



## Factsheet

# Beekeeping and sustainability

For thousands of years beekeeping has been a craft using low-impact technologies to deliver great benefits to people and biodiversity. In the last hundred years, apicultural practice in Britain and many countries world-wide has become increasingly focused on expensive equipment, intrusive management, and the monitoring of disease. Honey production and pollination of monocultures have been prioritised over the health of the superorganism and wider bee populations. This factsheet introduces a discussion about beekeeping and sustainability.

*Beekeeping is sustainable when the interactions between humans and bees maintain healthy populations of locally-adapted indigenous (where possible) bees, living in the wild and in the apiaries of beekeepers, bringing benefits to people and to biodiversity.*

### What is sustainability?

Sustainability has three dimensions:

- **Environmental** – the ability of natural ecosystems to maintain their biological processes and functions
- **Social** – the ability to meet our own needs without compromising the needs of future generations
- **Economic** – the just and equitable use and re-use of resources

Each of these is important. Beekeeping must contribute positively to local biodiversity; it must be appropriate and beneficial for communities now and in the future; and it must balance its use and production of resources.



*Honey bee swarm: natural reproduction supports the process of adaptation*

### What makes beekeeping sustainable?

In recent years there has been a growing interest in more natural approaches to keeping bees. This has arisen because some beekeepers are beginning to question the ubiquity of the frame hive as a bee management tool, and advocate top-bar hives or fixed comb hives as alternatives. The frame hive was invented in the 19th century and it allowed beekeepers more opportunity to manipulate the honey bee colony for production and profit. However it is a mistake to reduce a discussion on sustainability to one about hive type alone. In this factsheet we explain that for beekeeping to be sustainable one must consider issues beyond the hive, beyond the colony and instead take a look at the wider environment and the bee population as a whole.

## An Ecosystems Approach to sustainability in beekeeping

The role of honey bees within an ecosystem is the primary consideration. The relationship between bees and people has become central to this understanding. People can damage irretrievably the balance between bees and their environment. Our actions can have direct and indirect consequences on the population of honey bee colonies within an area. Direct effects are the transfer of pests and diseases, resulting from the introduction of diseased bees or contaminated/ed equipment by beekeepers. Imported bees can have deleterious effects on local bee populations. Indirect consequences occur through environmental damage such as destruction of habitat, or through poisoning at lethal and sub-lethal levels by the use of pesticides, agrochemicals and pollution<sup>(1)</sup>.

The welfare of honey bees lies at the heart of sustainable beekeeping: health resides not just in an individual colony, but in the whole honey bee population of a region. Beekeepers have often focused on their own apiaries, ignoring wider welfare. However honey bees behave without regard for human boundaries. They can forage 10km from their nest to find diverse sources of nutrition<sup>(2)</sup>; and their mating is away from the nest with drones (males) from many distant colonies. Honey bees require extensive, viable populations to retain population diversity and colony resilience<sup>(3)</sup>.

The honey bee species used in beekeeping in Europe, Africa and parts of the middle East, is *Apis mellifera*, a wild insect that is indigenous to this region. This species of honey bee has been introduced to nearly every other country world-wide and is the bee upon which industrialised beekeeping is based. These bees are not 'domesticated,' and yet because they store honey and make beeswax, people have long been interested to exploit them for these useful products. This has led to a close relationship between bees and people, and we can consider this relationship in three interacting dimensions:



*Removing comb from the hive allows inspection and management, but stresses bees*

- **Environment:** people have an impact on bees through our management of the natural environment, their habitat for nesting and feeding
- **Genetics:** people have an impact on the distribution and genetic diversity of bees through moving them outside their natural range, breeding, selection and queen importation
- **Management:** people have an impact on bees through colony manipulation, hive technology and management practices.

## Clean and flower-rich landscapes are vital

Bees need a clean, flower-rich and diverse landscape. They require sources of nectar and pollen, propolis (plant resins) and water. Diverse and nutritious forage is vital; and food and water must be free of contaminants injurious to insect health.

Bees and flowering plants have evolved together over millions of years. Without flowers, we would have no bees, and without bees we could not have flowers. They are inter-dependant. Bees collect

nectar, high in sugars, from flowers. This carbohydrate gives them energy to live, to create beeswax to build their nest structure, and to maintain and regulate the temperature of their nests. Pollen provides the proteins, lipids and micronutrients necessary to raise their young. In this process of nectar and pollen collection, bees pollinate the flowers, enabling sexual reproduction and adaptation to occur. Propolis (resin collected from tree buds and sap) is their medicine: it contains anti-viral and anti-microbial compounds and disinfects the nest. Water is used to cool the nest in summer, and to dilute stored honey for them to eat.

Bee populations are declining as a result of “multiple interacting causes of death”<sup>(4)</sup>. These are human-induced: flowerless

landscapes, monocultures (which become food deserts for bees for much of the year) and pesticides (including insecticides, fungicides and herbicides). When bees are malnourished, diseases and parasites have greater impact. But the situation is remediable: everyone can plant bee-friendly flowers, and stop contaminating them with pesticides. Trees are good sources of food and nest sites, hedgerow shrubs provide shelter and forage through the year, and native flowers in meadows and verges provide pollen and nectar at crucial times of reproduction and preparing for winter.



