



EXPORT PROMOTION OF
ORGANIC PRODUCTS FROM AFRICA

Practical Guide

For Organic Beekeepers





EPOPA (Export Promotion of Organic Products from Africa) is a development programme initiated by the Swedish International Development Cooperation Agency, Sida, in 1997.

EPOPA offers thousands of African smallholder farmers opportunities for improved livelihoods through the development of organic products for export.

The programme has been evaluated twice and has proven to deliver both increased business for exporters and increased income for farmers.

For more information about EPOPA visit: www.epopa.info

EPOPA is implemented by a consortium of Agro Eco BV and Grolink AB, specialised organic consultants.



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1. Introduction

This document was developed as a practical guide on organic beekeeping for African small-holders who are beekeepers or have an interest to start beekeeping. Traditionally beekeeping in Africa is a man's activity as traditional beehives are hung high up in the trees and women are not supposed to climb trees. By moving the beehives onto the ground, it not only opens the possibility for women to become involved in this activity but also to regularly monitor the bee colonies thus improving their management.

Traditional bee keepers burn out the colony when harvesting the products. In organic beekeeping this is not allowed. This practical guideline is developed with a lot of pictures and with limited text for use by small holder farmers.

2. Variety 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.

3. Life cycle

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 into 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

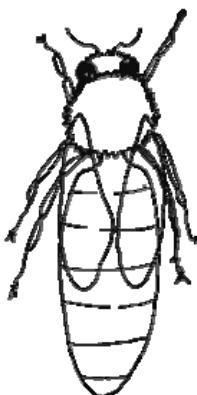
Adult bees are workers, drones, and queens. Around 50.000 workers, 200 to 500 drones and 1 queen live in a well-established colony.

4. 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 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, 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 failing or infertile. If a queen leaves a colony (swarming), half of the bees will follow her.



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

Colony bees	Worker	Queen	Drone
Sex	Female	Female	Male
Size	Small	Large	Medium
Size eyes	Small	Small	Big
Number in hive	20.000 – 60.000	1	0-200
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
Development time	21 days	16 days	24 days
Produced in	Worker/honey cell	Queen cell	Enlarged cell
Lifespan	40 – 140 days	Up to five years	90 days

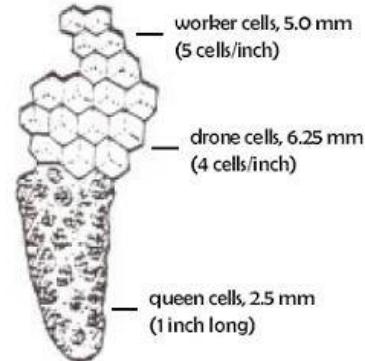
Drones

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.



Cells

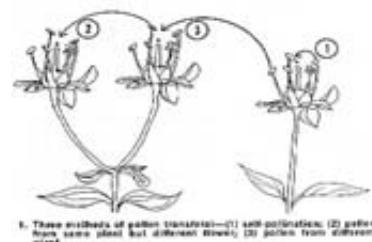
Whether larvae will develop into a worker, a queen or a drone depends on the type of cell the egg is laid. Workers are produced in worker cells, the same cells used for honey and pollen storage. Drones are produced in larger cells, or in worker cells with enlarged capping. Queen cells are much larger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



5. 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. Beeswax is used for candles, polish, food processing, cosmetics, medicine etc.

Propolis

Honeybees 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 the bees use it to disinfect hives to 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. The picture shows a three-day old larvae floating in royal jelly. 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.

6. Apiaries

Apiary sites

An apiary is a place where beehives are kept. The number of hives depends on the bee forage and water availability but must not exceed 20 hives. Bees forage up to 3 km so apiaries should be situated within a minimum distance of 3 km from bee forage places.

- Hives in small groups
- Bees prefer to work up hill
- Bees prefer to work along rows of produced crops
- Near good nectar forage places (forest, trees, nectar producing crops)
- Recommended distance from house 100 m.



- Near water source but not near large rivers as bees must cross the river to collect food.
- In shade, no direct sun, enough air circulation
- Hives entrances should not be placed into prevailing wind.
- Fencing around larger apiary sides avoiding disturbances with animals and humans.

