



Honey Processing

Read about the different procedures deployed when processing honey from Langstroth hive and the Kenya Top Bar Hive

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COVER STORY

Business Opportunities in Bee-Keeping

Bee keeping is gradually becoming a preferred agroecological enterprise among many farmers in Kenya and beyond. It is an enterprise with numerous benefits; unfortunately only a few beekeepers enjoy the full range of these benefits due to lack of skill, knowledge, and capacity to process the various products of the enterprise.

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ENTREPRENEURSHIP

Business Opportunities in Bee keeping

BEE KEEPING IS gradually becoming a preferred agroecological enterprise among many farmers in Kenya and beyond. It is an enterprise with numerous benefits; unfortunately only a few beekeepers enjoy the full range of these benefits due to lack of skill, knowledge, and capacity to process the various products of the enterprise and access appropriate markets.

This edition features practical information on why one should consider beekeeping as an income generating enterprise to not only produce honey but other commercial products as well.

It is a practical guide to production and processing of other bee products in addition to honey, including propolis, pollen, and royal jelly. With relevant knowledge, farmers can successfully establish bee keeping enterprises.

Indigenous Technical Knowledge (ITK) is valuable but additional technical training enables one to understand appropriate technologies, innovations and management practices. Technical trainings can be provided both formally and informally. The following are key aspects a beekeeper must strive to acquire skills on, in order to be successful:

- (i) **Apiary management skills** - These are skills that any beekeeper should acquire to increase productivity and become more profitable. Apiary management is the set of routine activities in an apiary. It is important for a beekeeper to use Good Agricultural Practices (GAPs) in his/her apiary in order to achieve maximum yields and quality products. Apiary management involves the following:
- Identification of good apiary sites,

- Placement of hives either by hanging or placing on stands,
- Hive stocking skills (either through swarm catching, colony division, queen rearing or colony transfers),
- Keeping apiary clean and hygienic,
- Carrying out regular inspection and keeping good records.

- (ii) **Knowledge on processing of bee products** is crucial for any beekeeper to ensure that he/she benefits maximumly from the enterprise and that the products obtained are of quality. Different products are processed differently with different equipment and tools.

The best-known primary products of beekeeping are honey and wax, but pollen, Propolis, royal jelly, venom and bee colonies are also marketable primary hive products. While most of these products can be consumed or used raw as produced by bees, there are many additional uses where these products can be a part of the ingredients of another product. Because of the quality and sometimes almost mystical reputation and characteristics of most primary bee products, their addition to other products usually enhances the value or quality of these secondary products.

- (iii) **Bee-keeping equipment** - It is important for anyone who intends to venture into beekeeping to know the different types of equipment used in beekeeping and the appropriate ones depending on the objective of the beneficiary. The beekeeping equipment are for both



production and processing. In production, the main equipment used include beehives (traditional, transitional and modern), protective gears, hive tools, smokers among others. The traditional hives include; hollow logs, basket and pot.

The transitional hives include the Kenya Top Bar Hive and the modern hives include the Langstroth hive, flow hive among others. Most beekeepers purchase ready-made hives, but some construct their own. In either case, it is important to use standard dimensions and assemble methods to ensure that the equipment are interchangeable, strong and durable. Pine or cedar timber is recommended for all construction. When selecting timber for hive construction, the following must be considered.

- All wood pieces must be flat/straight,
- The timber must be durable and long-lasting for several years without replacement,
- The wood must be suitable for carpentry (it must not split too easily and should not be so hard that wood working equipment is damaged),
- The wood should be free from knots as much as possible,
- The wood must be properly seasoned, otherwise shrinkage and warping of the hive will occur.

The processing equipment include but not limited to honey extractor, honey warmer, honey creamer, settling/bottling tank, honey press, solar wax melter, steam wax melter, pollen collector, venom extractor, among others. The processing

equipment should be non-metallic since honey is acidic and will corrode metallic surfaces. The containers used for storing honey and other bee products must be fitted with airtight gadgets to prevent honey from absorbing moisture from the atmosphere since honey is hygroscopic.

(iv) Bee-keeping entrepreneurship - It is important for beekeepers to acquire skills in entrepreneurship so as to: identify opportunities, make appropriate decisions to turn their ideas into reality, overcome challenges, and properly allocate resources to tasks in order to achieve goals.

