



**Eva Crane Trust**

## **ECTD\_201 (i)**

**TITLE:** Beekeeping

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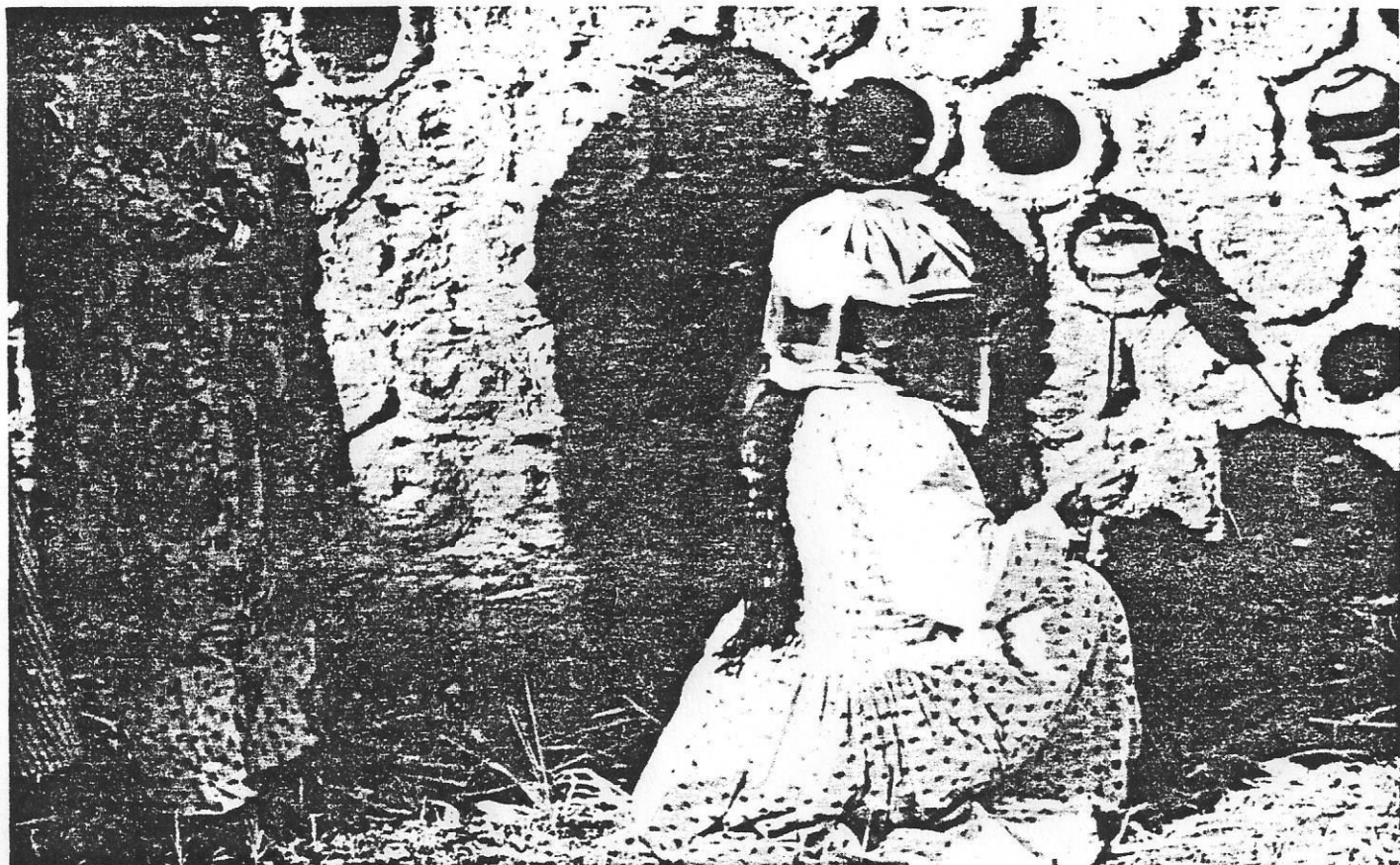
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[for more equipment see ECTD\_201 (ii)]

## 12. BEEKEEPING



DR. E. CRANE

Collecting honey from a traditional Egyptian hive.

Throughout history, and in all regions, beekeeping has been a specialized occupation of certain communities or families, remaining a mystery to the population as a whole. This is still true today, although now there are also large commercial beekeeping enterprises, and state and collective bee farms. The range of beekeeping operations in the tropics and subtropics is greater than anywhere else — from primitive honey hunting to some of the largest beekeeping enterprises in existence. Most of the honey exported onto the world market is produced in the subtropics.

