. Any type of commercially available gloves made of a thick material (leather or rubber) – such as those used to handle chemicals – are also suitable (Image 5), but they should only be used for beekeeping to avoid intoxicating the bees or contaminating hive products.

Figure 2 illustrates the steps to follow for beekeepers to make their own gloves.

Image 5: Rubber gloves can be used for beekeeping



Figure 2: How to make beekeeping gloves



More detailed information on how to make beekeeping gloves is available on the TECA Platform: <https://teca.apps.fao.org/teca/en/technologies/10117>

2.2.1.3 Boots

Rubber boots or other sturdy high-top boots will protect the beekeeper's feet from bee stings and bites from other insects or small animals living around the hives.

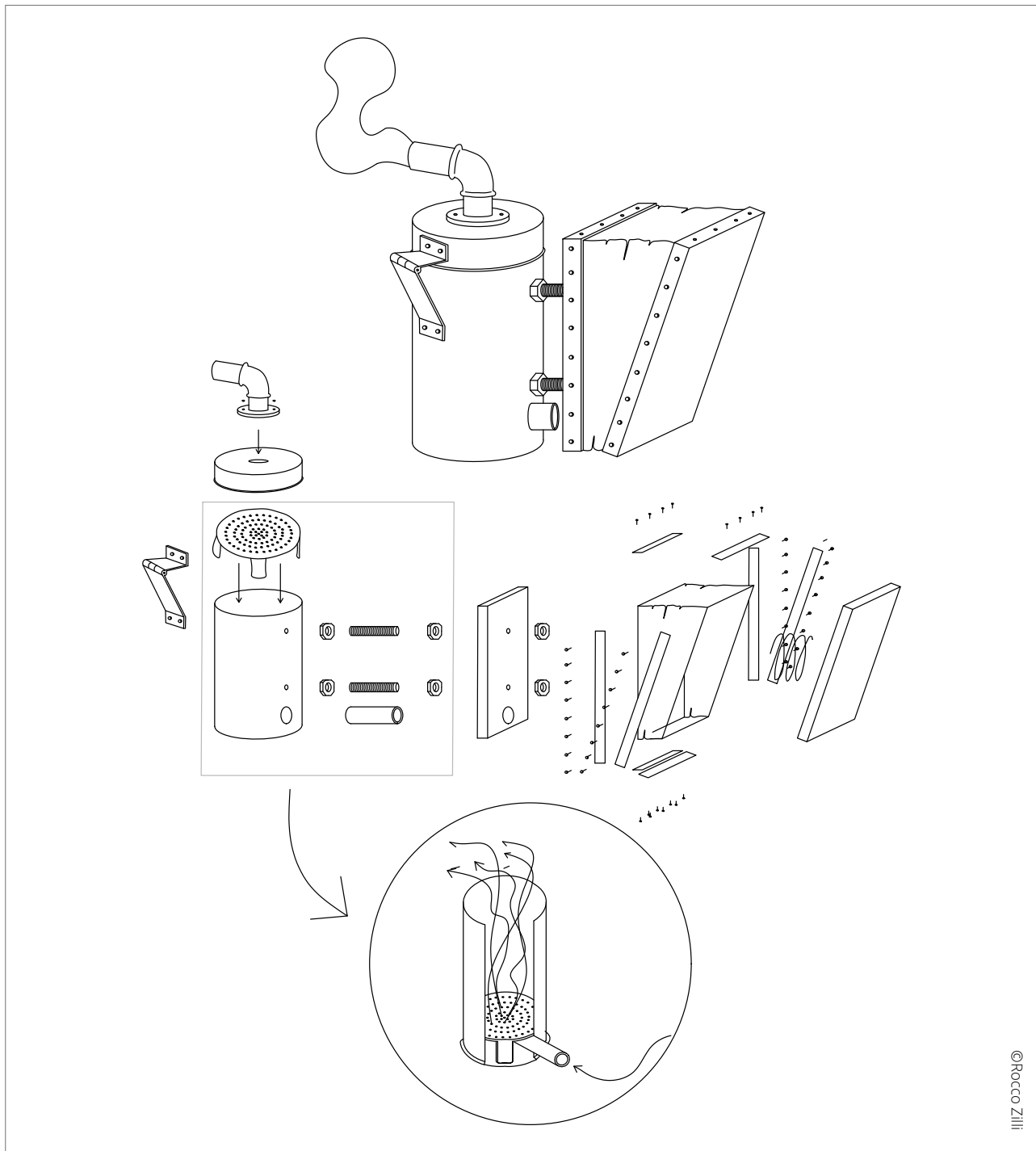
Regularly wash the protective gear, especially gloves, to keep them clear and avoid transmission of bee diseases. Use warm water with soap and rinse thoroughly. Gloves can also be disinfected with alcohol or by passing them through the flames of a fire if the material is fire-resistant.

2.2.2 SMOKER

A smoker is a fundamental beekeeping tool that is used to produce smoke from material burned inside it. Smoke is used to calm the bees, providing the beekeeper with a more peaceful work environment, as the bees will move away from the area where the smoke is blown. It will also reduce the number of bees crushed unintentionally (for example, when closing the beehive) during inspections and harvesting. The smoker can be made of any type of

heat-resistant metal and comprises a combustion chamber, an air inlet and a smoke outlet (Figure 3). It should be big enough to hold a suitable amount of combustion material (dry leaves, bark, wood chips or wood shavings, cardboard) that will produce enough smoke while the beekeeper is carrying out activities in the apiary, yet also transportable. It is a good idea to always bring enough combustion material when visiting the hives.

Figure 3: Beekeeping smoker



©Rocco Zilli

2.2.2.1 Combustion material

A natural and non-toxic material capable of producing cold smoke, such as wood shavings, dry grass, dry leaves or cow dung, should be used in the smoker (Figure 4). Materials containing any type of chemicals (such as painted wood) should not be used as they could harm the bees and contaminate hive products.

