

A TRAINING GUIDE ON POST HARVEST HANDLING OF HONEY AND WAX PRODUCTION AROUND THE KILUM IJIM FOREST AREA

This training guide is prepared by
**Cameroon Gender and Environment Watch
(CAMGEW)**

With support from
**The Oku Honey Cooperative Society
(OHCS)**

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This training is more practical with trainees learning-by-doing. This guide is prepared to give additional knowledge to trained persons on post harvest handling of honey and bee wax processing.

CONTACT:

Wirsy Emmanuel: 675184310, 699258803

Website: www.camgew.com

Email: camgew@gmail.com or camgew@yahoo.com

Bang George: 694261045

The activity is realised within the frame work of projects funded by Bees for Development – UK and Man and Nature – France.

MINEPIA-CAMEROON



Hub Cymru Africa



Bees for Development

Man & Nature



CAMGEW

PREFACE

CAMGEW is a not-for-profit organization created in October 2007 with authorization number N° 000998/RDA/JO6/BAPP to look for a solution to environmental and women's issues in Cameroon. CAMGEW works locally and thinks globally, integrating gender in solving environmental problems in Cameroon. CAMGEW believes that the future of our mother planet-earth is in the hands of men and women, young and old and also that this planet can be sustained by putting social and environmental justice at the centre of development. CAMGEW seeks to achieve her objectives by liaising with other like-minded organisations worldwide. **CAMGEW's Vision** is "A society free from poverty, gender inequality and unsustainable environmental practices" and **Mission Statement** is "We do environmental protection by strengthening the capacity of community members especially women and young people in eco-businesses and forest regeneration for livelihood improvement in the Kilum-Ijim forest area".

Oku Honey Cooperative Society is a local cooperative that carries out training in bee farming; she also construct, colonise and mount beehives; and buy and process honey to various end products from members for sell to customers. She buys honey upfront and shares profit made among her members.

Bee farming training objective: This activity is realized within the framework of the project supported by Man and Nature – France with funds from French Development Agency and Bees for Development – UK with funds from Hub Cymru Africa – UK. Man and Nature project is based on promoting the Oku White Honey Value Chain Development and that of Bees for Development is aimed at building resilient livelihoods in the Kilim-Ijim forest area by strengthening forest-based honey and beeswax production and trade. The two projects have one thing in common which is forest conservation and livelihood improvement of Kilum-Ijim forest communities. These two projects are supporting this bee farming training of Oku White Honey Cooperative members in post-harvest honey handling and beeswax extraction. The aim of the training is to improve on Oku White Honey and bees wax quality, quantity and also improve on marketing. The final goal of the training is to use apiculture to create green jobs, fight poverty, provide quality honey and wax to the market and protect the Kilum-Ijim forest. This training will involve newly created Oku White Honey Cooperatives (not yet legalised): Atumikui Oku White Honey Cooperative based in Akeh, Abasakom Oku White Honey Cooperative based in Mutteff, Bikov Oku White Honey Cooperative based in Vekovi, Belo Oku White Honey Cooperative based in Tumuku and Njinikom Oku White Honey Cooperative based in Muloin. Trained cooperatives will receive beehives for members and harvesting and storage materials from CAMGEW. CAMGEW through this project will increase the number of beehives of cooperative members in the forest and this will push them to better manage the forest. Ownership of hives by people in Kilum-Ijim area give them a source of livelihood from honey harvested and make them see the importance to protect the forest.

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Prepared by

Wirsiy Emmanuel Binyuy (MSc. Environmental Restoration) Cameroon Gender and Environment Watch (CAMGEW) Website: www.camgew.com Email: camgew@yahoo.com or camgew@gmail.com Tel: 237 675184310 or 697037417	Bang George, Manager of Oku Honey Cooperative Society Email: nyamkwibang@yahoo.ca Tel: 237 94261045
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SECTION A

GENERAL KNOWLEDGE ABOUT BEES

TYPES OF BEES: There are many different types of bees. Carpenter bees, Bumble bees, Honey bees (*Apis Mellifera*), Stingless bees (*Melipona*). There are about 25.000 species of bees worldwide. The honey bee is the type of bee present in Kilum-Ijim forest area that produces honey. The stingless bee is found in Europe but produces honey too.

LIFE CYCLE OF A BEE

The life stages of a bee are egg, larva, pupa and adult.

Egg: The egg looks like a small sausage seed. The queen always lays one egg in each cell, which is facing up. Eggs are very difficult to see. Hatching of the eggs takes 3 days.

Larvae: The larva is a white worm without legs and eyes. During the first two days after hatching all larvae are fed with royal jelly. From the third day onwards only queen larvae are fed with royal jelly. Worker and drone larvae are fed with pollen, honey and nectar. Larva duration depends on the development of the bee (worker, queen or drone). Worker bees pay continuous attention to the larvae. After 5, 5½ or 6 days the larvae cells are capped and the larvae will become a pupa.

Pupa: A silk cocoon encloses the larvae in each cell. During the pupal stage the worm-like larvae will transform in a bee. The pupa does not eat or move; it remains in the cell until fully developed. The duration of the pupal stage is 12 days for a worker, 7½ days for a queen and for a drone 14 days).

Adult: Adult bees are workers, drones, and queens. Around 50.000 workers, 200 to 500 drones and 1 queen live in a well-established colony.

A BEE COLONY: A bee colony consists of workers, drones and one queen.

Worker: Most bees in a colony are workers. They are female bees but lack the ability to reproduce. Workers are smaller than the queens, have pollen baskets on their hind legs and different type of glands. The functions of worker bees are diverse and differ from the age of the bee. The first three weeks a worker bee takes care of activities inside the hives, cleaning, feeding larvae and feeding queen. During this period worker bees start with orientation flights, guarding, wax secretion, comb building and nectar ripening. The following three weeks, worker bees develop as foraging bees collecting nectar, pollen, propolis and water.