Honey production involves both stock rearing (bees) and the handling and processing of food (honey). Widely differing items of equipment are therefore used, at various technological levels. In general a knowledge of beekeeping is necessary in order to understand the design and use of the equipment.

In addition to the different technological levels,

beekeeping in the tropics and subtropics uses bees of different species and races, each with its own characteristics. Most beekeepers in temperate-zone countries are familiar only with the European honeybee *Apis mellifera*.

### BEES KEPT IN THE TROPICS AND SUBTROPICS

Some beekeeping equipment must be precision-made according to the size of the worker bees. Bees build parallel combs at a precise distance apart, depending on the body size of the worker, and frame hives will not succeed unless they conform to this distance.

#### *European and Mediterranean bees*

The most widely used bees in the world are European *Apis mellifera*. Most of the equipment sold, and thus most of the entries in this catalogue, is for use this

## Beekeeping

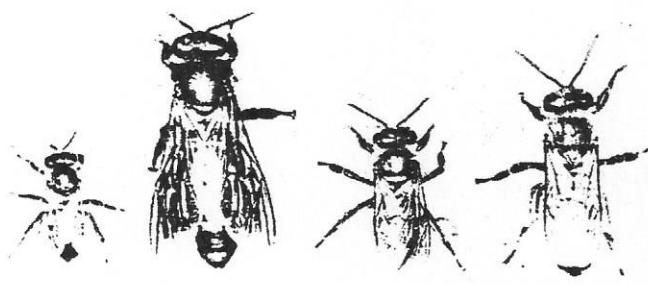
bee. The modern movable-frame hive was developed in the last century for this temperate-zone bee. It was not designed for tropical honeybees, and much time and effort have been wasted in the past by trying to manage tropical bees in the same type of hive, and by the same methods.

Various types of European bees were taken overseas, and their descendants are the bees used in most parts of the New World, where there are no native honeybees. European bees are now widespread in the Americas, Australia, New Zealand, and some of the Pacific islands. In the Mediterranean region — including Africa north of the Sahara — fairly distinct types of *Apis mellifera* are native. Some of them (in Israel, for instance) are now largely replaced by more productive bees of European ancestry. However, except in an isolated oasis or island, such replacement must be a continuing process, since new young queens are likely to mate with native drones, giving hybrid offspring of little use.

### African bees

Tropical Africa also has native *Apis mellifera*. They are slightly smaller than European *Apis mellifera*, and their behaviour is notably different. They are more readily alerted to fly off the comb and to sting, and when one bee stings, others are attracted to sting at the same place. Colonies are liable to abscond from their hives if disturbed, and in some areas the colonies migrate seasonally. These are paramount factors governing bee management and hive design.

In Madagascar the native honeybee is a subspecies *Apis mellifera unicolor*, and this bee was introduced in past centuries to islands previously without honeybees, including Mauritius and Réunion. European bees are introduced successfully (and of necessity continuously) into these islands. In the very south of mainland Africa is *Apis mellifera capensis*.



Workers of the four honeybee species: from left '*Apis florea*', '*Apis dorsata*', '*Apis cerana*', European '*Apis mellifera*'.

### Asian bees

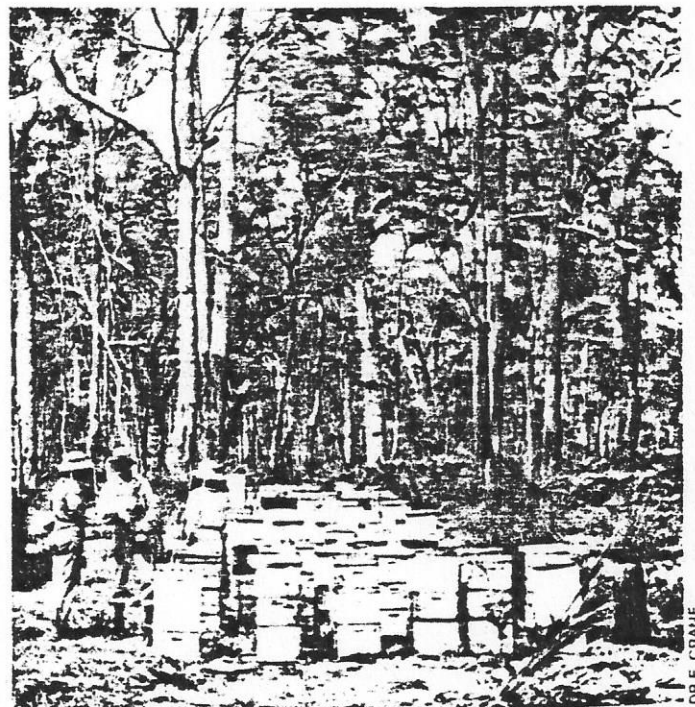
Asia is the most complex continent with regard to honeybees, there being three native tropical species, *Apis cerana*, *Apis dorsata*, *Apis florea*. There are *Apis mellifera* native in the west (Turkey, the Levant, Iran, Iraq, etc.), and European *Apis mellifera* has also been introduced in many places elsewhere. *Apis cerana*, the Asiatic hive bee, looks like a smaller version of *Apis mellifera*. In India and elsewhere it is kept in small frame hives. The size of *Apis cerana* varies more than that of *Apis mellifera*. The smallest are found in parts of lowland tropical Asia, and the largest in the western Himalayas; the latter are about the size of *Apis mellifera*, and European-type hives and fittings can be used for them.