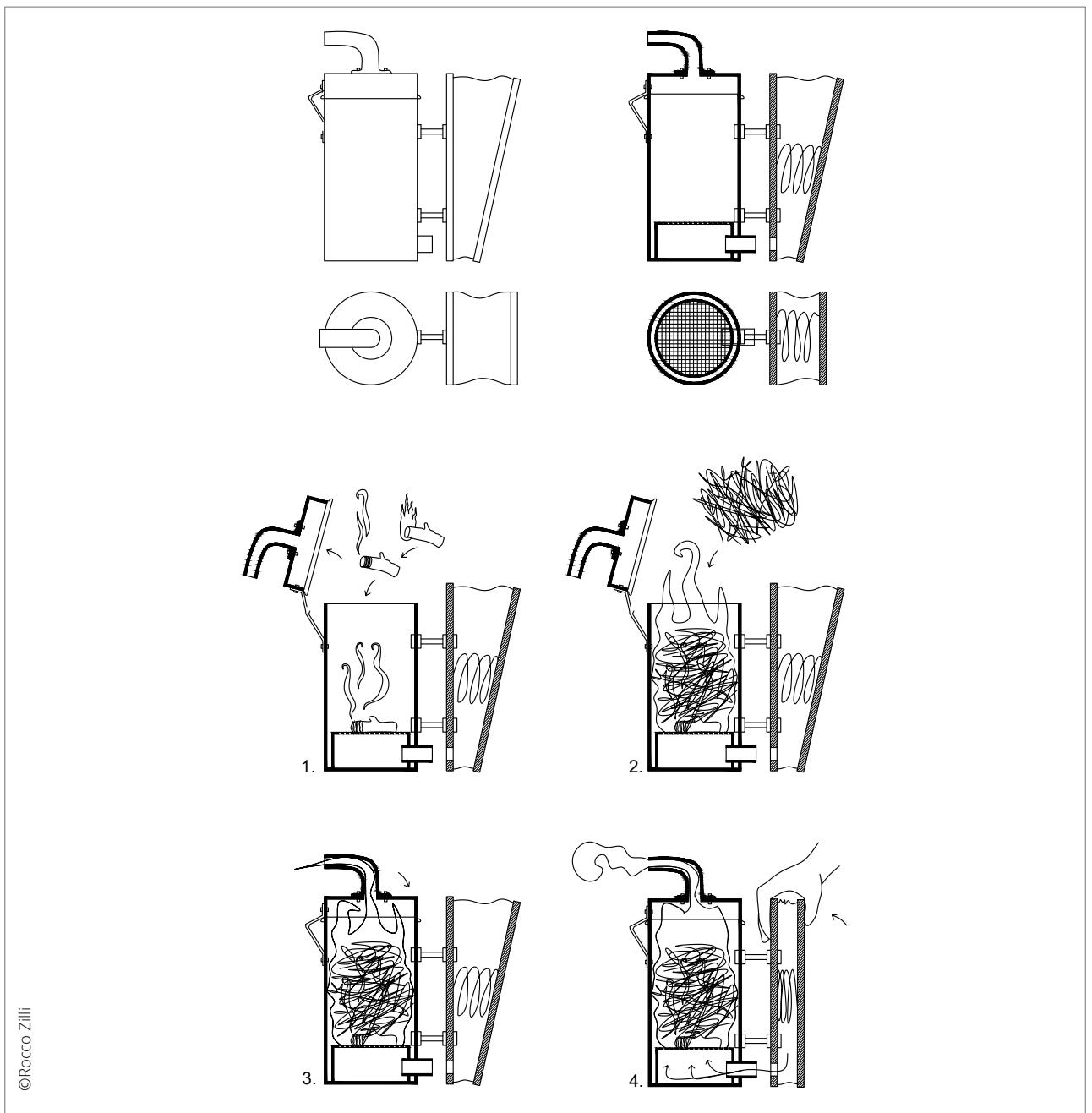
2.2.2.2 How to use the smoker

When opening the hive, and especially when harvesting honey, smoke should not be applied excessively to minimize bee disturbance and prevent “smoking” the honey,

which results in a smoky taste. Before opening the hive, some smoke can be blown in front of the hive entrance and under the hive cover to calm the bees before starting the manipulation of the colony. Smoke can also be blown onto the bees to move them away during inspection and to avoid crushing them when closing the hive. Beekeepers will quickly learn the right amount of smoke needed with some experience.

Do not abandon or leave unattended any combustion material from the smoker that is not completely extinguished to avoid starting wildfires.

Figure 4: Lighting the smoker and creating smoke



Images 6 and 7 show a commercial smoker and a locally-made smoker, respectively. Detailed step-by-step instructions on how to make a smoker are available on the TECA Platform:

- No welding required:
<https://teca.apps.fao.org/teca/en/technologies/10118>
- Welded smoker:
<https://teca.apps.fao.org/teca/en/technologies/9114>

Instructions on using a smoker are available from the following link: <https://teca.apps.fao.org/teca/en/technologies/10119>

Image 6: A commercial smoker



Image 7: A welder in Sierra Leone making a locally-made smoker (left) and the completed smoker (right)



2.2.3 HIVE TOOL

The function of the hive tool is to help open the hive (Image 8), remove combs and loosen and lift the top bars or frames. It can also be used to remove propolis or wax from the hive, top bars or frames. The tool is flat on one side and should be sturdy, ideally made from iron or

stainless steel. A machete, flat screwdriver or chisel can be used as an alternative (Image 9).

Detailed step-by-step instructions on how to make a hive tool are available from the following link: <https://teca.apps.fao.org/teca/en/technologies/10120>

Image 8: A beekeeper using the hive tool to open a catcher box



Image 9: A machete or a large flat screwdriver can be used as a hive tool



2.2.4 BEE BRUSH

The bee brush is used to brush bees off combs, mainly honeycombs that are ready for harvesting. With a gentle sweeping movement, the bees on the comb can be brushed back into the hive, freeing the comb of bees.

A commercial brush has a handle and a long single row of soft long bristles made of horsehair or any other long animal hair (Image 10). Bee brushes can also be made from locally available items, such as chicken wings, large feathers, whisk brooms or a bundle of soft long grass (Image 11). The brush should be cleaned and disinfected regularly to avoid the possible transmission of diseases among hives. Home-made brushes should be replaced on a regular basis.

Only use beekeeping equipment for beekeeping activities. Do not use equipment for any other purpose, such as for handling chemicals.

Disinfect beekeeping equipment regularly using soap and warm water or by passing the item through the flames of a fire if it is fire-resistant.

Image 10: A beekeeper using a commercial bee brush to remove bees from the comb of a movable frame hive



Image 11: Mint branches being used to remove bees from a comb



2.2.5 HIVE

A hive is a closed container that can host a honeybee colony, mimicking the cavity that a wild swarm would naturally occupy. The container should be big enough to host a strong colony during the peak season, though not so big that the bees struggle to control the hive's temperature off-season. A hive protects the honeybee colony from heat, cold, rain and predators. It usually has one entrance and may have a horizontal or vertical structure.

Hives can be grouped into two different types: native hives and movable comb hives.

2.2.5.1 Native hives

Native hives are also referred to as "traditional hives", "fixed comb hives" or "natural hives" and are the human-made hive most similar to the nests of wild honeybee colonies. The bees build combs downward naturally from the ceiling of the hive and, unlike the movable comb hives, cannot be removed by the beekeeper for inspection. Such hives are usually a horizontal model, in which the bees develop their colonies horizontally. Native hives are the easiest and cheapest hives to make and can easily be increased in number without major investment.

Many different types of native hives are used across Africa, made of natural material such as tree bark, bamboo, reeds and grasses (Image 12 and 13), tree trunks (Images 14 and 15), clay pots (Images 16) and gourds, among others. These hives usually have both sides closed with one opening for the bees to enter and leave the hive, and are either hung horizontally in a tree or placed on a hive stand.

Native hives require little or no intervention from the beekeeper. To harvest honey, the beekeeper will open one side of the hive (usually the extreme opposite to the hive entrance) or lift up its top half (if it is a traditional log hive – Image 14) and cut out the ripe honeycombs. It is often difficult to determine which combs contain ripe honey and which combs contain unripe honey (non-operculated (unsealed/open) cells) and/or brood. Combs containing brood and/or cells with honey that are not sealed should not be harvested and should be left in the hive. Combs can only be harvested when at least two thirds of its honey-containing cells are sealed (Image 26). Harvesting unripe honeycombs and extracting combs containing brood will reduce the quality of the honey, which is also at risk of

Image 12: Beekeepers making traditional hives made of locally available material



©FAO/Charlotte Heister

Image 13: Local style hive made of raffia palm and covered with grass



Image 14: Combs inside a traditional log hive made from a hollowed-out tree trunk



Image 15: Traditional local log hives being made from coconut tree logs



©FAO/Charlotte Lietzner



©FAO/Charlotte Lietzner

Image 16: Traditional clay pot hive hanging from a tree



©FAO/Charlotte Lauer

Image 17: Skep hive made from a bucket covered with raffia palm (left image: view from the outside; right image: view into the hive from below, with bottom lid removed)



©Wolfgang Ertl



©Wolfgang Ertl

2.2.5.2 Movable comb hives

Movable comb hives have combs that can be removed from the hive. This allows the beekeeper to directly manage the bees, check the development of the colony, select the combs to be harvested without destroying combs or bees, and adopt specific beekeeping techniques, among others. Depending on the model of hive used, the bees will build the combs on top bars or in frames.