Queen: The queen is a fully developed female, the only bee in a colony producing eggs (up to 2000 per day). There is only one queen in a colony. Her abdomen is much larger compared to worker bees. Her wings are only reaching half her abdomen. In a colony a queen is usually found on the brood comb with several worker bees facing to her. A queen can live up to 4 years, producing eggs daily. A new queen will be produced in a special queen cell if the original queen is ailing or infertile. If a queen leaves a colony (swarming), half of the bees will follow her.

Drones: Drones are the male bees within a colony. Drones are much larger than worker bees and their abdomens are rectangular. The eyes of the drones cover the whole head. They make a noisy sound when flying. The major task of drones is fertilizing the queen. Drones do not have a sting.



The chart below compares the types of bees in a colony.

Colony of bees

	Worker	Queen	Drone
Sex	Female	Female	Male
Size	Small	Large	Medium
Eye Size	small	small	Big
Egg hatches after	3 days	3 days	3 days
Larvae status	6 days	5½ days	6½ days
Cell sealed	12 days	7 days	14½ days
Number in hive	20000-60000	1	0-200
Development time	21 days	16 days	24 days
Produced in	Worker/honey cell 1	Queen cell	Enlarged cell
Lifespan	40 – 140 days	Up to five years	90 days

Cells: Whether larvae will develop into a worker, a queen or a drone depends on the type of cell the egg is laid. Workers are produced in worker cells, the same cells used for honey and pollen storage. Drones are produced in larger cells, or in worker cells with enlarged capping. Queen cells are much larger and usually found vertical on the lowest part of the comb.

BEE PRODUCTS

Pollination: Pollination of plants through bees ensures the production of fruits and seeds. Honey bees account for 80% of all insect pollination.

Pollen: Pollen produced by plants is collected on the hind legs of the bees. Pollen is rich in proteins, vitamins and minerals. Pollen can be defined as field pollen and beebread. Field pollen can be harvested by using pollen traps. Intensive pollen trapping may decrease bee population though, with as much as one third of a colony.

Honey: Bees produce honey from nectar collected from plants, and it is their food. Honey quality is graded according to colour, taste, and moisture content, HMF. Honey is used for human consumption.

Beeswax: Honey is stored in comb. Wax is produced out of the wax glands, which are found under the abdomen of the worker bees. Bees wax is used for candles, polish, food processing, cosmetics, medicine etc.

Propolis: Honey bees collect propolis from trees, flowers and floral buttons; the sticky resin is mixed with wax to make sticky glue. The bees use this to seal cracks and repair their hive. As propolis is very antiseptic and bees use it to disinfect hives, protect the colonies from diseases. It is used by humans as a health aid, and as the basis for fine wood varnishes. Propolis, the same as pollen is collected on the hind legs of the bees.

Royal Jelly: Royal jelly is produced in glands of young worker (nurse) bees, to feed young larvae and the adult queen bee. Royal jelly can only be harvested as queen rearing is practiced. Royal jelly is used in the food industry, cosmetic and pharmaceutical industry.

Bee Venom: Bees defend themselves using a sting and venom. Only female bees can sting. The sting is situated at the end of the abdomen and after stinging it will remain behind continuing pumping venom into the skin of the victim. The bee releases an alarm pheromone to mark the victim and attract other bees to act defensively towards the victim. Bee venom is used in the pharmaceutical industry to improve different health problems in humans.



SECTION B

HONEY HARVESTING PROCEDURE

HONEY HARVESTING

Tools and materials needed for honey harvesting: bee suit, veil, gloves, rain boots, or raincoats, knives, cutlass, dry clean plastic containers and a smoker.

Preparation for harvesting: Some few weeks before harvesting, the beehive should be open to check if there is honey in it. The tools and materials are then prepared before time.

Using a smoker: The local material used to produce smoke around Kilum-Ijim forest is the moss plant that is found growing on tree barks in the forest. The moss is harvested when dry and put in a modern smoker and then lighted to produce smoke. Many bee farmers collect this plant and keep to use later.

Smoking the bees: Smoking bees in a beehive is essential in honey harvesting. Smoke helps to keep bees under control. When the bees are smoked they go out of the beehive. Bees that have eaten well are less prone to sting. This is why bees are first smoke before harvesting. Smoking also helps to mask the initial release of alarm pheromones. After the beehive had been opened more smoke is blown into the hive. The bees will move away and leave the honey combs towards the brood combs. This is observed in a hive that bees start building combs from the posterior end of the hive going backward and the first combs are usually the brood combs. The honey combs are blind. That is why in traditional hive we open from the back; and the top bar hive are open from behind. To get good quality honey, individual beehives should not be smoked for more than 40 minutes. The smoke adheres to honey and bees wax reducing the qualities. Bee farmers should dress in bee suits, wear boots and gloves to prevent bee sting that can harm them and kill more bees. A bee dies after stinging.

In the Kilum-Ijim area, harvesting is done by at least two individuals. When harvesting is done in the night, the outcome is that the honey is mixed with brood combs and uncapped honey (rich in water content). This makes the honey impure. The honey will not also last for long. The water content in honey



will increase. When the brood in combs die and decay it contaminate honey. The water content and brood in harvested honey reduce honey quality and this destroys the market for honey.

Types of honey harvested

Capped honeycomb with honey: Good quality honey should only be harvested when the honeycomb is sealed. Whitish wax covers the comb, which seals the honey completely from outside air. In this way honey can be stored for a long period. Sealed honey does not have high moisture content, usually below 19%.

Capped honeycomb with pollen: Pollen is found in combs near the brood but also it can be found in between the honey cells. The pollen is easily detected because of its variety of colours. Pollen is fermented and usually mixed with nectar/honey to become sticky. Pollen is the food for honeybee larvae and young worker bees to make royal jelly. Pollen in combs can be consumed by humans and is very nutritious.

Capped honeycomb with worker brood: Brood is usually found near the entrance of the hive. Brood comb is sealed with a brownish mixture substance, which unlike capped honey can let air go through. In between the sealed brood some of the young worker bees have already emerged.