Apiary management

- Keep the apiary clean; cut grass and prune trees. This will prevent disturbing insect ants from entering the hive.
- Keep quiet in the apiary place.
- Increase nectar sources like trees.
- Observe the beehives, are bees gathering nectar, pollen, propolis, are they irritated.
- Inspect hives regularly, preferably every two weeks. Inspect on Brood In All Stages (BIAS; eggs, larvae, capped cells) cells filled with honey, pollen, any problems, pests)
- Remove old combs from empty hives



7. Hives

Apiary sides

An organic hive is made of natural material with exception of small materials and roofing. For proper management, hives should have one side that can be opened, this can be situated at the back at or at the top. Hives can be made from:



Clay and mud



Bark hives



Log hives



Kenya Top Bar Hives



Baskets

8. Foraging

As nectar secretion is dependent on many factors (climate, weather, and soil), certain tree species may not be good nectar producers when introduced into a new region. Check to see if a tree species is a good nectar producer under the conditions in the area where it will be growing, before advocating its use as a nectar source for bees.

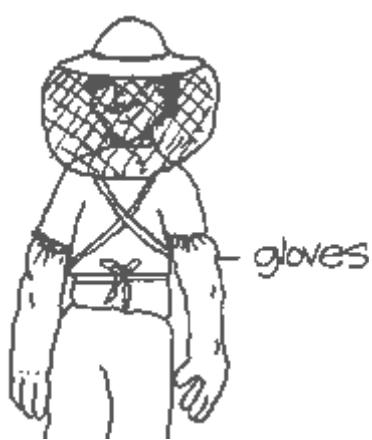
Nectar flow

Rainfall, temperature and sunlight affect the plants and thus determine the actual nectar flow. The quality, or sugar content, of nectar also varies among the different plant species. Weather also has an effect on quality. High rainfall promotes nectar secretion, but such nectar is often very low in sugar content. Conditions promoting optimum nectar flow are adequate rainfall previous to flowering and dry, sunny conditions during the flowering period.

Some good forage trees:

<i>Acacia baileyana</i>	<i>Calistemon citrinus</i>	<i>Gmelina arborea</i>	<i>Ligustrum lucidum</i>
<i>Acacia spp.</i>	<i>Croton megalocarpus</i>	<i>Grevillea robusta</i>	<i>Malus spp,</i>
<i>Albera caffra</i>	<i>Calodendrum capense</i>	<i>Guazuma ulmifolia</i>	<i>Melaleuca spp</i>
<i>Albizia lebbek</i>	<i>Ceratonia siliqua</i>	<i>Halleria Lucida</i>	<i>Pithecellobium dulce</i>
<i>Avicennia spp.</i>	<i>Erythrina spp</i>	<i>Inga vera</i>	<i>Prosopis juliflora</i>
<i>Azadirachta indica</i>	<i>Eucalyptus camaldulensis</i>	<i>Jacaranda</i>	<i>Prunus serotina</i>
<i>Bauhinia variegata</i>	<i>Eucalyptus citriodora</i>	<i>Kigelia africana</i>	<i>Rhizophora spp.</i>
<i>Burchillia bubalina</i>	<i>Eucalyptus globulus</i>	<i>Langunaria pattersonii</i>	<i>Syzygium cumini</i>
<i>Calliandra calothyrsus</i>	<i>Gliricidia sepium</i>	<i>Leucaena Leucocephala</i>	

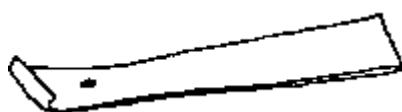
9. Protective wear and equipment



When working with bees, people need to protect themselves to avoid getting stung. Veils can be made of metal or plastic screen, of nylon mesh, or of mosquito netting. A veil is usually made to fit over a wide brim hat, which serves to hold it away from the face and neck. Elastic rubber bands, or strips cut from an old tire tube can be used to hold them onto the hat. The mesh material of the veil should preferably be dark. This limits reflection, which gives better sight when working in bright sunlight.

As with veils, gloves are good confidence boosters for beginners.

Gloves can be



made of leather or of heavy, light-coloured cloth. Gauntlets that reach the elbow and have elastic to hold them tight, give protection to the wrists.

The smoker is used to produce smoke, which causes the bees to consume honey, reducing their tendency to fly and sting. Smoke also directs bees away from the area around the hive where the beekeeper is working. The smoker consists of a firebox with a grate to hold the smouldering material, a nozzle to direct the smoke, and a bellows. The firebox should hold enough fuel so that it does not have to be refilled frequently when working with the bees. Heavy smoke will affect the honey quality negatively.

A hive tool is the most useful piece of beekeeping equipment. It can be used to pry up the inner cover, pry apart frames, scrape and clean hive parts, and do many other jobs.

10. Handling bees

Most bees will not attack if left alone. If provoked, a bee will sting in defence of its colony or itself.

Avoiding bees stings:

- Avoid perfumes, scented lotions and alcohol when working with bees.
- Sweat angers bees so if you are sweating bath before working with bees.
- Avoid wearing brightly coloured or patterned clothing. Wear light coloured clothing.
- Handle bees gently; move in slow motion.
- Attend to bees in the evenings.
- Do not stand in front of the beehive entrance, so that bees can freely enter the hive without any disturbance.