In eastern Asia *Apis cerana* has spread northwards as far as China, Korea, Japan and the Far East of U.S.S.R., i.e. into the north temperate zone. *Apis mellifera* has been introduced into these same regions, and is now used in many agricultural areas where it is much more productive than *Apis cerana*. It is the basis of the beekeeping industries of the countries concerned. Beekeeping with *Apis cerana* tends to be a separate activity, often employing traditional fixed-comb hives and management methods, confined to hill country with native flora, where *Apis mellifera* would not do as well.

*Apis dorsata* and *Apis florea* build a single comb in the open, and cannot be kept in enclosed hives. Both live only in the tropics of Asia. *Apis dorsata* is the largest of the honeybees; its comb may be a metre or more across, and it yields much honey. The honey is harvested by honey hunters, as described below.

### Bees in Latin America

Latin America has seen a great change in beekeeping during the past thirty years. European *Apis mellifera* was used previously, but in 1956 some tropical *Apis mellifera* queens were introduced from South Africa; their offspring hybridized with the *Apis mellifera* already there, and proved dominant over them; they were 'tropical' bees, whereas the European bees were not. These 'Africanized' bees have now spread throughout much of South America and well into Central America. They still have the tropical African characteristics, including high 'aggressiveness'. This has altered management practices but has also increased honey yields.



Migratory apiary in Australia, where Langstroth hives are used.

## DIFFERENT LEVELS OF HONEY PRODUCTION

### Honey hunting

Certain communities in Asia and Africa get much honey by hunting wild nests of honeybees in trees and rocks. In tropical Asia all of the large honey harvest from *Apis*



*dorsata* is obtained in this way. Honey hunters reach the nests by ladders, or from a rope let down from the top of the cliff above the nests. Although honey hunting is a widespread and hazardous occupation, very little attention has been given to improving the equipment used, and none is on sale as such — so it is not recorded in this catalogue. It may include specially shaped knives to cut the combs out, and appropriate wide containers to catch the pieces of comb and carry them home. A smouldering bunch of twigs, grass, etc., is used to smoke the bees.

Collecting honey from nests of other honeybees (often in trees) is somewhat less dangerous. Combs taken from the nests are put into barrels, gourds or baskets, all locally made. *Apis florea*, whose range extends into China, and as far west as Oman, is used for a primitive form of beekeeping in Oman, but again, no equipment is on sale.

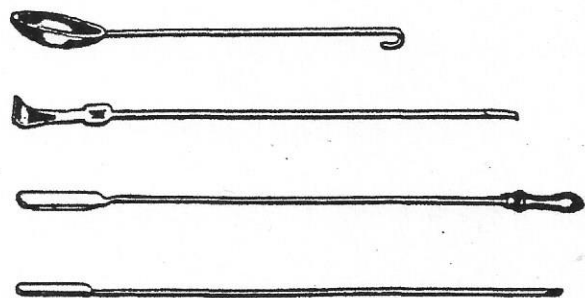
### Traditional hives

Tropical Africa has a rich tradition of beekeeping in hives made locally from a log or bark, earthenware, or basketry of various types. These hives often show a high level of craftsmanship, and some communities have developed careful and ingenious methods of taking honey without killing the bees. Equipment is made locally, and there are no 'suppliers'. Log and box hives are used for *Apis cerana* in Asia. There are other fixed-comb hives, usually with no provision for bee management, and therefore needing no equipment purchased from a supplier.

Another group of bees, the stingless bees or Meliponinae, yield modest amounts of honey in tropical America, and to a smaller extent in Africa. The nests are hunted to obtain the honey, as they are also in the tropics/subtropics of Asia and Australia. Particularly in Latin America, the bees have been kept in log and pot hives using methods probably unchanged for centuries, and also in a few 'improved' hives — but these are not stocked by suppliers.