The importance of entrepreneurship skills include; encouraging social change and improving lives; creating employment opportunities for others; driving economic growth and opening new markets and industries; improving the quality of life with new ideas and building functional products or services; providing opportunities for personal and professional growth, as well as financial rewards.

(v) Marketing of bee products - Marketing a product is different from producing it. Each activity requires very specific knowledge and insight. Someone who is a good producer may not necessarily be a good seller. A producer who wants to market his/her products will have to negotiate with traders or consumers. He/she will have to know about supply, demand and pricing. Bee products are seasonal and therefore it is very important to understand how they are presented to the consumers.



APICULTURE

Bee Products

Honey

HONEY IS A natural sweet substance produced by honeybees from the nectar of flowering plants which honeybees collect, transfer and combine with specific substance of their own, store and deposit in the cells of the combs to ripen and mature.

Harvesting honey

Preparations before harvesting

Assemble the tools and equipment- protective gears, smokers, bee brush, hive tool, bucket (food grade plastic or stainless steel), honeycomb tray (to carry the frame that has honeycomb) and spotlight.

During the harvesting season, inspect your hives for signs of maturity for harvest. A gentle knock along the length of the hive producing a solid sound is an indication that combs are filled with honey; a hollow sound is an indication that combs are empty. Honey should be harvested from capped honeycombs only showing a whitish wax cover. In these combs the honey is completely sealed from outside air, has a low moisture content and stores well for a long period.

Steps to harvest honey

- i. The first step to harvesting honey is to light the smoker. The smoker is used by pumping a bellow that puffs out smoke from a canon.
- ii. After lighting the smoker, the next step is to put on protective gear.
- iii. Identify the hive to harvest. Start with the less aggressive and finish with the most aggressive.
- iv. Smoke the hive starting from behind then sides and then the front. Smoke disrupts communication of the bees. They

cannot communicate when engulfed in smoke, instead, on sensing a disruption each bee feeds on the honey as a stock up precaution and in the process, they become too heavy to fly or react. This reduces their aggression and makes harvesting possible. After smoking, give them some time to allow them to be inactive. Do not over smoke since it affects the aroma of the honey.

- v. Open the hive lid using the hive tool.
- vi. Smoke the bees again from the top after opening the hive.
- vii. Use the hive tool to remove the hive frames starting with the central one or side frame.
- viii. Check the combs for maturity. If capped to 75-90 percent and whitish in color, the honey is mature and harvestable. If not capped, the honey is immature, and the frames should be returned to the hive till the honey matures.
Note: capped brood is yellow capped - this should not be confused with the capped brood which is white in colour.
- ix. Do not harvest honey stored in the brood chamber.
- x. Put honeycombs in clean honeycomb trays, use bee brush to remove the remaining bees.
- xi. Transfer the combs to the extraction/processing room. Avoid storing them in areas frequented by people as honey may attract bees which can cause harm to people.
- xii. After extraction return the empty frames to the hive.

Processing of Honey

Processing honey from Langstroth hive and the Kenya Top Bar Hive takes different procedures. Note that when processing honey from the Langstroth hive, you have to protect the combs, but when processing honey from the KTBH, one can process wax from the combs.

Extracting honey from Langstroth hive:

1. Place the honey frames on the uncapping tray, then uncap them using the uncapping fork or warm knife.

- Place the uncapped honey frames inside the centrifuge and manually or automatically extract the honey. Store the empty frame combs safely to avoid damage as you will need to return them to the hives later.
- Open the centrifuge tap to drain the honey into a holding bucket, through a sieve.
- Preheat the extracted honey using honey warmers. If you do not have honey warmers, you can use a water bath (use warm water between 60 and 70 degrees Celsius.) Avoid heating the honey directly as it affects its nutritional value and color. Preheating helps in reducing the moisture content to avoid crystallization and fermentation depending on the environmental conditions.
- Use a refractometer to measure the moisture content. The moisture content should be 20% and below. If it surpasses this level, it means the honey was harvested immaturely and can easily ferment.
- Let it cool overnight and let it settle for one to two days then remove any wax or pollen that may settle on the top.
- Analyze the quality of the honey through a credited body such as Kenya Bureau of Standards (KEBS) for accreditation.
- Package in plastic bottles or glass jars and seal.
- Label to indicate the brand name, source, the content of the product, packaging date, the type of honey, expiry date, the plants it's made from, and the quantity packaged in the container.