Unlike beekeeping with local hives, which are made of locally available material, beekeeping with movable comb hives usually requires financial resources, as the hives are usually made using wooden planks. A certain level of

expertise is also required to build and manage the hive, depending on the type of movable comb hive to be used.

2.2.5.2.1 Top bar hive

Top bar hives are the most commonly used movable comb hive in Africa. These hives are usually a rectangular shaped box with wooden bars laid across the top, which are known as the top bars. These are covered with a lid to protect the colony inside the hive from rain, wind and sun. The bees build their combs downward from the top bars (Figure 5; Image 23).

Figure 5: A top bar hive installed on a hive stand



The top bar hive is also known as an “improved”, “transitional” or “intermediate” hive because it is considered an improvement from the traditional local hives. The combs can be removed from the hive and specifically selected for honey harvesting, without disturbing the brood nest and leaving enough honey reserves needed for the colony to survive, making the task much easier for beekeepers.

2.2.5.2.1.1 Hive models

Images 18 to 22 show different models of top bar hives in use across Africa. The shape of the hive and the materials used vary according to the local conditions and available materials. Although the length of the bar depends on the size of the hive, the width of the top bars is always the same at 32 mm, regardless the model of the top bar hive.

Image 18: Two different models of top bar hives suspended, Tanzania



Image 19: Top bar hive in Nkoko (*Raphia vinifera*), Democratic Republic of the Congo



Image 20: The *Fonge* hive: a farmer innovation in Cameroon (a hybrid top bar hive with honey super)



©Cameroonian Local Initiative Group
Lumière du Cameroun - Cameroonian Beekeeping Knowledge (GIC Lumière AMV/Christophe Fonge)

Image 21: Tanzanian top bar hives hanging from a tree, Tanzania



©FAO/Charlotte De G

Image 22: Beekeepers inspecting a Kenyan (trapezoidal shape) top bar hive, Democratic Republic of the Congo (the Kenyan top bar hive has trapezoidal walls, unlike the Tanzanian top bar hive, which has rectangular walls)



©Maya Foning/Elsa Demoulin

2.2.5.2.2 Top bars

If the top bar hive is constructed correctly using bars with the proper dimensions and starter strips, the bees will build their combs downward, parallel to each other (Figure 8; Image 23). However, if the top bars do not have the correct

dimensions or no starter strips, the bees may build their combs across different bars, making it impossible to remove a top bar without destroying combs. Figure 6 shows how beekeepers can inspect a hive and harvest honey.

Figure 6: Inspecting a top bar hive and harvesting honey



Image 23: Newly built comb on a top bar



The width of the top bars and the spacing between the centre of two top bars should be 32 mm when working with African honeybees.

Figure 7: Top bar measurements

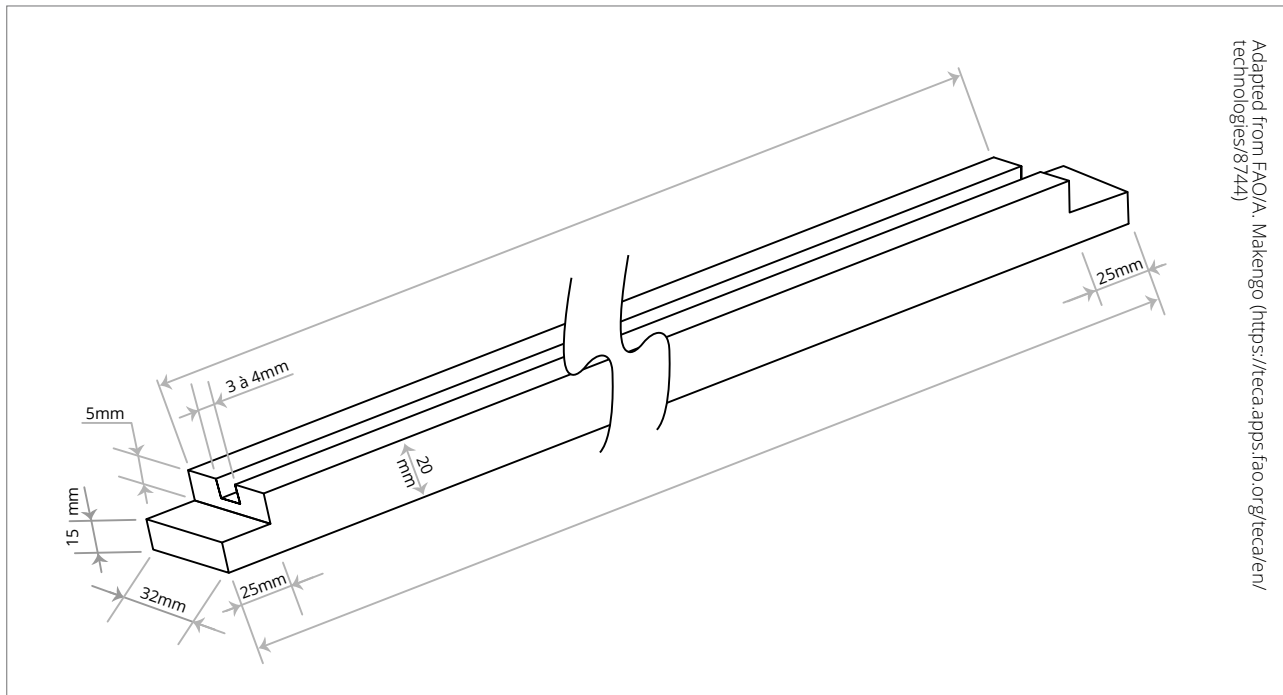
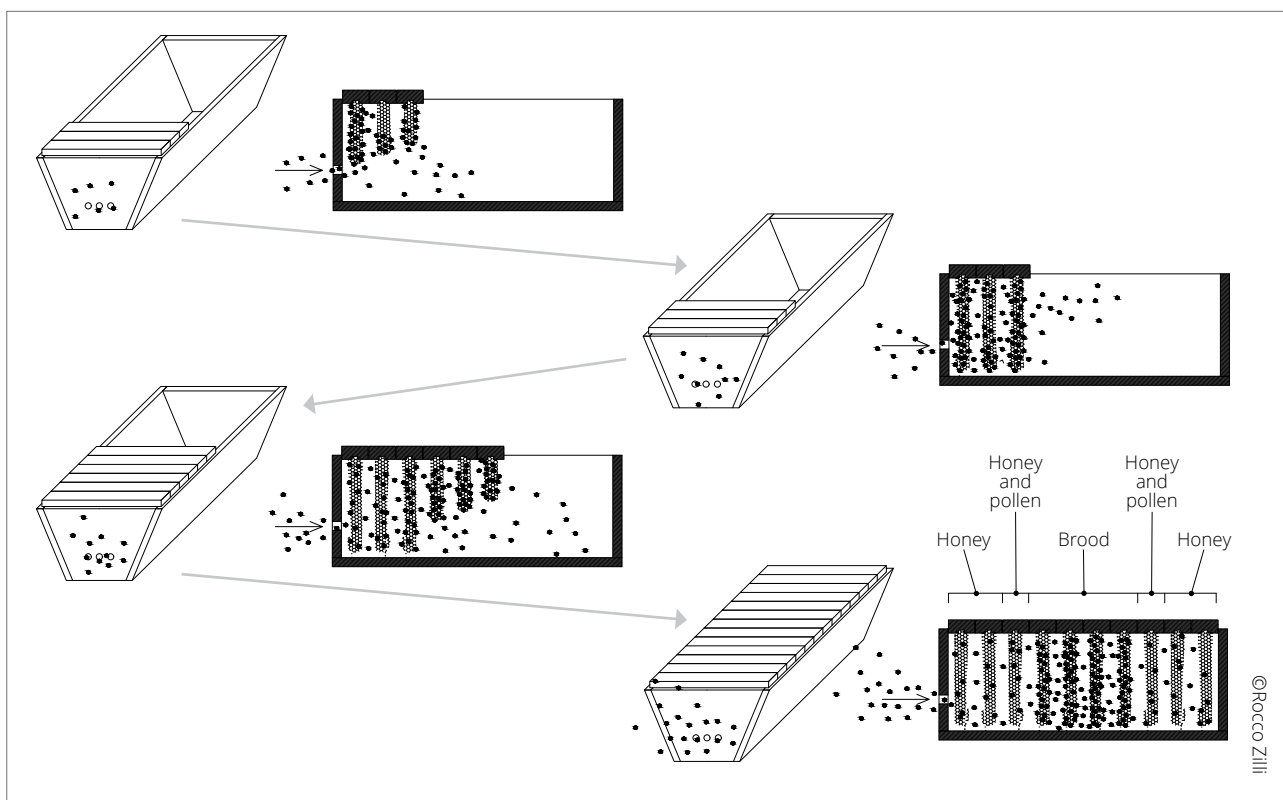