Remove the sting by scratching (scraping) with your nail. Never pull out the sting between thumb and finger as you might squeeze the venom sac, resulting in pushing the venom inside your body.



11. Comb

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 brood:

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 brood 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.



12. Swarming

Swarming is natural colony division or reproduction, which happens when a colony is getting too large within the hive and abundant forage, is available. A honey-bound brood nest is another factor in stimulating swarming. Queen cells or swarm cells are usually located around the edges of the comb. A few days before a new queen emerges the old queen leaves the colony with half of the workers. Swarms usually fly in the same direction and look for suitable places to start a colony site. If the colony was very big, an after swarm can occur after the initial swarm. Then the new virgin queen leaves the hive with again half of the colony.



Absconding

Absconding is the abandonment of a nest site by a colony, usually due to excessive disturbance of the colony by predators or beekeepers, or diminishing resources in an area (forage, water, too much sun, too windy etc.). Absconding is common in tropical species and races of the honeybee. Leaving honey at harvesting for the colony can reduce absconding.

Attracting swarm

In a (new wooden) hive:

- Burn two sheets of newspaper inside the hive.
- Smear the hive with wax and propolis.
- Place the hive in a tree on a tracking route
- Rubbing with aromatic plants (lemon grass)
- Place some new empty combs inside the hive

Sweeping the swarm into a hive when it is found clustered in a branch can catch swarms. If the queen is in the hive the swarm is likely to stay as well. If the bees fly away again the queen might not be there and sweeping the colony in the hive needs to be repeated.

Hiving a swarm

If the swarm is on a low limb or bush, remove some of the top bars of the hive, put the hive under the swarm, and shake the swarm directly into the hive. It is also possible to cover such a swarm with a large bag, shake the swarm into the bag, and transport it to the hive. If the swarm is clustered on a high limb, cut the limb and lower it carefully with a rope.

It is necessary for the queen to be in the hive if the bees are to stay. If the bees return to the original cluster site or cluster in another place, most likely the queen is in the cluster. Try again to shake or dump the cluster in the hive. Although it is not necessary to find the queen, it is helpful to see her and know

where she is. A small screen-wire cage or a matchbox is handy to enclose the queen. Catch her from behind by both wings and guide her into the cage. If she is caught by one wing or by one leg she may twist and hurt herself. Never grasp the queen by the abdomen. This area is soft and you can injure the reproductive organs.

Harvesting Honey

- Wear protective clothing and make sure you have all the equipment needed.
- Use clean equipment (knife and buckets)
- Only harvest combs that are for at least $\frac{3}{4}$ sealed to obtain ripe honey.
- Harvest in the evenings.
- Use as little smoke as possible.
- Leave some honey remaining for the colony.
- Do not harvest combs containing brood.

Honey storage

- When sealed comb is harvested, place it in a bucket and close the bucket properly.
- The bucket should be clean and free from foreign odours.
- To reduce moisture content in the honey, the sealed comb can be placed in a warm room 30-35°C only if relative humidity is low outside (meaning only during dry seasons).



Development through organic trade

Since the early 1960s there has been a growing market in Europe, Japan and the USA for products grown in a sustainable manner and without the use of agro chemicals. The organic market has grown from US\$ 13 billion in 1998 to US\$ 30 billion in 2007. This is due to the increasing environmental concerns by the consumers in these developed countries. As such, they are willing to pay premium prices for certified organic products. Slowly but surely, governments, as well as development cooperatives, are recognising the contributions that organic agriculture can make to environmental, health, bio-diversity and food security issues.

The aforementioned situation made for a good opportunity for African countries to find premium export markets. Thus, the EPOPA programme – Export Promotion of Organic Products from Africa – was birthed by Sida in 1997.

The first two phases of EPOPA-programme from 1997-2001 and from 2002-2004 proved to be successful. In total more than 100,000 smallholders in Tanzania, Uganda and Zambia have participated. It is encouraging to note that the first two projects initiated by EPOPA, involving 30,000 farmers, are self-sustaining to this day.

The price that the farmers receive for their cash crops is 15 to 40 percent higher. Many farmers report a significant increase in productivity due to more intensive crop management measures. The farmers also produce their own food organically.

The farmers also appreciate the extra attention given to them by the extension workers and generally respond to that by caring more about farming.

The higher prices are not achieved by the organic qualification only but also by better quality products and in some cases, by more direct trading structures. In one project, the exporter is also on the fair trade coffee register. These three aspects together resulted in a 50 to 100 percent increase in income.

Read more about EPOPA at: www.epopa.info