The honey is now ready for the market. You must inspect the hives to ensure that the bee activity is normal, then place the empty comb frames in the super box.

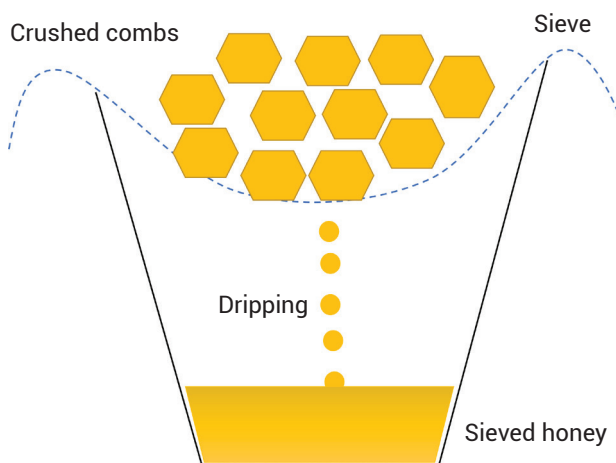
Processing comb honey

Crushed comb honey can be processed either by using dripping method through a sieve or by using honey press machine or through water bath method then sieving. We explain below the dripping method;

(i) Dripping method:

Materials required:

- Bucket
- Clean nylon/cotton net
- 2 sieves
- Knife



Processing procedure:

- Tie the sieve on top of the bucket.
- Cut the honeycombs into small pieces using a knife.
- Place the crumbled combs on top of the net overnight, and the honey will drain into the bucket gradually.

- Put the combs with any remaining honey in a separate bucket and smash to extract the honey.
- Place the smashed combs on top of the net to further drain the honey, you can squeeze the honey out of the combs by pressing.
- Preserve the already drained honeycombs in a bucket for processing wax later.
- Leave the extracted honey in the bucket to settle for 24 hours.
- Then remove the scum or impurities that settle on the top using a spoon.
- Strain the honey using a double strainer sieve.
- The honey is now ready for packaging.

(ii) Processing using the pressing machine

Equipment required:

- Honey press machine
- Uncapping tray
- Uncapping fork
- Double sieve
- Honey jars



Procedure:

- Put the uncapped honeycombs into the honey press machine.
- Press the honeycombs, manually or automatically to extract the honey from the combs.
- Preserve the already drained honeycombs in a bucket for processing wax later.
- Open the tap of the press machine to drain the honey into a honey vessel.
- Strain the honey using a double sieve or muslin cloth into a food grade container.
- Leave it to settle for 24 hours.
- Remove the scum using a spoon and package the honey appropriately for market.

Products of honey

There are marketable forms of honey consumed:

i. **Extracted honey (filtered honey)** - Honey that has been finely sieved. Sieved honey may be obtained from extraction or after going through warming. The filtered honey is poured in jars of different quantities for the market.



ii. **Comb honey** - This is honey that has been harvested direct from the hive and has not been interfered with. It may be broken into pieces for processing or cut into different shapes and packed as per the preference of the customers. Comb honey can be consumed before any processing and in this state, it is more nutritious since nutrients therein have not been interfered with.



iii. **Blended honey** - This is honey from different ecological zones from different nectar sources mixed together. This can either be bitter honey mixed with sweet honey or dark coloured mixed with light coloured honey.



iv. **Crystallized honey** - This is honey that has solidified. This is a sign of good quality honey. Good quality honey crystallizes in cool weather. To reliquify, stand the container in warm water for the honey to become liquid again.



v. **Crude honey** - Honey that is crushed before filtering/ sieving, and which still contains impurities.



vi. **Creamed honey** - Crystallized honey that has been crushed.



vii. **Chunk honey** - Liquid honey and comb honey mixed/ put together in a container.