Figure 8: Colony developing its nest inside a newly occupied hive with correctly sized top bars and starter strips applied



2.2.5.2.3 Starter strips

Starter strips are made of molten beeswax and are applied to the centre of top bars (Figure 9; Image 24) to guide the bees to build combs downward, parallel to each other. An incision can be made in the centre of the top bar to make the application of the starter strip easier.

Image 24: Beekeeper applies starter strips to top bars



Figure 9: Applying a strip of beeswax on top bars encourages the bees to build combs downward, parallel to each other

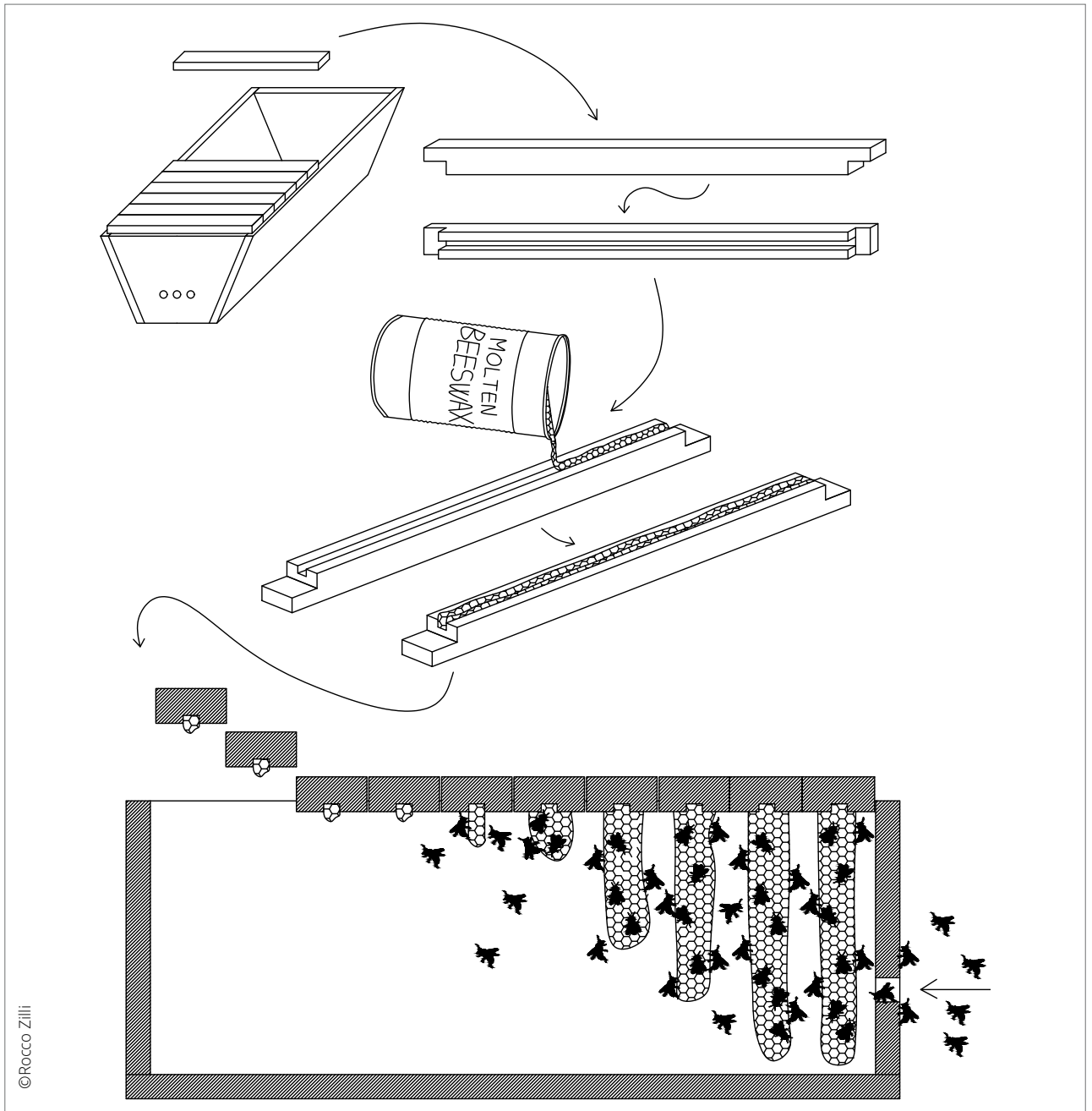


Image 25: Beekeepers inspecting a top bar hive



2.2.5.2.4 Hive inspection

To inspect the hive and check the development of the colony the beekeeper will remove one bar at the opposite extreme of the hive entrance to create space (Figure 10; Images 22 and 25). This enables the other bars to be loosened and pulled out of the hive for checking. As illustrated in Figure 8, the colony will develop on one side of the hive, closest to the hive opening. Honey reserves will be stored around the brood nest and towards the opposite side of the hive entrance.

2.2.5.2.5 Harvesting

As is the case with the local hive, only ripe honeycombs (at least two thirds of the cells containing honey are sealed) should be harvested. The ripe honeycombs are cut from the top bars, which are then returned to the hive. Combs containing brood should be returned straight to the hive (Image 26). At least one comb containing honey and located closest to the brood nest should be left in the hive as a food reserve for the bees.