Honeycomb with drone broods: Usually drones brood is established in cells bigger than worker brood. If drones are established in worker cells, the cells are enlarged, capped with a domed cap. This suspects the absence of a queen, and the presence of a worker bee laying eggs. Drone broods in worker cells are often neglected and the larvae die.

Old comb: Old comb turns dark in colour and gets very heavy. A comb used by bees for more than two seasons gets hard and heavy. When bees abscond the hive, it is recommended to remove the very old comb from the hive as new combs optimise overall honeybee colony health and reproduction.

NB: The liquid honey from these groups should be processed separately in order to have best quality honey. The best honey comes from new white combs which should be extracted separately and packed.

Old notion that is changed: Harvesting was usually carried out at night or towards evenings. With recent training given bee farmers, harvesting is now done at day time in order to bring out good quality honey. Harvesting is done using a cutlass. The cutlass is used to cut the honey combs from the walls of the hive in case of traditional hive and from the bars in case of top bar hive.

Bee farmer open the lid of beehive from behind and continue to puff in smoke into the hive so that bees leave the combs and he removes it and passes it to his assistance that will now brush off the bees and examine whether ripped combs and brood combs and separate them into the different containers. Harvesting is done up to a certain level because not all the combs are harvested. After this operation is



completed, the bee keepers cover the back lid and thatch the hive and they will carry their honey home. The ripped honey is taken to their organization where it is weighed and the processing will now take place.

HARVESTING PROBLEMS

- The main problem faced during harvesting or even when working with bees is bee stings. Bees' stings react adversely to human body's chemistry. Bee's sting can actually kill and this is why working with bees can sometimes be dangerous. The immediate solution to bee sting is to scrap the sting off by either using a fingernail or a harvesting cutlass as soon as possible. This will reduce the amount of venom that will go into the wound. Smoking the area stung will mask the alarm odour thereby reducing the incident of being stung by many more bees.
- Another problem faced during harvesting in a traditional hive is to determine the honey combs and the brood combs to be removed during harvesting. With traditional hive some of the brood combs are removed. It is understood here that the brood are going to mature and will be the next generation to serve the colony, so harvesting the brood combs is just the same as killing the whole bee colony.
- Most traditional hive absconds after harvesting. This is because all the honey is removed leaving nothing for the bees. The consequent of this practice is that the brood will die because the bees have no food to feed them. The best way to solve this problem is to leave at least one honey comb in the hive since we do not feed the bees. This has been the problem of the past for education and training to farmers has help to improve harvesting problems.



SECTION C

POST HARVEST HANDLING OF HONEY AND BEES WAX

A)EXTRACTING AND PROCESSING HONEY

What is honey?: Honey is the sweet substance produced by honey bees from nectar and from secretion from living parts of plants, which bees collect, transform and combine with specific substances, and store in honey combs. Honey is produced by bees collecting nectar for use as sugars consumed to support metabolism of muscle activity during foraging or to be stored as a long-term food supply. During foraging, bees' access part of the nectar collected to support metabolic activity of flight muscles, with the majority of collected nectar destined for regurgitation, digestion, and storage as honey. Humans and other animals that eat honey only get a share of bees' food. The rich Kilum-Ijim forest biodiversity produces much nectar that bees use to produce honey. The forest is rich in medicinal plants and so produces honey of high medicinal value.

HONEY EXTRACTION

It is best to process honey as soon as it is harvested say 24hours after harvesting especially Oku White Honey. Oku White Honey clot in combs if not extracted before 24hrs. Honey processing needs time and patience to achieve the best results.

Honey is food and **MUST** be handled hygienically and all equipment **MUST** be perfectly clean. Honey is hygroscopic and will absorb moisture from the environment; therefore all honey processing equipment **MUST** be perfectly dry. Too much water in honey will cause it to ferment.

Honey is found in the cells of the combs. Bees use wax to build combs and use wax to seal or cap the cells of the combs. There are many ways of extracting honey, traditionally many people squeeze honey with their hands which is not hygienic because it contaminates honey and encourages fermentation.

Boiling also destroys some nutrient and honey loses its aroma (flavor). Some people use mosquito nets to drain honey and this is wrong because mosquito nets are impregnated with chemicals to fight mosquitos. Better method of extracting honey involves the use of mesh, cotton cloth, solar extractor or honey extractor.



The best methods to use when there is a big consignment of honey harvested are solar and honey extractors. Here it consists of wooden box which carries a galvanized metal plate and a piece of glass. The metal plate and glass generate a temperature on the sun and melt the bee comb so that both honey and bees wax flow into the container inside the box, and with honey extractor fresh honey comb harvested at correct time and within 24hours do not require a solar extractor or any heat from the sun.

Honey extractor consist of a wooden frame with a set of categorised wire mesh of three sets to let the fresh clean honey and some wax drain through the three set into a collecting basin and into a plastic container for storage. The finest clean honey must only be stored in a clean plastic or rubber container. The honey extractor remove fresh honey from combs at high speed so that honey is propelled out of the combs into the wall of the extractor and then turn dram to the bottom of rubber dram of plastic containers. The already drained honey should be store in clean plastic and rubber containers for marketing.

One may ask how long it takes to harvest honey and the answer will only be that as soon as bees enter a hive, they begin to build combs and source for laying eggs. The honey is for feeding the queen, drones and their young ones or for feeding the whole colony. The honey is their main source of food. In the same way as a man has a reason of abundant food in barns against the season of scarcity, bees also have a period of honey flow and one of scarcity too. As man should not deprive the bees during the period of scarcity, he has to wait for the period when there is plenty of honey called honey flow period.