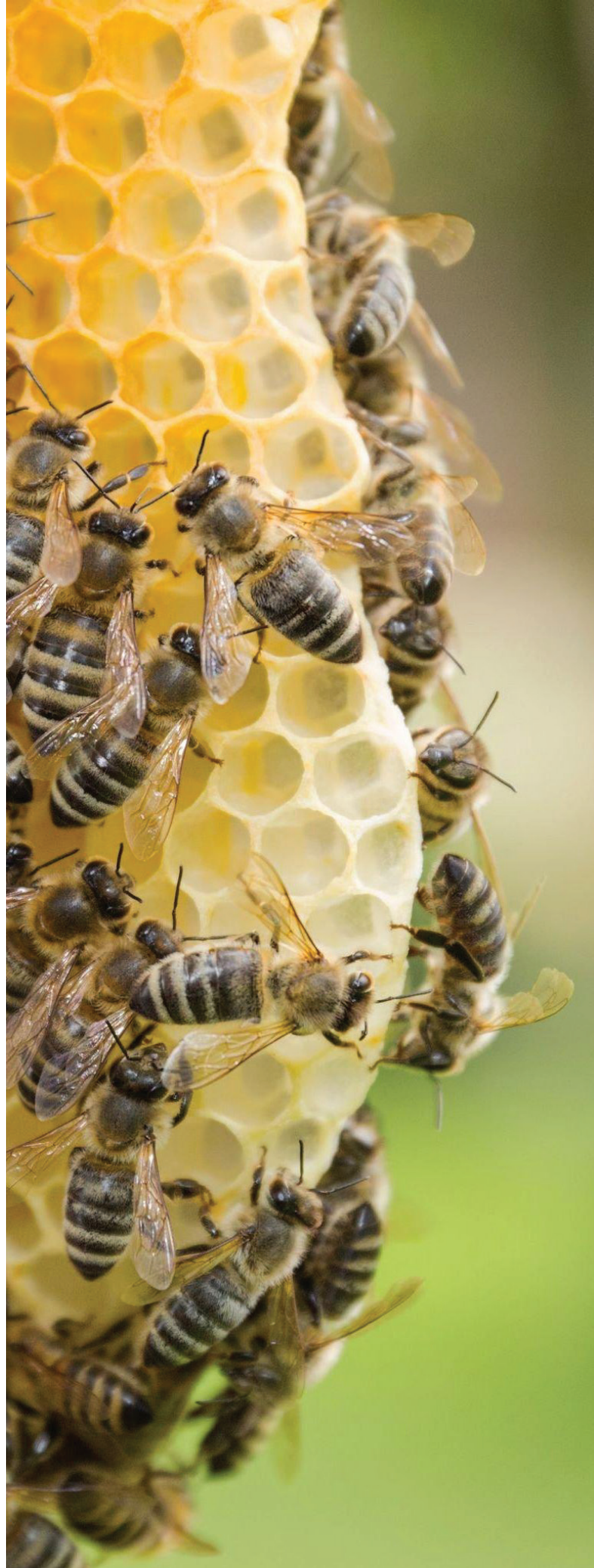


Uses of honey:

The following are common uses of honey: -

- Used as food
- As a substitute of sugar in cooking and bakery.
- Making alcoholic beverages.
- Used as a drug – cough syrup.
- As a sweetening agent in drugs.
- Used in animal feeding.
- In cosmetics as an ingredient in hand lotions, facial cleansers, etc.
- It is used as a food preservative.
- For cultural purposes.

Bees wax

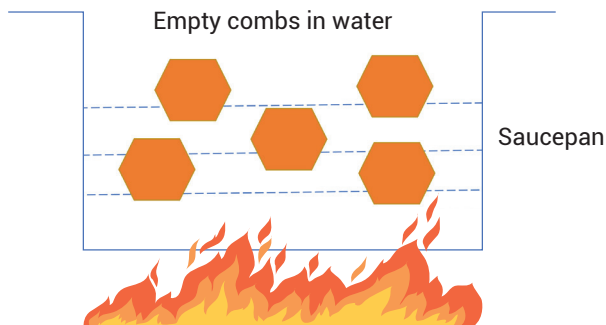


Processing beeswax

Beeswax is processed through heating method.