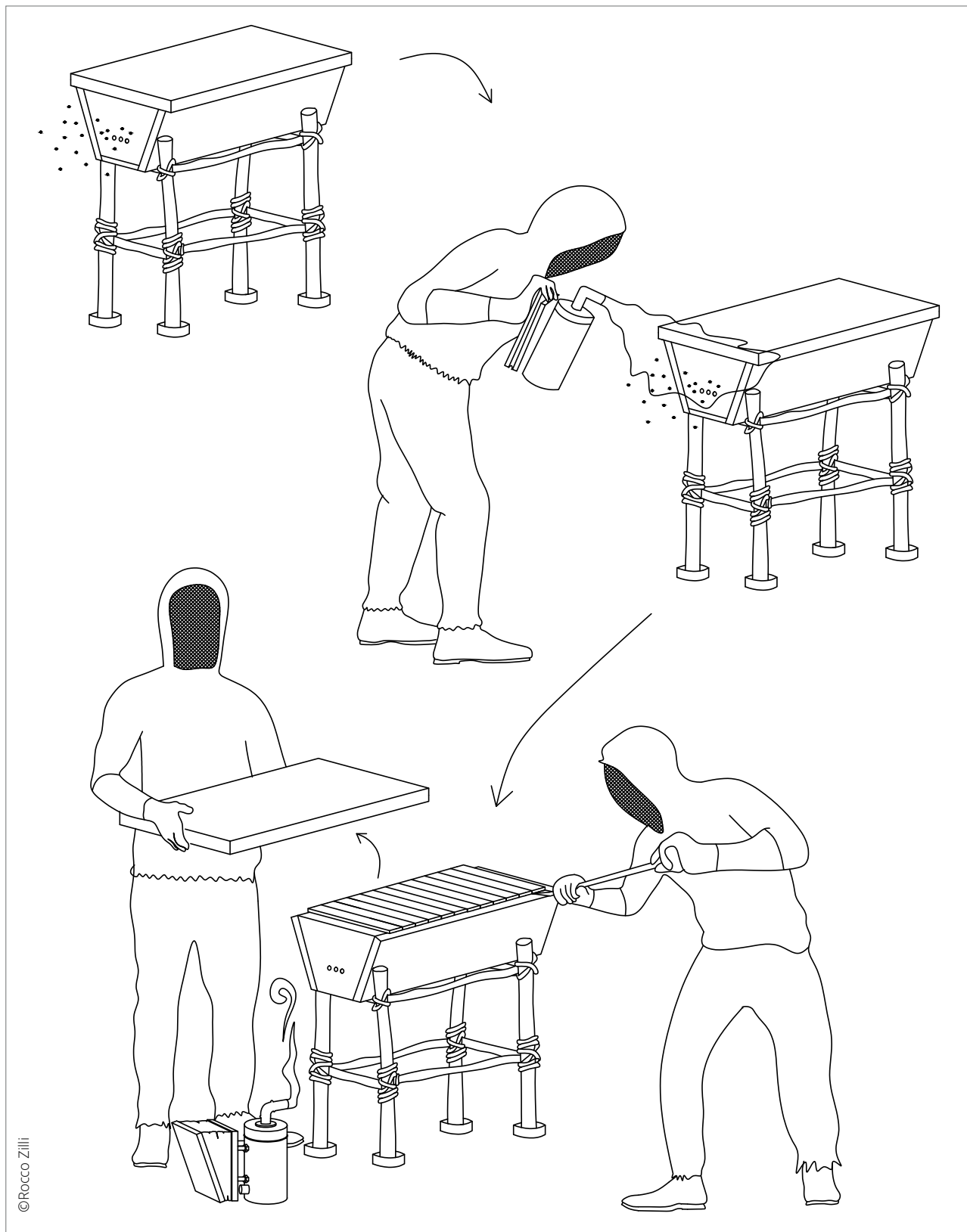
Image 26: Combs containing brood should not be harvested (left); combs that have at least two thirds of its honey-containing cells sealed can be harvested (right)



The following figures show how to open a top bar hive (Figure 10a), inspect the hive using the hive tool and smoker (Figure 10b), harvest honey (Figure 10c), proper-

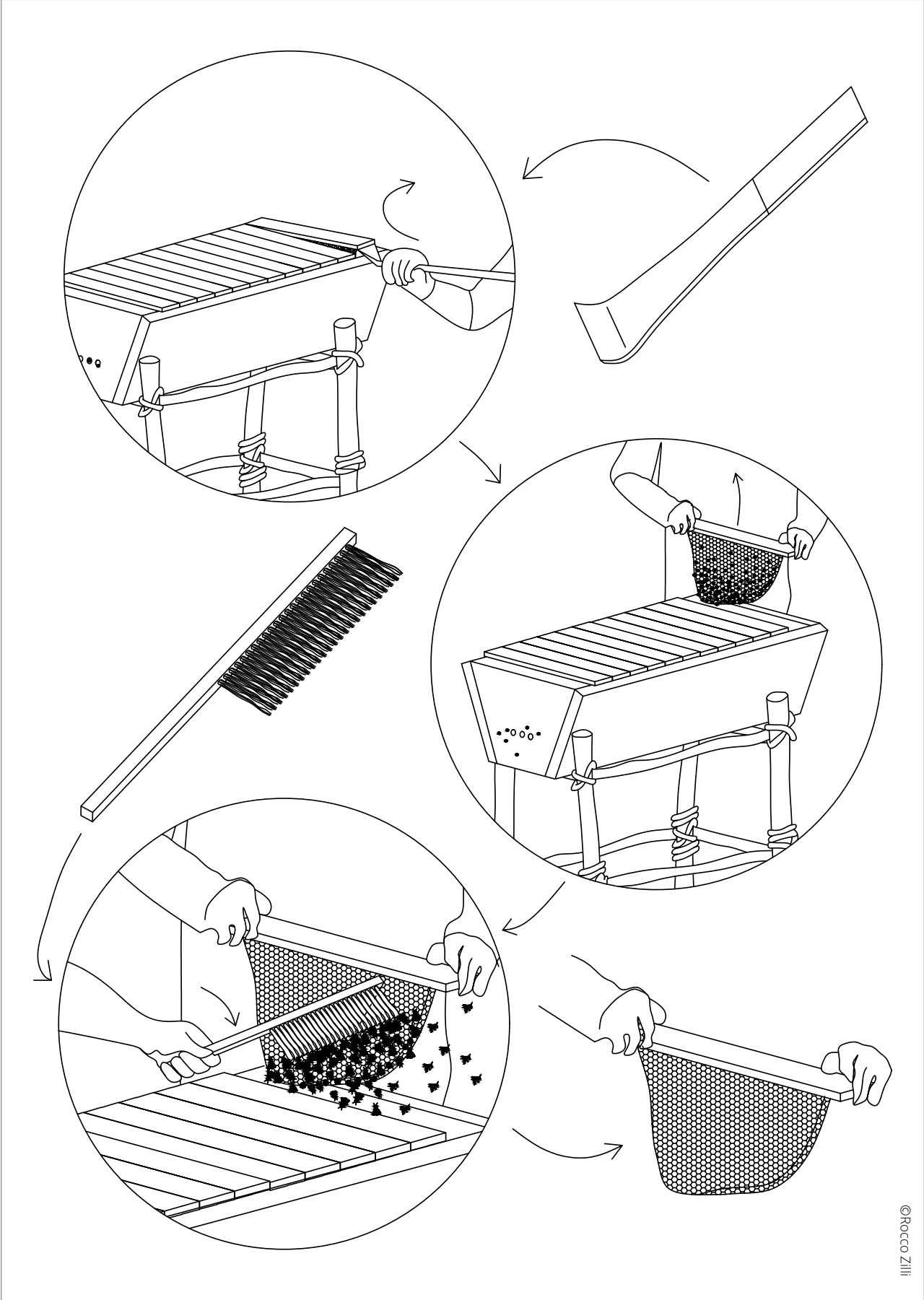
ly store honeycombs for transport to the honey house, and return the harvested bars to the top bar hive (Figure 10d).