Like in Oku this is the period one can reap the fruits of his labour. Harvesting period start in the months of April to June and some years are usually having dry season harvest done in the months of February and March. Tropical bees are very aggressive, so the best time to be harvesting honey in Oku should be in the evening hours from 5pm and in the morning periods as from 6:30 to 8am. This is good time because most of the bee keepers do harvesting without protecting themselves with bee suit. But above all harvesting in broad day light is preferable and is the best because you can be seeing the internal part of the hive and even the combs before cutting. While we recommend the mornings and the evening time is because insects in general are less active in cool weathers. During this time the bee keepers should have somebody to handling equipment and brushing off bees from combs while separating broad combs from ripped honey before filling the containers.



B) BEE WAX EXTRACTION FROM OKU WHITE HONEY

Introduction

Bee wax is the creamy coloured substance used by bees to make honey combs. Very pure bee wax is white but the presence of pollen and other impurities cause it to become yellow.

Bee wax is a valuable product which can provide income in addition to honey (One K.G of bee wax is worth more than one K.G of honey). Bee wax does not require careful packaging like honey and this simplifies transportation and storage. In areas where honey is produced and consumed locally and where there is no local use of bee wax, it is often discarded.

The development of bees wax collection system encourages bee keepers in the area to save bees wax by organizing the sales of a combined market for bee wax and honey. This will go a long way to increase income and improve on the livelihoods of each household in the area of production.

In some countries, bees wax is therefore the most valuable product than honey because of its high demand in the world market. Do not waste your bee wax.

Who produces bees wax?

Bees wax is made by young worker bees and used to construct the honey combs on which bees live. The wax is secreted as a liquid from eight wax glands on the outside of the abdomen. In contact with air, the wax hardens and forms scales which can be seen as small flakements of wax on the underside of the bee.

Bees use the stiff hairs on their legs to remove the scales of wax and pass them on to the middle legs and so to the mandibles-jaws where the wax is chewed before it is incorporated into the honey combs.

Bees are stimulated to produce wax when there is surplus honey to be stored and lack honey combs in which to store it.

What type of bees produces wax?

Bees wax is produced by all species of honey bees. Wax produced by the tropical Asian species of honey bees *Apis cirana* and *Apis adousata* has slightly different chemical properties from bees wax produced by *Apis meillifera*. Bees wax produced by stingless bees and bumble bees are very different from wax produced by honey bees.

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Bee wax quality

Bee wax is valued according to its purity and colour. Light coloured wax is highly valued than dark coloured wax capping (i.e. the wax seal with which bees cover ripe honey combs). This brand new wax is pure and lighter in colour.

GENERAL RULES FOR PROCESSING BEE WAX

1. **Bee wax must always be heated in water** because it is highly flammable and will burn if heated directly
2. **Heating discolours bees wax and boiling will ruin it.** Only heat wax enough to melt. Bees wax melts a 62-64°C.
3. **Clean rain water is the best water to use.** Ground water often contains lime which will react with bee wax
4. **Combs of the same type should be prepared together.** Do not mix dark combs with light combs as this will lower the final quality (dark combs contain propolis and cocoons)
5. **Containers and utensils made of aluminum, brass, copper, zinc, tinfoil or iron must never be used.** Beeswax is slightly acidic and will react with and be stained by these metals.
6. **Bees wax must not be allowed to cool too quickly.** Impurities and water will be trapped inside the wax as the block sets and it will have to be rendered again. The cooling process can be slowed if necessary by placing the container with the water wax mixture in a heat containing box filled with sawdust and covered with a lid.
7. **Slum gum is the black residue that remains after rendering.** It contains cocoons from brood cells and larvae excrement. It burns well and if soaked up in old newspapers, can be used as fuel for cooking or to make firelighters.
8. **Avoid at the maximum the contact of boiling beeswax with smoke from oven or wood.** Bees wax has a lipid structure and can absorb components from ashes and smoke which decreases its smell and color or texture. Many cosmetic companies needs bees wax free from smoke.



BEE WAX EXTRACTION METHODS

The honey comb is broken during the extraction of honey. After honey extraction and washing of by-product for honey juice what is left is honey chaffs. Bees wax is then extracted from honey chaffs (broken combs).

There are many ways of extracting wax. They include:

- Solar Wax Extraction
- Hot Water Bath Extraction Or Submerge Sack Method
- Metal Foil Extraction
- Double Boiler Method.

1. Hot water bath Method

When combs of honey are crushed after harvesting and honey drained what is left is combs and some small honey in them. We can try to remove as much honey as possible from the combs and then wash them by soaking them in clean rain water (honey remaining in combs will be rinsed out in the water). Repeat this washing process three times. After washing the combs, break them into small pieces. Place the combs in a pan and add clean water to the level of the combs or a little above. Bees wax should never be heated without water because it is highly flammable and can burn. Heat the mixture gently, and stir the mixture. After the combs have melted, pour the molten wax and water mixture through the sieve (made out of woven rush, nylon, jute or heavy cloth) over a bucket. Brood, pieces of wood, grass and other particles will be removed by the process.

Leave the bucket with the mixture of hot water and molten wax in a shade room to cool. The bees wax solidifies as it cools, forming a disc of wax on the surface of the water. Any particles that have filters through the bag will settle below the wax layer. When the mixture is completely cool, remove the wax layer. Scrape off any material stuck to the underside of the wax dish and re-melt the wax in an equal volume of clean water. This time, use a finer cotton cloth to strain small impurities out of the wax. After filtering through the cloth, collect the hot mixture of wax and water in a bowl which has been smeared with a very dilute film of detergent in water.

Bowls made from enamel, clay, stainless steel, plastic, wood or even calabashes can be used as moulds for beeswax. Aluminum, brass, copper, zinc, pewter, tinfoil or iron should never be used with beeswax because they will react with and stain the wax. About 12 hours after pouring the mixture into the bowl, it should have solidified and cooled down completely making it easy to remove the block of wax from the mould. Do not attempt to remove the wax any sooner or you may spoil it. Any impurities adhering to the bottom of the cake can be scraped off the knife.