Equipment & materials required:

1. Empty combs
2. 1 sufuria/ saucepan
3. Holding bucket
4. source of heat
5. Water
6. cotton bag
7. Two round wooden logs
8. unscented bar soap

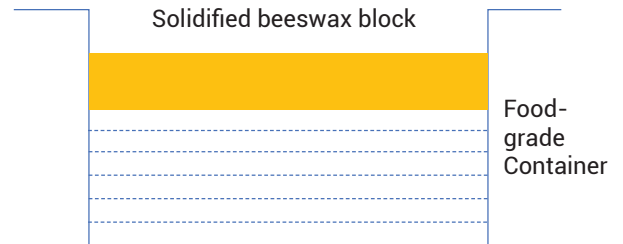


Procedure for preparing beeswax:

1. Wash the empty combs using fresh cold water; avoid salty water. This is to remove any honey remaining in the combs. Empty combs from the hives after inspection can also be used for the extraction.
2. Squeeze them using your hands to remove water, wash them again and squeeze them to remove water. This water can be used as a supplement in making nutritional porridge, syrup for the bees or traditional drinks.
3. Place them in a sufuria and add water to submerge the combs.
4. Light a fire and heat the combs inside the water. If you want to clean or mould it, use the double pan method.
5. Stir the combs in the water in one direction consistently. The boiling water will heat the sufuria with the combs and the water until the combs melt into liquid.
6. Sieve the melted substance using the cotton bag, draining it into a bucket. Hold the cotton bag with wooden sticks to avoid being burnt. You can as well use a double sieve.
7. Leave the sieved liquid in the open bucket for 12 hours to settle.
8. After 12 hours, the liquid will have separated into two layers. The topmost layer is wax, yellowish in color, the second layer is water. If the melted liquid is not completely cleaned of impurities through straining or double sieving, a third layer of scam will be formed at the bottom. The water can be used to supplement the bee food. The scam is usually a black sticky substance, remove all the impurities, then mix with paraffin or glycerin to make a black shoe polish. The scam can also be fed to poultry or used with water as livestock feed supplement.
9. In case the wax still has some debris, re-melt it completely and then uses a double sieve to filter the fine wax liquid into a clean vessel.
10. Pour the fine liquid wax while it is hot in molders that have been oiled. You can use containers but ensure to apply oil on their surface before pouring in.

11. Once cooled in the molders, the wax will have solidified. Remove it from the molder and wash it with cold water to remove the oil, then leave it to dry.
12. The wax is now ready for use.
13. Package in materials such as grease proof papers, poly-thene, jute or sisal bags.
14. Label to indicate the name and address of the dealer, name and type of the wax, net content, and origin.

Settled Beeswax:



Uses of beeswax

Beeswax can be used to make a variety of household items including the following:

- i. Candle making is the largest use of bees wax as it's raw material. Candles made of bees wax burn longer, have a nice aroma and are environmentally friendly. There are three types of candles:
 - Ornamental candles
 - Insect repellent candles
 - Aromatic candles
 - Others: Batiks (in clothing and upholstery industries)
- ii. Cosmetics industry: cosmetics such as lipsticks, lip balms, skin creams, soaps, deodorant, mascara and hair creams, nail polish, eye pencil, ointments are made from beeswax.
- iii. Leather industry: Shoe polish, waxing threads are made from beeswax.
- iv. Bee keeping industry: used as a starter, comb foundation, lure attractants and making queen caps.
- v. Textile industry: Used in designing patterns on fabrics in dyeing boutiques and kitenge.
- vi. Food processing: As a preservative; to protect cheese and some fruits from moulding and further drying.
- vii. Pharmaceutical: capsules, pills, drugs, surgical bone works, apitherapy.
- viii. Making carbon papers.
- ix. Waterproofing and crayons.
- x. Treatment of cracked hooves of livestock.
- xi. Modelling and statue making.
- xii. Other uses include making chewing gum, inks, electric insulators and adhesives, oil stabilizers, floor and furniture polishes, grafting of trees to stabilize wood glue.





Propolis

THIS IS A mixture of various amounts of beeswax and resins collected by honeybees from plants, particularly from flowers and leaf buds. It is very difficult for one to distinguish from which plants the bees collect the resins. It is assumed that in the process of collecting and modelling the resins, they mix with some saliva and other secretions from their mouths and with wax.