*Wax combs, built by bees, are the foundation of a honey bee nest*

## Locally adapted bee populations are thriving and healthy

Sustainability in beekeeping depends on the suitability of bees to their local environment. Honey bees collect honey to feed themselves through the winter: their survival depends on their ability to make best use of the resources available to them during short flowering seasons. Bees imported from other regions may not adapt to the British weather. Mild winters, long cold springs, and cool wet summers can increase stress, disease and the possibility of starvation in poorly adapted bees. Historically, the importation of bees and queens has diluted the genetic fitness of wild bee populations and spread parasites and disease.

Healthy colonies require queens to mate successfully with many drones from different colonies. Polyandry brings genetic variability to the worker offspring; the advantages are improved social organisation and tolerance of changing environmental conditions. Natural mating behaviour allows bees to optimise their adaptability and resilience. Beekeepers can contribute to the genetic fitness of the bee population in their area by keeping only local bees, never importing queens or bees, and allowing natural mating.

## How bees want to live

Sustainable methodologies are determined by the way the bees want to live. Bees do not need beekeepers for them to survive, but they do need people to stop destroying and poisoning their food, habitats and nests. Bees in extensive natural systems in Africa remain healthy despite the presence of pests and diseases; research in Europe is increasingly demonstrating that ‘unmanaged’ colonies are able to resist parasites such as *Varroa* (Note 1) <sup>(5)</sup>.

Many different hive types are used worldwide. The type of hive determines to some extent the way the honey bee colony housed therein is managed. All beekeepers, regardless of hive type used, can adhere to the principles of sustainable beekeeping provided they regard and prioritise the welfare of the superorganism – rather than focus exclusively on production of profit for the beekeeper. The natural processes of the colony life cycle must be respected. This may lead to some reconsideration of conventional bee management practices. For example, honey bee colonies reproduce naturally by division (swarming), resulting in an increase in the number of colonies and consequent diversity of the population. Beekeepers who try to prevent swarming in order to maximise the size of the colony and the honey harvest run the risk of compromising genetic diversity and undermining sustainability.

## Key principles

Natural management is based on key principles. These principles are not dependent on particular hive types but are generally applicable to all beekeeping.

- The bee colony is treated as a complete organism
- The natural processes of the bees are respected
- The heat, scent and humidity of the nest are maintained at all times
- Intrusion into the colony is minimised
- Bees make all their own comb
- The bees' own swarming impulse determines reproduction
- Bees overwinter on their own honey
- Bees are local, adapted to local microclimates and environment
- Colony density is appropriate to forage availability and maintenance of health.

Regular observation allows the beekeeper to understand and recognise the health and development of the colony. Management is informed by the bees' own needs. Interventions are minimised, using three broad principles:

- Do not put anything into the hive which did not come from the bees
- Do not take anything out of the hive which the bees cannot afford to lose
- Be guided by the bees.

## The way forward

Declines in bee health are leading many beekeepers to rethink old assumptions about bees, and to focus on bee health more than profit. Books, conferences, web forums and training courses offer fresh alternatives to conventional thinking, and membership of natural beekeeping groups is increasing steadily <sup>(6)</sup>.

**Bees for development** regularly participates in and contributes to the debate on sustainable beekeeping. Our Ecosystems Approach to Sustainability has been developed in collaboration with beekeepers from Britain and partners in our international network. Thank you to all who are working alongside us to make a better future for bees and people.

## Links

Bees for Development: information, training courses

[www.beesfordevelopment.org](http://www.beesfordevelopment.org)

The Barefoot Beekeeper: web forum for all natural beekeeping

[www.biobees.com](http://www.biobees.com)

Natural Beekeeping Trust: biodynamic beekeeping

[www.naturalbeekeepingtrust.org](http://www.naturalbeekeepingtrust.org)

## Notes

1. *Varroa destructor*, a parasitic mite of the honey bee originating from another honey bee species in Asia, has been carried around the world by beekeepers transporting colonies

### References

1. PAN-UK: Bee Declines and Pesticides Factsheet 2, (2012) *Sub-lethal and chronic effects of neonicotinoids on bees and other pollinators*, PAN-UK
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3. Ruttner and Ruttner 1966;
4. Winston, M. L. *The Biology of the Honey Bee* (1987) Harvard University Press, USA
5. Cushman, D.: *Mating frequency in honey bees*. dave-cushman.net
6. Spivak, M. *Why bees are disappearing*, (2013) TED talk, Edinburgh
7. Locke, B., Conte, Y. L., Crauser, D., & Fries, I. (2012). *Host adaptations reduce the reproductive success of Varroa destructor in two distinct European honey bee populations*. *Ecology and evolution*, 2(6), 1144-1150.
8. **Bfd**: Debate on sustainable beekeeping (2009). [www.beesfordevelopment.org](http://www.beesfordevelopment.org)

These fact sheets are published by **Bees for development** as a key part of our Learning and Knowledge Programme. Our intention is that all beekeepers and organisations that support them have access to the information they need to build sustainable beekeeping livelihoods and know how to use and care for our environment wisely.

Please use this information in the education of others and acknowledge **Bees for development**.

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