2. Double Boiler Method

Equipment needed

Aluminum pot	Insolated stirrer
Fuel wood	Mold or pan
Unrefined wax	Rubber bucket
Jute bag and clean water	

The wax obtained from either honey extraction or empty combs is washed and tied firmly in a jute bag and put into aluminum pot already filled with clean water. It is heated until all the wax in the combs is dissolved. During heating, the wax is stirred from time to time to ensure all the wax come out of the combs to the surface of the water for collection.

Now you can start collecting the wax that has dissolved and is floating on top of the water into another bucket full with cold water using your rubber plate. The coated wax will be removed and put into another clean container for a second melt. This time you will heat the wax in a clean pot to melt and get purified for molding. At this stage, what remains in the bag now is nothing but particles of grass, brood, pieces of wood and all what is not wax that passed through during harvesting or during the processing exercise.

The bees wax melts to liquid as steering continuous. A plastic bowl which is a mold that could be of various size and shape depending on needed shape and size of wax is smear with soap. The reason for smearing with soap is to prevent wax from adhering to container walls. The liquid wax is poured into the smeared mold (bowl) and placed in a cold place to harden. After putting the liquid wax in a bowl it takes between 1 to 3 hours to have a cake of solid wax. The smeared container with wax after solidifying is shook to remove the wax from plastic bowl.



STORING AND SELLING OF BEESWAX

Approximately half of the world's production of bees wax comes to the market. The rest is either used by the beekeeper or thrown away. Yet bees wax is proportionally more valuable than honey. Bees wax is an excellent export crop for rural communities for several reasons;

- **Processing is easy**, rendering beeswax to a quality suitable for export involves only heating and filtering to ensure it is clean
- **Storage is simple**; care needs to be taken to ensure that it is stored away from bright light, heat and toxic chemicals.
- **Transportation** is easy, no special packaging is required. It can be transported as lumps of unwrapped beeswax inside hessian sacks.
- **Beeswax does not deteriorate with age or time.**
- **Regulations** are less stringent than for honey.

Wax cappings, old honey combs, old brood combs and old bits of combs built by the bees as part of the nest structure can yield valuable bees wax harvests. However, if combs are stored in the open they will be eaten by wax moths within few weeks. Old combs can also harbor honey bee diseases. Melting bees wax and forming it into a solid brick enables it to be stored for long periods. Bees wax blocks are not attractive to wax moths. Most beekeepers achieve excellent results using homemade equipment.

USES OF WAX

- Primarily wax is used by bees to make their combs
- Purified wax is used in the production of food: bee wax treated with alcohol is used to create a coating for cheese to protect the cheese from spoilage through the growth of molds on the cheese.
- It is used in cosmetics. Wax is used in the production of lip balms, lip gloss, hand cream and moisturizers. It is also used in making hair pomade, candles and polish.
- Bee wax is also used in pharmaceutical industry to produce bones wax used during bone surgery to control bone bleeding. It is also used as an ancient form of medicine for dental filling.
- To strengthen and preserve sewing thread, cordage, shoe laces etc.



C) PRODUCTION OF HONEY WINE

This is a delicious less alcoholic honey drink good to take after meal

Ingredients:

- 5 kilograms of honey (possibly unfiltered honey)
- 15 litres of pure drinkable water
- A clean bucket with a good cover (Make sure containers are sterilize first with hot water otherwise you will get mold on the wine)

Directions

- Mix honey in water and allow it in temperatures below 30°C for about 1 week in an air tight container to enable it have a good taste.
- After this stage you will now filter it to enable cleanliness and purification.
- After this you can now bottle it to your various sizes.

The left over which could be called chaffs is now ready for the extraction OF BEESWAX.

ALOE AND HONEY DRINK

Ingredients

- ½ litre of honey
- 1litre clean water
- 1 litre uncoated aloe-vera leaves

Directions

- Mix well and enjoy
- This mixture is good for cold and cough



SECTION D

PRODUCT FLOW OF BEE FARMING AND RISKS OF CONTAMINATION OF PRODUCT AROUND KILUM IJIM FOREST AREA

Introduction

This is the entire process of honey production from the inputs that include beehives, bees wax for baiting or starter combs, colonies and stands for beehive mounting, transportation of hives from colonized zones, harvesting, transportation, processing, packaging, storage and to the last stage which is the sale of the organic honey. Honey produced from Kilum-Ijim forest is organic and has been certified as Geographical Indication Product.

During these processes, there are possibilities of adulterating the honey. There is need for the honey to be treated with precautions so that the final consumers' purchases and consumes a good quality honey. The adulteration can either be done unknowingly or consciously by bee farmers.

Adulteration of honey is sometimes used as a method of deception and this destroys the market and confidence from consumers. Some people either add ripe bananas as the case may be or increase the water content by adding more water to the honey. Exposing the honey in an area with high humidity also increases water content of honey. Some people add sugar to the honey to increase the quantity. We can use equipment like the Refractometers to check on the water content of the honey. Water content: the water content must be below 19% or honey will ferment.

Other methods of checking honey quality locally include placing the honey on an A4 white paper and then looking under the paper to see if the paper will get wet or not. If the paper is wet then the honey is not good and if it does not get wet then the honey is good. Honey can also be tested locally by putting the honey on a non-safety match; the match should burn if water content is below 19% or by dripping honey into a glass of clean water the honey should sink to the bottom of the glass without dissolving.

HMF (Hydroxyl-Methy Furfuraldehyd) level indicates the breakdown of sugar and is the principal measurement of honey that has been over heated or stored for long periods. HMF maximum 40mg/kg.



HANDLING, PROCESSING, TRACEABILITY AND LABELLING OF HONEY

The objective of this process is to, avoid contaminations, avoid mixing of organic and non organic honey and ensure traceability of organic honey. At all levels of product handling (value chain) different operators or units are responsible to ensure these at their levels. Each unit or operator responsible for the value chain should be certified unless exempted. Organic or inorganic integrity for honey must be maintained at all levels.