These resins are used by worker bees to line the inside of the nest cavities and all the brood combs, seal small cracks in the hive, reduce the size of hive entrance, seal off inside the hive any dead animal or insects which are too large to be carried out and perhaps most importantly, mix small quantities of Propolis with wax to seal brood cells.

The bees use the Propolis in such manner due to the advantage of antibacterial and antifungal effects they possess in protecting the colony against diseases. The composition of Propolis depends on the type of plants accessed by bees. Propolis has different colour, odour and medicinal characteristics due to different sources and the seasons of the year.

Harvesting Propolis

Propolis can only be acquired from the Kenya Top Bar Hive, log hives, box hives and other traditional hives. Very little can be obtained from Langstroth hives.

Equipment required in harvesting propolis from traditional hives:

- i. Hive tools
- ii. Bucket
- iii. Knife
- iv. Propolis trap mat
- v. Smoker
- vi. Bee suite
- vii. Bee brush

Propolis harvesting procedure:

- i. Light the smoker- ensure you have enough fuel such as wood shaving. avoid contaminant materials like cow dung.
- ii. Wear protective gear.
- iii. Identify the hive to harvest.
- iv. Start with the less aggressive and finish with the most aggressive.
- v. Smoke the hive starting from the behind then sides and then the front side. Smoke disrupts communication, bees should be allowed to drink honey after smoking for emergency, get heavy and calms to reduce stinging. Do not over smoke

- vi. since it affects the aroma of the honey.
- vii. Open the hive lid using the hive tool.
- viii. Smoke the bees again from the top after opening the hive.
- ix. Scrub the propolis using the hive tool.
- ix Put them in a bucket and take to the processing room.

Propolis can also be harvested by using the Propolis screen. The screen is placed under the inner cover of a Langstroth hive, left for some time for the bees to propolize after which the beekeepers go to the hive, remove the Propolis screen and scrape the Propolis into a container.



Raw propolis



Propolis collector screen

Processing Propolis

Processing Propolis requires appropriate equipment and clear procedure.

Requirements:

- i. Water
- ii. Source of heat
- iii. Sieve
- iv. Buckets
- v. Propolis

It is advisable for farmers to preserve the propolis in its raw form to preserve its quality and content.

Procedure:

- Place your harvested propolis in sufuria and add clean water to cover the propolis.
- Heat over a hot water bath until it liquifies while stirring.
- Remove from hot water bath while in liquid form.

- Sieve to remove impurities.
- Leave it to cool for some hours until it forms two layers with water on top layer and propolis at the bottom and in soft form.
- Drain the water layer for further use/recycling as poultry and dairy food supplement, as cough syrup.
- The propolis is then preserved in a dark container placed in cold water, fridge, or freezer to solidify.

Use of propolis

Propolis is used in the following areas:

- i. Cosmetics: dermatological cream, cream applied to enhance tissue regeneration and renovation, anti-aging, antibacterial/antifungal body cream.
- ii. Medicine: used in dental care; used as a deodorant, wound healing, treating respiratory infections/colds, making propolis tincture and tablets, treating burns and external ulcers, treating stomach ulcers.
- iii. Bee keeping: as a lure for swarm and as an antibiotic in beehives.
- iv. Used as a food additive and preservative.
- v. Used in tree grafting.
- vi. Used in mummifying human bodies for preservation.
- vii. Used in herbal medicine.

Pollen

POLLEN GRAINS ARE small, male reproduction units formed in the anthers of the flowering plants. Each pollen grain carries a variety of nutrients and upon arrival at the stigma, it divides into several cells and grows a tube through the often very long stigma of the flower. The pollen is transferred onto the stigma of a flower (a process called pollination) by either wind, water or various animals (mostly insects), bees are the most



Smoking the bees to calm before fixing the pollen trap



Bees passing through a pollen trap Fixing pollen trap at hive entrance

Harvesting/collection of pollen

Pollen is relatively simple to harvest from the hive using a pollen trap fitted to the hive entrance. When the bees pass through the trap, a grid knocks the pollen out of the pollen baskets on their back legs and it falls into a tray from which it is collected.

Extreme care should be taken that pollen is not contaminated by bees collecting from flowers treated with pesticides. Since a pollen pellet is collected from many flowers, even small quantities of pesticides per flower can be accumulated rapidly to reach significant concentration.