Figure 10a: Opening



©Rocco Zilli

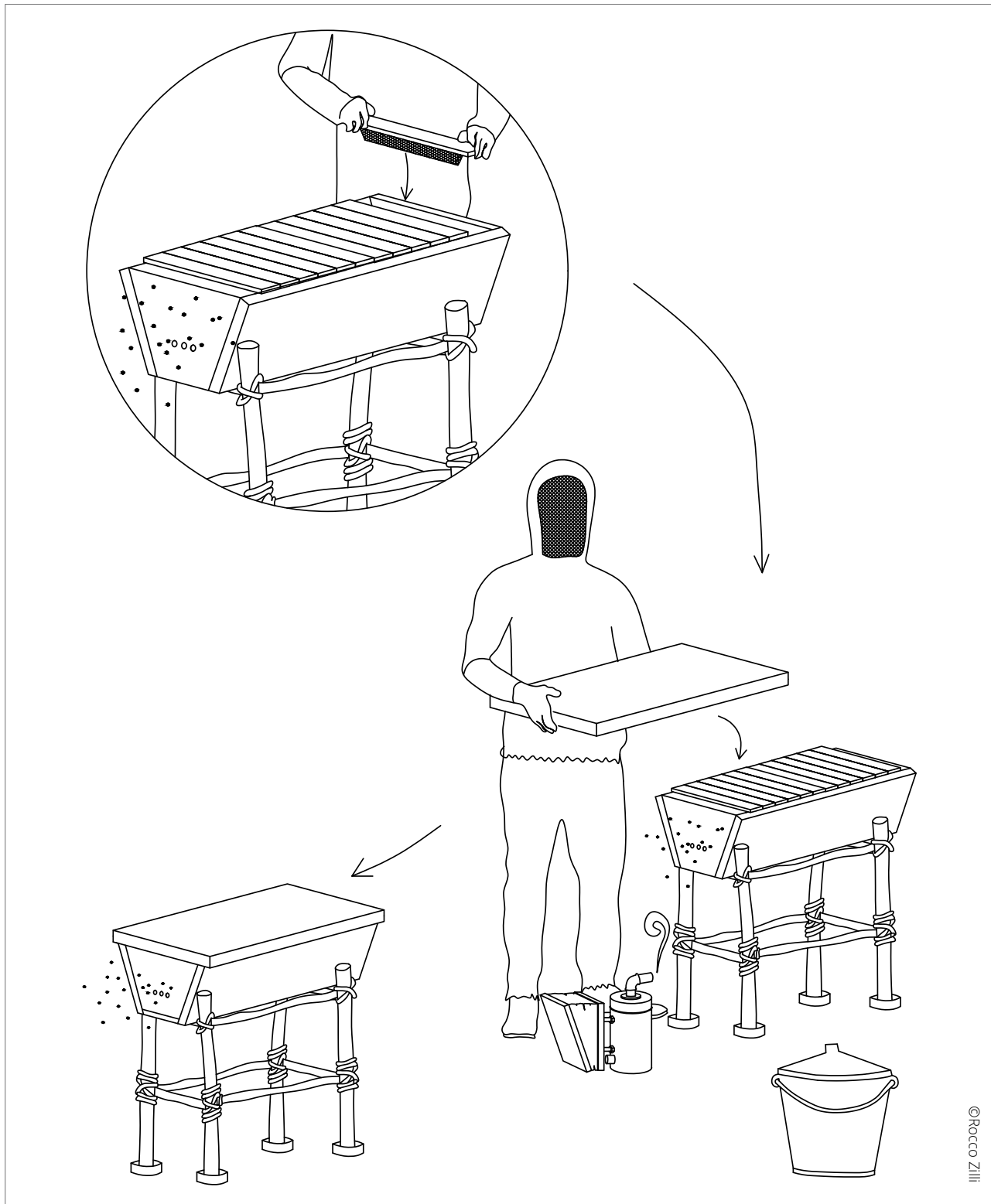
Figure 10b: Inspecting



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Figure 10c: Harvesting



Figure 10d: Returning harvested bars

The top bar hive requires more expertise and accuracy when constructing compared with the local hive. However, honey harvesting is much easier from a top bar hive when it is properly built and managed correctly, and also

has less of an impact on colonies, as it allows beekeepers to avoid removing combs with brood and leave enough honey reserves for the colony.

2.2.5.3 Dadant and Langstroth hives

Dadant and Langstroth hives are other commercial movable comb hive models used in Africa. These hives consist of brood boxes that can be stacked to expand as the colony develops. During the honey flow season, the beekeeper can add one or more honey supers to the hive (a superstructure), stacking them on top of the brood box (or boxes), where the bees will store honey (Image 27).

Both the brood box and honey supers have removable wooden frames on which the beekeeper places a foundation sheet, often with the support of iron wires to keep it in place (Image 28). The foundation sheet is made of beeswax imprinted with the shape of hexagonal cells. The bees will create combs using the cell shape on the foundation sheet, which is usually the same size as its frame.

Image 27: Two Langstroth hives (the left hive has a brood chamber on the bottom and a honey super on top; the right hive only has a brood chamber)



Image 28: Frame with a foundation sheet (left: partial comb created; right: completed brood comb)



As with the top bar hive, the beekeeper can easily remove frames from the Dadant and Langstroth hives for hive inspection, colony management and honey harvesting.

To prevent the queen from moving up and laying eggs in the honey supers, the beekeeper can insert a “queen excluder” between the brood box and honey super. The queen excluder is an iron mesh that has openings big enough for bees other than the queen bee to pass through.

To harvest the honey, the beekeeper simply removes the entire honey super placed on top of the brood box or, when not all frames are ready, removes the frames containing the ripe honey (at least two thirds of the cells containing honey should be sealed) from the honey super. To make it easier to harvest the honey, the beekeeper can insert a “bee escape” the day before harvesting (Image 29). The bee escape is a board placed between the honey super and the brood box that allows the bees to move down from the honey super into the brood box, but not up from the brood box into the honey super. This tool helps free the honey super of bees when the beekeeper wants to collect honey from the frames.

After the cells of frames containing ripe honey have been uncapped, the frames are placed into a honey extractor, which uses centrifugal force to draw out the honey. Once the honey has been extracted, beekeepers can reinsert the frames back into hives for the bees to start refilling with nectar without having to first build a new comb.