I. PROCESSING

Processing starts with crushing and straining of honey combs. This produces the highest quality honey. The honey is then put in harvesting buckets and is transported to the Cooperatives or to draining areas for individual farmers who drain their own honey. The honey harvesting buckets should either be new buckets that have never been used or be containers of edible items like chocolate, butter, mayonnaise, etc. Avoid the use of containers of non-edible items like paint. The drained honey is stored in a suitable container (plastic or glass jars) that is tightly closed.

The following should be done in the processing process;

- Only ripe and capped honey should be drained.
- In case the honey is certified as organic or not, the honey harvested should be processed separately (organic and conventional). The purpose is to avoid contamination by the conventional honey.
- In case the bee farmer or cooperative has both conventional (inorganic) and organic honey and needs to drain the honey using the same draining equipment, he will have to clean the drainers after draining conventional honey before draining the organic honey.
- Effectiveness of the cleaning measures shall be regularly checked and recorded by the farmers in case he stores honey as an individual or the store keeper in case it is a Cooperative.
- The different lots of honey (organic and inorganic) shall always be identified to avoid mixtures or exchanges with the conforming product.



II. STORAGE AND PRESERVATION

Because of its unique composition and chemical properties, honey is suitable for long-term storage, and is easily assimilated even after long preservation. Honey and objects immersed in honey, have been preserved for centuries.

The key in honey preservation is;

- Limiting honey access to humidity. In its pure state, honey has a sufficiently high sugar content to inhibit fermentation. If exposed to moist air, its [hydrophilic](#) properties pull moisture into the honey, eventually diluting it to the point that fermentation can begin.
- Honey should be stored in clean and dry containers.
- Honey should be labelled and stored in appropriate places and should be separated from other products.
- Plans or sketches and addresses of all storage facilities shall be available
- There must be sufficient hygiene and sanitation practiced to avoid any contamination of the stored products.

TRANSPORTATION

- Appropriate measures should be taken to avoid substitution, mixing or contamination of honey with non-conforming products during loading and transportation of honey from the apiary to storage site or Cooperative.
- The product should always be accompanied by a document or label mentioning the name and address of the operator, the name of the product, the reference linked to organic production and the name of the certification body

TRACEABILITY

Traceability of honey is the ability to trace the history, the application and/or location of the product from the area of production to the area of consumption. Consumers in Europe and around the world show an increasing interest in the qualities of foods. Honey attributes such as geographical origin and specified botanical sources often command a premium price due to their organic or pharmaco-active properties. Producers and consumers are especially interested in correct labelling of the origin, traceability, and lack

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of adulteration of honeys. The European Union (EU) safeguards food quality in many ways, for example, via the system known as protected designation of origin, promoting and protecting valuable food names. This tells it clear that if the honey produced in the Kilum Ijim Forest has to fetch more money there is need to increase knowledge on traceability of the Oku White Honey to be able to enjoy the good prices for the products.

Honey is one of the few remaining food products that is considered natural – or without added ingredients or other refined additives that alter the composition of the product. Honey is produced by the bee that is sensitive to unsustainable human activities in its environment. It is easy to monitor the health of an ecological system through the number of bees available or the quantity of honey that bees produce because bees are sensitive.

The objective of traceability is not only protecting the reputation of honey, but also to adopt a global standard that guarantees traceability and authenticity of the product. In an effort to set such a standard and meet this goal, it is imperative that we do trainings with bee farmers around the Kilum-Ijim forest area.

The following should be done to ensure traceability;

- Provide information about the origin of the product. The information should include the geographic location of the beehives.
- Documentation be done in place that allows honey to be traced back to a field
- A system for identification of honey lots should be established
- Data in the accounts should be documented with appropriate justification documents
- The balance check must show a good correlation between the quantities of products purchased and sold or the quantities of input received and used or in stock

LABELLING

The honey produced should be labelled. This will indicate the source of the product, the producer or the Cooperative producing the honey.

- In accordance with the certification status of the product
- At least 95% by weight of its ingredients of agricultural origin are organic
- The conventional ingredients in the allowed list
- The list of ingredients should indicate which ingredients are organic



CHAIN CUSTODY OF ORGANIC BEEKEEPING AROUND THE KILUM-IJIM FOREST, MAJOR RISKS AND WAYS OF MITIGATION

SN	PRODUCT FLOW STEP/ CHAIN OF CUSTODY	MAJOR RISKS	WAYS OF MITIGATION
1	<i>Hives</i>	Hives Wax for baiting or starter combs Colonies Stands for hive mounting	Avoid painting hives with colour paint Use natural wax or wax from a converted hive Avoid importation of hive colonies
2	<i>Apiary</i>	Location in the savanna where hives are colonized Location in the forest where hives are mounted and ready for harvesting Forage (Feed) Pests and diseases	Locate hive far from conventional farms Locate hives at least 3 KM from a conventional farm Feed bees (in case of severe climate conditions) with organic honey or sugar Use only authorized chemicals after concerting certifier. (Preferably use organic products)
3	<i>Transportation Of Hives From Colonisation Sites</i>	Spillage Absconsion of colony	Precautions should be taken when
4	<i>Harvesting</i>	Containers used for harvesting Maturity of the honey in combs Killing of bees during harvesting Over smoking during harvesting	Use new and clean containers or food related containers Make sure only matured up to 75% honey is harvested Avoid killing bees and eating broods Avoid over smoking of honey not to contaminated honey
5	<i>Transportation Of Honey From Apiary</i>	Rains Spillage Commingling of honey	Use closed containers (avoid harvesting under rain) Careful when transporting Avoid mixing organic and non organic honey
6	<i>Processing</i>	Draining systems (methods and equipment) Adulteration or commingling of product Duration of time after harvesting Heating	Use conventional equipment for draining Avoid adulteration of honey Process honey at most 24 hours after harvest Avoid heating honey
7	<i>Packaging And Storage</i>	Storage containers Packaging (chemical free containers) Commingling or mixing of product (organic and in-organic)	Store in clean and new containers Package in clean and chemical free containers Avoid commingling or mixing of organic honey with inorganic honey