Pollen pellets are removed from the bees before they enter the hive. There are many designs of pollen traps





whereby some are easier to clean and harvest, others are more efficient or easier to install. Bees are ingenious in finding ways to avoid losing their pellets, like small holes or uneven screen and may even rob pollen from the collecting trays, if access is possible. Under some circumstances, pollen collection methods and regimes may interfere with normal colony growth or honey production. Therefore, pollen collection should be for a short time then the pollen trap removed to allow the honeybees take the pollen inside the hive for broods and the colony.

Required tools and equipment:

- a) Beesuit
- b) Smoker
- c) Pollen trap
- d) Screws and screw driver

Procedure of pollen harvesting/collection:

- a) Light the smoker using the right fuel like wood shavings. Wood shaving can be from Cyprus tree or pine.
- b) Properly put on a beesuit and ensure there is no opening that will allow the bees to pass through.
- c) Identify the hive to harvest pollen from.
- d) Fix the pollen trap and ensure that there is no other opening except through the trap. Ensure that the bees are collecting pollen during the installation.
- e) Smoke the hive starting from behind then sides and then the end side. Avoid over smoking the bees.
- f) Leave the pollen trap/s on the hive for few days then come back later to pick the trap and transfer the pollen pellets into a clean dry container and cover tightly.



Royal Jelly

Processing of pollen

Processing of pollen entails drying of the grains to less than 10% moisture content as soon as possible after harvesting. A simple method uses a regular light bulb (wE and 1 10V or 20W and 220V) suspended high enough above a pollen carton or tray so that the pollen does not heat to more than 40 or 45°C. For solar drying, the pollen itself should be covered to avoid direct sunlight and overheating.

After drying, the pollen needs to be cleaned of all foreign matter. A tubular tumbler made from a wire mesh with a fan can clean considerable quantities of pollen pellets.

Uses of Pollen

- As medicine - For treatment of various diseases such as prostate illnesses, pollen is usually prescribed in its dry pellet form as collected by the bees.
- As food - It has been used as food or food supplement.
- In cosmetics - Pollen has been included in some cosmetics for rejuvenating and nourishing effects for the skin.
- For pollution monitoring - Experiments have shown that pollen collected by honeybees reflects environmental pollution levels when examined for metals, heavy metals, and radioactivity. Contaminants can be quantified, and sampling may be cheaper than most standard methods currently in use.



Harvesting/collection of pollen

Production of royal jelly

ROYAL JELLY IS secreted by the hypo-pharyngeal gland of young worker bees, to feed young larvae and the queen bee. Royal jelly is always fed directly to the queen or the larvae as it is secreted, it is not stored. Therefore, it is not a traditional beekeeping product. The only situation in which harvesting becomes feasible is during queen rearing, when the larvae destined to become queen bees are supplied with an over-abundance of Royal jelly. The Queen larvae cannot consume the food as fast as it is provided, and Royal jelly accumulates in the Queen cells.

Royal jelly is a homogeneous substance with the consistency of a fairly fluid paste. It is whitish in colour with yellow or beige tinges, has a pungent phenolic odour and a characteristic sour flavour. Royal jelly is composed of water, proteins, sugars, lipids and minerals.

Processing/extraction of royal jelly

Steps in Royal jelly extraction:

- Put on protective gears (bee suit).
- Pull out one of the frames and sweep away the bees.
- Take the frames somewhere away from the beehives (probably in the processing room).
- Use a knife to cut the open narrow part of each of the cells.
- Pull the larvae out of the cells using tweezers or small forceps.
- Place the Royal jelly into a glass storage container.
- Transfer the Royal jelly into dark glass vials.
- Refrigerate (0 to 5° C) the royal jelly for up to 18 months.

Following extraction, the cells are immediately returned for another rearing cycle.

Uses of royal jelly

Royal jelly is used as a dietary supplement and as an ingredient in food products, medicine and cosmetics products.

Conclusion

To successfully establish a market for these bee products, a farmer must undertake market research to identify existing opportunities for consumption of these products and advertise to communicate to potential buyers of the availability of the products and their benefits. Farmers can form cooperatives to unlock the business potential in bee keeping.

Articles compiled by Fred Otieno ✉ fred.otieno@africanbeekeeping.org

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