FACTSHEET

Top-bar hive
Bee space

Movable-comb technology

The use of a top-bar hive - a form of movable-comb hive – opens up exciting new opportunities for beekeeping in many parts of the world. To get the most out of this technology it is important to understand the principles which underpin the design, and their limitations. Poor understanding can lead to disappointment, wasted resources and failure.

The importance of bee space

Although top-bar hives can often look crude, especially if they are made of simple local materials, the ideas underpinning them are very sophisticated. They are based on the vital concept of the bee space. Combs in a honey bee nest are built in a regular manner with clear spaces between them so the bees are able to pass freely around the nest. All the combs are built with the same spacing between them. This space is precise and the bees maintain it carefully. If the bee space is exceeded the bees will fill it with comb known as brace comb. This simple observation made so long ago allowed the development of movable-comb top-bar hives. In northern races of *Apis mellifera* the bee space is accepted as ranging between 7 and 9 mm. In smaller tropical bees the space is correspondingly less. In practice it is the distance needed for two worker bees to pass comfortably back-to-back between the comb faces. Knowing this can help when working out hive design specifications. In particular it is essential knowledge to work out the top-bar dimensions. It cannot be emphasised enough that accurately sized top-bars are the key to successful movable-comb beekeeping. If the top-bar size is right the bees will oblige by building one comb from each top-bar. The correct size will vary slightly from place to place depending on the local bee type and ideally should be determined experimentally by measuring local bees and comb. However in general it is fairly safe to use a top-bar width of 32 mm for African *Apis mellifera* honey bees, 35 mm for northern *Apis mellifera* honey bees, and 29 mm for the Asian hive bee *Apis cerana*. *Apis cerana* varies greatly in size throughout the region where it occurs as does *Apis mellifera*. Notice that this spacing is not the same as the bee space but incorporates both the bee space and the width of the comb to give a measurement that goes from the centre of the first comb to the centre of the next one.

Bee space is the gap between combs and is regular as seen in this image.

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Comb shapes

To make it easy to move combs it is good practice to try and avoid side comb attachment. One way to do this is to look at how honeycombs are shaped if the bees have a free choice. Combs are only attached at the top and not at the edges which taper to become very thin, with a slightly ribbed reinforcement along the edge. This special form is called a catenary curve and describes the wide topped gentle 'U' shape of natural comb. This applies to comb from all species of honey bees. The sloping sides of the standard designs of top-bar hives attempt to reflect this natural catenary shape. This allows the bee space rule to be observed all down the side of the hive where the comb is built in its natural form without the constraining influence of a frame. Where a curved comb is built in a square box there is always the possibility that the bees will attach the comb to the side of the box because the bee space has become too large. Making hives with sloping sides is harder (and so more expensive) than making hives with straight sides. This is why some

people choose to use straight sided top-bar hives and manage side-attachment by ensuring the hive depth is relatively shallow – which reduces the bees' need to use side-attachment for comb support.

Precise measurement

It is ideal if beekeepers are able to make their own equipment as this means the technology can be used in remote locations and where people lack resources to purchase inputs. If beekeepers make their own top-bar hives it allows them to experiment with the technology at little cost or risk. In practical terms however, the hardest part is to cut accurate top-bars for the hive and it is often necessary for the beekeepers to purchase top-bars from carpenters. A very real concern with top-bar hives is that if the top-bars are not well made or of the wrong dimension, the bees will not build one comb neatly on one bar, and the advantages of the technology are lost.

Top-bar hives can be an efficient beekeeping tool because they allow the same flexibility of management as a frame hive. It is the potential for sophisticated management combined with low costs that makes the top-bar hive ideal in many situations. Top-bar hives can help to improve yields and simplify harvesting without the need for the complicated equipment that has become essential for beekeeping in industrialised countries. There is no management activity that can be done using a frame hive, that cannot be done in a top-bar hive, although slightly different techniques may be needed. However the underlying ideas behind the use of top-bar hives need to be thoroughly understood. It is also most important that beekeepers are quite clear about what exactly they want to achieve before abandoning other tried and tested local and traditional techniques.

Above. Top-bars taken from one hive. This mistake of having top-bars of different widths must be avoided

Right. Top-bars machine-made at a carpentry workshop. The advantage is the precision and quality of the bars – yet the cost may be prohibitive

A top-bar of the correct dimension encourages bees to build one comb per bar, enabling the combs to be moved