The Dadant and Langstroth movable comb hives are considered more efficient from an economical perspective, as the frames can be reused after honey extraction, meaning the bees do not need to build new combs and can produce greater quantities of honey. However, these hives require sophisticated construction skills, access to foundation sheets, a certain level of hive management skills and storage facilities for honey supers during dearth periods. In addition, this hive type produces lower quantities of beeswax than local and top bar hives. Such movable comb hives are not the best choice for small-scale beekeepers in remote areas that cannot benefit from services offered by beekeeping associations or cooperatives, such as bulk purchases of foundation sheets and a centrifugal honey extractor.

Image 29: A bee escape inserted between the honey super and the brood box



SUMMARY

	Native hive	Top bar hive	Dadant/Langstroth hive
Combs	Fixed, attached to hive ceiling	Movable, attached to top bars	Movable, attached to frames
Cost to build	Low	Medium	High
Cost to manage	None	None/low	Medium/high
Hive management skills required	Low	Medium	High
Wax production	High	High	Medium/low
Honey extraction method	Dripping/press/comb honey	Dripping/press/comb honey	Dripping/centrifugal extraction

It is possible to produce high-quality honey regardless of the hive model. The best choice of model will be one that best responds to the beekeeper’s situation and ambitions. Ultimately, the beekeeper’s success depends on his or her passion for the bees and ability to learn from them and the environment.

More detailed explanations on how to make different hive models (native and top bar hives) are available from the following links on the TECA Platform:

- Native hives:
 - i. Basket hive: <https://teca.apps.fao.org/teca/en/technologies/10125>
 - ii. Improved basket hive (brood section and honey section): <https://teca.apps.fao.org/teca/en/technologies/7289>
- Top bar hive:
 - i. Kenyan top bar hive using wood planks: <https://teca.apps.fao.org/teca/en/technologies/7274> and/ or <https://teca.apps.fao.org/teca/en/technologies/10126>
 - ii. Top bar hive in *Raphia vinifera*: <https://teca.apps.fao.org/teca/en/technologies/10127>
 - iii. *La Grande* top bar hive: <https://teca.apps.fao.org/teca/en/technologies/10128>
 - iv. *Fonge* top bar/hive (hybrid model): <https://teca.apps.fao.org/teca/en/technologies/10129>
 - v. Starter strips: <https://teca.apps.fao.org/teca/en/technologies/10124>

2.2.6 HIVE STAND

All hives should be protected from rain entering the hive, deteriorating the structure or damaging the bees. Hives should also be protected from predators, such as ants, termites, honey badgers and thieves. The area around hives should be kept clean (grass and weeds should be cleaned on a regular basis) and protected so that grazing or wild animals cannot disturb or kick them over. Some beekeepers prefer to hang hives in trees for these reasons (Image 21), but this only makes harvesting the honey more complicated as the hives will need be

lowered to the ground or the beekeeper will have to climb up the tree to carry out the task. One alternative is to place the hive on a hive stand, which can be made of various locally available materials (Images 30, 31, 32). Ideally, the stand should be around 70–80 cm high to allow for comfortable hive inspection, and can have a roof to protect the hive from the elements. The legs of the hive stand can be placed in cans filled with water and a little used motor oil (to prevent evaporation), which stops ants and termites crawling up the stand and entering the hive (Figure 5).

Image 30: Hive stand with roofing



Image 31: Hives placed on bricks



Image 32: An apiary with hives on wooden hive stands



2.2.7 BAIT HIVES

New or empty hives can be placed in nature to be occupied by wild swarms. Bait can be used to attract a wild swarm to an empty hive. There are many locally tested and proven baits, so it is useful to ask for advice from an experienced local beekeeper. Rubbing beeswax on the inside walls of the hive usually helps to attract bees to the hive. If possible, it might also help to place the hives at the height at which swarms usually fly.

2.2.8 ESSENTIAL EQUIPMENT FOR COMB HARVESTING AND STORING COMBS BEFORE PROCESSING

2.2.8.1 Bucket with lid

Honeycombs should be placed in a clean, food-safe bucket immediately after harvesting them from the hive (Image 33). The bucket should be tightly closed to avoid robbing by bees, attacks by other insects such as ants, and any type of contamination. The bucket should not have been previously used to store chemicals or toxic products (paint, petrol, pesticides) or strong-smelling products. Honeycombs sometimes break during manipulation or transportation, which releases a flow of honey. It is therefore important to store the combs in tightly closed buckets as this will prevent insects from entering the bucket and humidity from the air being absorbed by the honey (Image 34). When transporting honeycombs, buckets should not be placed in direct sunlight. Removed honeycombs should also not be placed directly into smoke from the smoker.

The buckets containing the honeycombs should be stored in a clean, dry and cool area, away from direct sunlight. The container should be airtight and can be marked with the name and contact details of the beekeeper so that upon arrival in the bulking centre, it is possible to trace where the honey was produced and by whom.

Image 33: Honey harvesting (the honeycombs are cut from the top bar and put in a suitable bucket with a lid)



Image 34: Honeycombs are stored in a clean, airtight container before extraction



2.2.9 BULKING CENTRE

The bulking centre is where honey from different beekeepers is gathered for easy processing (Image 35). Honeycombs are checked to ensure that they are properly operculated (cells are sealed) and weighed and the beekeeper is paid for the raw honey. Bulking centres make it easier for honey traders to collect more honey from a central location.

Beekeepers can be advised when to harvest their honey and bring it to the bulking centres for honey buyers to purchase. This means that beekeepers do not have to store buckets of harvested honey in their homes while waiting for a buyer and can also avoid possible contamination or even crystallization of the honey before it is processed.

Image 35: Beekeepers showcasing their freshly bottled honey in front of the bulking centre



2.2.10 HONEY PROCESSING AND LABELLING

After being collected in the bulking centre, the honey is placed in a honey processing machine for extraction, which ensures it is clean and free from debris, such as pieces of dead bees or wax. Windows should be covered with mesh nets to prevent bees from entering the extraction area. Extracted honey should be stored in clean, closed, airtight containers in a clean, dry location away from direct sunlight.

Honey can be sold in bulk or in various smaller-sized containers made of food-safe plastic or glass. The bottled

honey should bear a label indicating information such as the brand name, where the honey was produced (for example, honey from Kilimanjaro) or the botanical origin (for example, eucalyptus honey), the name and contact details of the beekeeper, the best before date (usually 18 months after extraction) and the content of the jar (grams or millilitres) (Image 36). Honey can also be sold unextracted as honeycomb and should be packaged in appropriate containers (Image 37).

Image 36: Forest honey from Cameroon packed in glass jars with product information



Image 37: Extracted honey and honeycomb packaged in appropriate containers for retail





3

Good beekeeping practices

Good beekeeping practices are activities that beekeepers apply to ensure a positive effect on colony health and society, as well as high production standards. They are generally accepted as the best way for beekeepers to proceed. This section presents a set of good beekeeping practices that will help beekeepers keep happy bees, work safely and produce quality honey. The practices cover apitary activities, along with good hygiene practices for honey extraction, processing and storage.

3.1 KEEPING BEES

Although it is bees that collect nectar from flowering plants to produce honey, several aspects of the process depend on beekeepers, whose practices could affect the overall production and quality of the honey. The following are good beekeeping practices that beekeepers can adopt in their honey production process.

BEEKEEPER

A beekeeper is a custodian of the environment in which the bees live and thrive. Unlike honey hunters, beekeepers keep bees and do not carry out any actions that will harm them. Employing good beekeeping practices helps the beekeeper to achieve this.