SECTION E

CERTIFICATION OF OKU WHITE HONEY AS GEOGRAPHICAL INDICATION PRODUCT

GENERAL NOTION ABOUT GEOGRAPHICAL INDICATION

The issue of geographical indications (GIs) has been around for many years and has long been the subject of heated debate in a number of international gatherings. The first section of this paper provides a brief definition of a GI as well as the delimitation zone of Kilum-Ijim forest and some of the historical background to the issue and Oku White Honey as a Geographical Indication (GI). Some protection has been offered for GIs in the context of the intellectual property regime under the World Intellectual Property Organization (WIPO). There are a number of different definitions of a geographical indication but for the purposes of this work a GI is defined as “a designation which identifies certain qualities or other characteristics or the reputation of a particular product to a specific geographical locality”. More so, geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. As a result, the originality of Oku White Honey depends on the unique ecosystem of the Kilum-Ijim forest where it is made. This forest harbor plants that when pollinated by the bees result in honey that yields unique characteristics.

DELIMITATTON OF KILUM –IJIM FOREST

The Kilum-Ijim forest is found in the North West Region of Cameroon and is the largest remaining montane forest covering an area of 20,000 hectares and is located on Mount Kilum (3011m) and adjoining Ijim Ridge (2000-2500m) which is recognized globally for its endemism. The Kilum range (also known as Mount Oku) is situated in Bui Administrative Division in the North West Region. The Ijim Ridge stretches northwest from Mount Oku, starting from the west side of Lake Oku to Kom in Boyo Division. The contiguous Kilum and Ijim Mountain Forest are located between latitude 6°0TN and 6°1TN and Longitude 10°20'E and 10°35'E.

CASE STUDY: OKU WHITE HONEY

The originality of Oku White Honey depends on the unique ecosystem of the Kilum-Ijim forest where it comes from. In general, there are two ways in which honey is procured: harvesting it from wild bees or using the science of domesticating bees, which is known as apiculture (according to the Food and Agriculture Organization). It should be noted that bees in Kilum-Ijim forest are gotten from the outskirts of Oku. They are



gotten from the valleys like Mbam, Tadu, Njotin, Babungo, Bambessi, Din, Vekovi, Kai, Wvem, Ntur, Muloin, etc distances of approximately 15 Kilometres or more from the forest. Colonised beehives are carried to the Kilum-Ijim forest where Oku White Honey is produced. Some bee farmers transport by head and others use motorcycles or vehicles. All of these methods need care not to harm bee combs.

Historical Background of Geographical Indications

Some of the world's most famous products owe their success to the region they are produced. Whether it is tequila from Mexico, Italian parmigiana cheese, or Colombian coffee, the unique geographical features of where these products are produced results in their equally unique qualities. Geographical Indications (GIs) are a form of intellectual property (IP) right that protects such products, and they have helped spur economic development. While Africa is endowed with some of the richest ecosystems in the world GIs in the continent have yet to take off. However, with the help of the African Intellectual Property Organization (OAPI), a small number of products from various African countries have been registered as GIs as a way to increase market reach and expand the livelihood of producers. One of the first three products are Oku White Honey from the Republic of Cameroon (Cameroon), which is produced in the nationally protected forest of Kilum-Ijim. As one of Cameroon's first registered GIs, producers and cooperatives involved in the production of Oku White Honey are hoping that their product can eventually compete on an international level like other well-known GIs and spur economic development. Another GI product in Cameroon is the Penja White Pepper. Note should be taken that, Geographical indications are typically used for agricultural products, foodstuffs, wine and spirit drinks, handicrafts, and industrial products.

FACTORS THAT INFLUENCE THE UNIQUENESS OF OKU WHITE HONEY

A) Varieties of Different Flora and Fauna in Kilum-Ijim Forest

Kilum-Ijim is endowed with multiple and diverse flora ranging from herbs, shrubs and trees. This flora produces multi-coloured flowers with different flavours. Moreover, since bees play a double role in plants and human beings unconsciously, i.e. in plant pollination and extraction of nectar, and pollen grains that is then converted into honey and combs. Some of these shrubs that produces varieties of flowers are *Kniphofia reflexa* (Asphodelaceae), *Plectranthus punctatus subsp. lanatus* (Labiatae), *Gladiolus sp. Nov.* (Iridaceae), *Eriocaulon asteroides* (Eriocaulaceae), *Eriocaulon parvulum* (Eriocaulaceae), *Dombeya ledermannii* (Sterculiaceae),



Oncoba sp. Nov.(Flacourtiaceae), *Caterostigma* (Scrophulariaceae), *Helichrysum cameroonense* (compositae)
Dipsacus narcisseaanum (Dipsacaceae).

In addition, trees species available in Kilum-Ijim forest that contribute enormously in honey production when they flowers are: *Schefflera abyssinica*, *Schefflera manni*, *Maesa Lanceolata*, *Solanecio Mannii*, *Prunus africana*, *Newtonia Camerunensis*, *Bridelia Speciosa*, *Pittosporium Mannii*, *Zysiguim Staundti*, *Albizia Gummefera*, *Croton Macrotatchyst*.

B) The Altitude of Kilum –Ijim Mountain

Kilum-Ijim forest is located in the North West region of Cameroon and surrounded by three tribes: Oku, Nso and Kom. Its delimitation zone cuts across Liakom and Fundong in Kom 6061, Oku 10017'04 and Vekovijakiri in Nso 6014'59 to 10026'02. Rising up to 2,000 meters above sea level, with an attitude of a mountainous zone of 1600m and 3011m, the Kilum-Ijim forest is a rich, diverse ecosystem covering over 20,000 hectares. With over 150 melliferous plant species which is collected by bees and turned into honey, the amount of rainfall, sunlight, temperature, altitude, and soil quality in the Kilum Ijim forest all serve to influence the end product- oku white honey.