A beekeeper can talk to community members about the bees and their important role in pollinating crops and wild plants. Bees need flowering plants to produce honey, which the community can support by protecting forests and planting flowering plants and trees in and around the community. Excessive use of chemical products can



seriously harm bees and contaminate honey. Farming practices that limit the use of chemical products should therefore be adopted.

THE APIARY

Before setting up an apiary, evaluate the available bee fodder (pollen and nectar) and adjust the number of colonies in a given area accordingly. It is important to remember that wild swarms and other pollinators will also be collecting nectar and pollen from flowering plants. Overcrowding an area with hives might make it difficult for the bees to collect enough nectar and/or pollen to sustain the colony and produce surplus for harvesting. If there is not enough food available, the bees might abscond (leave) the hive in search of a more suitable area.

Place the hives in a quiet area, away from movements of people or animals.

Do not use herbicides or pesticides around the hives, as these products might harm the bees and contaminate the honey.

Keep noises to a minimum and move gently around the hives. Bees are sensitive to noise and vibrations and might attack if they are disturbed.

Keep the area around the hives clean and protected from grazing or wild animals. Cut any dry grass around the hives.

Protect the apiary from grazing animals that could kick over the hives.

Develop a flower calendar indicating melliferous plants available in the area where the hives are located, their flowering times and their prevalence. Observe bee behaviours and link it to the flower calendar and seasonal patterns: indicate swarming periods, harvesting times, periods of reduced activity and even absconding of colonies.

HIVES

Use natural materials that have not been treated with toxic products to make the hives.

Protect hives from insects or other small animals that might disturb the bees and cause them to abscond.

Prevent rain from entering the hive; bees prefer to establish colonies in dry environments.

Bait empty hives to attract wild swarms.

Use the correct top bar dimensions and apply wax on the top bars so that the bees do not build combs across the bars.

Keep a record of each hive: indicate when the swarm occupied the hive, the amount of honey harvested on particular dates, dates of swarming or absconding of the colony, and any other observation related to the colony or the environment. Observe and analyse patterns.

HIVE INSPECTION

When working with the bees, move gently and wear light-coloured clothes. Do not use strong smells such as perfume.

Always wear protective gear and use a smoker when opening the hives.

Do not open the hives too often and unnecessarily. Too many disturbances could cause the bees to abscond.

HONEYCOMB HARVESTING

When harvesting honeycombs from the hives, only select combs that contain ripe honey (sealed cells). Unripe honey (honey in cells that are not sealed) contains too much humidity that can ferment the extracted honey. Combs that do not have at least two thirds of its honey-containing cells sealed should not be harvested.

When harvesting combs, do not remove any with brood. Be careful not to kill the queen bee.

Leave the bees enough honey to survive.

When harvesting combs, do not use too much smoke to avoid the honey absorbing the smoke and developing a smoky taste.

Do not place combs directly onto soil.

Store combs in clean, airtight containers, away from direct sunlight. Buckets used for storing the combs should not have been used to store chemicals or paint.

USE OF THE SMOKER

Use smoke (not fire) to calm the bees.

Use the smoke cautiously, just enough to calm the bees without suffocating them. Before opening the hive, use a little smoke at the hive entrance.

Do not use toxic or harmful materials in the smoker (for example, painted wood).

Do not abandon any unextinguished combustion material to avoid wildfires.

GENERAL HYGIENE

Clean beekeeping equipment regularly with clean water and soap or, if the material is fire-resistant, by passing it through the flame of a fire.

Use beekeeping equipment for beekeeping activities only (for example, do not use beekeeping gloves to protect hands when handling chemicals, do not use buckets used to store honey for cleaning purposes).

BEES

Keep local bees that are adapted to the environment. Learn to understand the bees and the environment in which they thrive.

Always leave enough honey in the hives as food for the bees. Never remove all honey reserves.

Make sure clean water is available for the bees in the area surrounding the apiary. If providing an artificial drinking source, ensure that the bees are able to land on the water source without risk of drowning. Use rocks or wood sticks for this.

3.2 HONEY EXTRACTION, PROCESSING AND STORAGE

Honey is a delicious, valuable food that can also be used as a medicine. To ensure a good quality product, it is essential to observe good hygiene practices during honey extraction and processing. The following are good practices that should be observed when extracting and storing honey to ensure it maintains an excellent quality.

HONEY EXTRACTION

When extracting honey, work in an area with windows protected by mesh screens so that the bees cannot enter the room.

To safeguard the nutritious properties of the honey and produce a quality product for retail, apply the following practices:

- Wash hands thoroughly before starting extraction work.
- Work in a clean area and use clean tools.
- Do not use extraction equipment or containers for other purposes.
- Only extract ripe honeycombs containing honey. Do not extract combs containing brood and/or pollen.
- Store combs and extracted honey away from direct sunlight and heat sources.
- Never heat the honey.
- Do not mix the honey with water or syrup.

Extracted honey can be filtered using a clean sieve or cotton cloth to remove any debris, such as pieces of wax or dead bees.

STORAGE OF EXTRACTED HONEY

- Store the honey in a clean area.
- Store the honey in a clean, airtight and ideally food-safe container.
- Store the honey away from direct sunlight. Never place the honey in direct sunlight, not even when selling the honey.
- Store the honey in a cool area. Temperatures above 40°C damage the nutritious properties of honey.

PRODUCTION OF QUALITY HONEY

Beekeepers can produce high-quality honey regardless of the hive model used. The characteristics of honey (colour, smell, taste, viscosity) will be determined by the plants from which the bees collected the nectar. The following are some of the main characteristics of quality honey:

- Produced in a natural area where no chemicals have been used, such as forests and wild lands, and away from human activities that could contaminate the environment (for example, industrial activities).
- Obtained from the extraction of ripe honeycombs only, has not been mixed with other products (such as water or syrup) and does not contain brood or the juice from crushed brood.
- Has colours ranging from an almost transparent white to dark brown or almost black.
- Can have different grades of liquidity or a solid form.
- May crystallize (become hard) over time (some types of honey crystallize faster than others) or when temperatures drop.
- Has a floral smell (not that of a fermented product or of smoke).
- Is clean and free from debris, such as pieces of dead bees.
- Is not fermented.

Note: Do not administer honey to children younger than 1 year as the low acidity of young children's stomachs may enable the survival of *Clostridium botulinum* spores, which settle in the large intestine and start toxin production. Symptoms include initial constipation followed by muscular paralysis (<https://agris.fao.org/agris-search/search.do?recordID=IT2005602203>).

CONTACT

For any questions on good beekeeping practices or any other topic in this manual, please contact Apimondia (<https://www.apimondia.com/en/>) or your local beekeeping association.

This manual is a visual, practical document on good beekeeping practices for sustainable small-scale beekeepers in Africa. It has been designed to serve as a beekeeping training tool and is a concise, practical reference document. The manual opens with an illustrated story of the damaging effect of certain practices adopted when collecting wild honey (honey hunting) and aims to spark interest among readers on how to harvest honey more sustainably. The second section presents the reader with the main beekeeping equipment and explains how the tools can be used to keep healthy bees and harvest quality honey. It ends with an overview of good beekeeping practices that will help the beekeeper produce good honey in a sustainable manner.

Rather than recommend a specific type of hive, the manual provides necessary information that will help beekeepers determine which type is best suited to their local conditions. The many illustrations included in the manual aim to help beekeepers make their own versions of the equipment that are tailored to local needs.



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