Two plants yield white flowers in the forest namely; *schefflera abyssinica*, *Schefflera manni* and *nuxia congesta* and in combination with the environment help give Oku white honey its unique properties,

C) Properties of Oku White Honey and Bee species:

The species of bees available in Kilum-IJim forest that produce this remarkable honey is called *Apis midlifera adansoni*. Oku White Honey Colour content is 9-17mm. Taste quality of Oku White Honey is flavoured flowery. Texture content is creamy white and lightly granular. Moisture content is between 18% and 20%. All these qualities make Oku White Honey unique and beyond compared.

D) Smoky flavour:

Oku honey has a rich smoky flavour that distinguishes it from other types and it is this flavor that our customers appreciate and go back to shop again and again. The smoke should however not be too much.



THE CERTIFICATION OF OKU WHITE HONEY AS A GEOGRAPHICAL INDICATION PRODUCT

The Kilum/Ijim White Honey Association (KIWHA) is the umbrella organization created in March 29th, 2011 and registered under authorized No.122/AR/E26/PS/188 in conformity with Law No.90/053 of 19/12/90 relating to freedom of Association in Cameroon.

The above association is therefore charged with the control of the production of white honey, transportation and marketing of honey and some honey products around the delimitation zone of Kilum/Ijim forest.

Geographical indication of the Oku white honey: the G.I refers to the certification of the Oku white honey under certification № 003 of 22/07/2013 in compliance to application № 6201300002 and prefectorial decision № AR/E26/PS of 29th of March 2011 granting the sole operation of KIWHA over the Delimitation zone that cover the Divisions of Bui and Boyo as follows: Kom, Oku and Nso across Fundong and Belo in Boyo Division Jakiri and Oku in Bui Division.

These zones are located around both edges of the Oku Mountain, the Kilum zone of which includes Oku and Jakiri being the principal pole of production and the Ijim zone represented by Belo, Njinikom and Fundong.

Three principal types of stakeholders are involved in the white honey value chain as follows: the producers' traders, and the forest management agents. The latter intervene essentially in the preservation of natural resources.

Under these conditions, each operator within the said system is charge to identify his/her self as follows:

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IDENTIFICATION

A	IDENTIFICATION
NAME OF MEMBER	Refers to each operator in the white honey zone that most register with KIWHA
Date, signature and reference of contract	Each operator must sign a contract with KIWHA to respect production roles and the date of engagement is made clear with contract No.
Address (Tel, email, P.O. box etc.)	The operator gives his full address.
Honey production zone.	The operator must follow the roles defined in the zone.
Species of bees	All honey and honey products must be of Apis Meilifera a donson
Last date of training of members	Each operator must have undergone training before carrying out operation in the zone
B.	Production
Period of placing Hives	The operator must respect the period of placing the hive in the field of colonization and in the production zone.
Harvest Period	Harvest period begins in April and ends in June and in February after every two years.
Date and Time of Harvest	The date must be mentioned and time must be within the day.
Duration of smoking before harvest.	The time taken to smoke each hive should not exist 30mm to avoid smoke getting adhered to honey and material should come from the forest.
Time and date of deposit at the conditioning centre	The time to smoke should be stated to make sure that the honey is harvested and bring to conditioning before 24 hrs.
Training report of internal controllers.	A panel of controllers are trained to carry control and monitor the activities of operators in the Delimitation zone
Annual internal control (all control report, statistics of internal control, list of recalcitrant producers and measures taken.	All control reports are compiled to annual reports and recalcitrant producers and sanction according to their offence as defined in the role of operation.
Annual protocol report for all inspection carried	The reports are examined and compiled to annual reports by president.
Type and nature of sanctions	The list of sanction is stated in relation with the offence as follows: time warnings, remarks and dismissal or legal charges.



SOME STANDARDS POINTS FOR BEE FARMERS IN KILUM-IJIM FOREST

- i. Bee keepers shall use both traditional and modern hives. Modern hives should not be painted with oil paint
- ii. Bee keepers shall use combs or clean combs approved by the cooperative
- iii. The apiary should be located in the forest (Kilum –Ijim) in zones with enough forage and water
- iv. Apiaries should be located in adequate distance (2KM) from forest periphery
- v. Pests in apiaries shall be managed through physical, biological and use of allowed inputs
- vi. In extreme situations, beekeepers may feed their bees using organic honey
- vii. Bee keepers shall harvest only ripe honey at least 75% capped
- viii. Do not over smoke during harvest
- ix. Avoid killing of bees or harvesting g of broods
- x. Use clean containers and equipment during harvesting
- xi. Leave at least 30% of honey during harvesting
- xii. Honey combs shall be delivered to collection centres within 24 hours after harvesting
- xiii. Bee keepers shall keep records of their organic apiary activities

INTERNAL CONTROL SYSTEM DOCUMENTATION

- One of the things required is keeping documents - documentation
- Each group should ensure that internal control document meet certification requirements,
- Each producer understands the use and relevance of the developed Geographical Indication Product certification in order to respect it.

Records must be inspected and evaluated as part of internal and external inspections,

Each producer must participate in the developed of their own records often ICS provides supports in their proc

IMPORTANT MANAGEMENT DOCUMENTS FOR OKU WHITE HONEY COOPERATIVES

- Producer lists (by community or zone, approved in transition or sanction),
- Regional maps community zone,
- Harvest results/ totals by community and by producer,
- Transport and storage record,
- Processing record,
- Sales and export record,
- Internal regulation
- Producer loading systems,
- Staff qualification; conflict of interest statement,
- Training: extensions, internal inspectors and reviewers.

DOCUMENTS THAT BEE FARMERS MUST HAVE

- Farmers contract with KIWHA,
- Farmers basics data form (include field history),
- Maps,
- Notes on training or advice given to farmer,
- Farm inspection checklist : 01/year
- Annual consolidated field records: use of inputs.