Both honey hunting and traditional beekeeping are carried out with equipment made locally from local materials, at virtually no cost except for the time taken, and following the experience of previous generations. On the other hand, most beekeeping development programmes are based on improved techniques, and on locally manufactured or purchased equipment. They can give much higher yields, but the introduction of high-cost purchases in place of home-made equipment from local materials changes the nature of the enterprise.

Traditional beekeepers may use specialized tools that they cannot themselves produce, for instance knives and other metal implements for removing combs from long



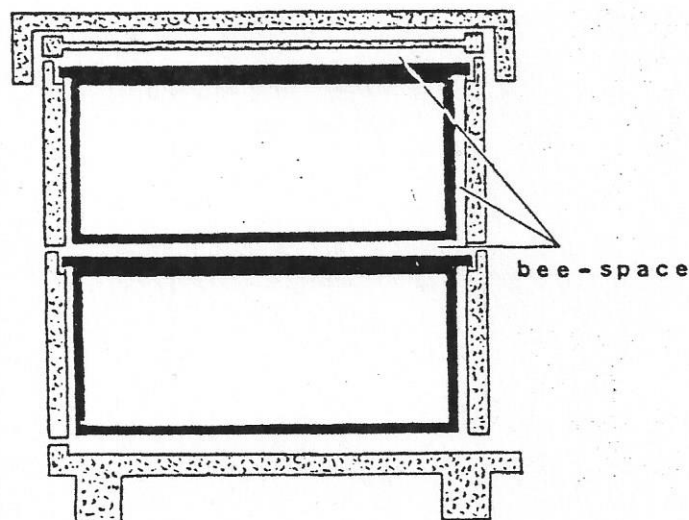
Tools used with traditional Egyptian hives.

cylindrical mud hives. The picture shows a set used with mud hives containing *Apis mellifera lamarckii* in Egypt. Such tools are long-lasting, and a blacksmith would be able to copy them when needed.

### Modern movable-frame hives

There is a great gulf between harvesting honey in the traditional ways — whether by hunting or from hives — and 'modern' beekeeping, for which equipment is purchased. Modern beekeeping is based on the movable-frame hive devised by the Rev. L.L. Langstroth in the USA in 1851. This hive was the culmination of much experimentation in Europe and North America during previous decades. It uses rectangular wooden 'frames' to support the combs the bees build. In a natural nest, combs are spaced so as to leave the same distance (a bee-space) between comb surfaces facing each other. The wooden frames are similarly distanced from each other so that combs are separated by a bee-space. They are suspended on 'runners' like files in a suspension filing cabinet. They are movable (i.e. the beekeeper can remove any one frame at will): they are also suitably distanced from the inside walls of the hive, so the bees 'respect' this distance and do not build comb across it. If a larger space is left, bees will build more comb in it; if less space, they will attach the frames to the hive walls.

Nowadays a hive is made up of several superimposed hive boxes, each with its complement of suspended frames, and frames in one box are also distanced from those above and below by a suitable bee-space. Thus each frame and hive box must be made to quite precise dimensions. Each box must fit exactly on to the one below, with no gaps through which bees could enter or leave.



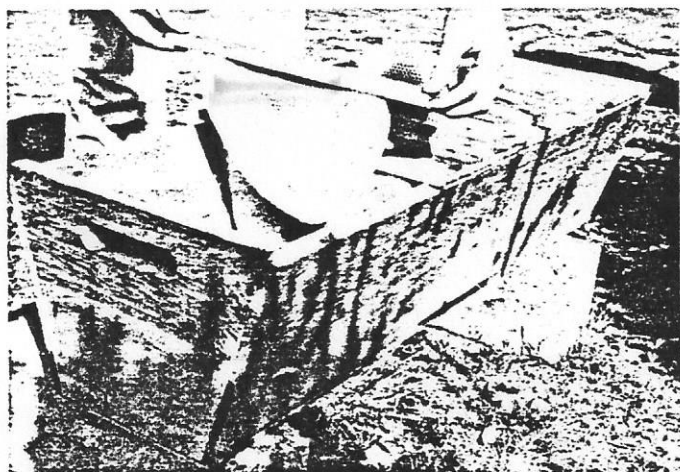
Cross-section of Langstroth movable-frame hive showing bee-space.

### Intermediate movable-comb hives

In the last few decades 'movable-comb' hives have been developed, which are at an intermediate level of technology. Instead of the frames, there is a series of wooden top-bars only, suspended on runners and spaced similarly to the frames. This spacing is the only precision measurement in the hive. The sides of the hive slope inwards towards the bottom. The bees build combs downwards from the top-bars, but do not attach them to the sloping walls. These hives are made as a single,



## Beekeeping

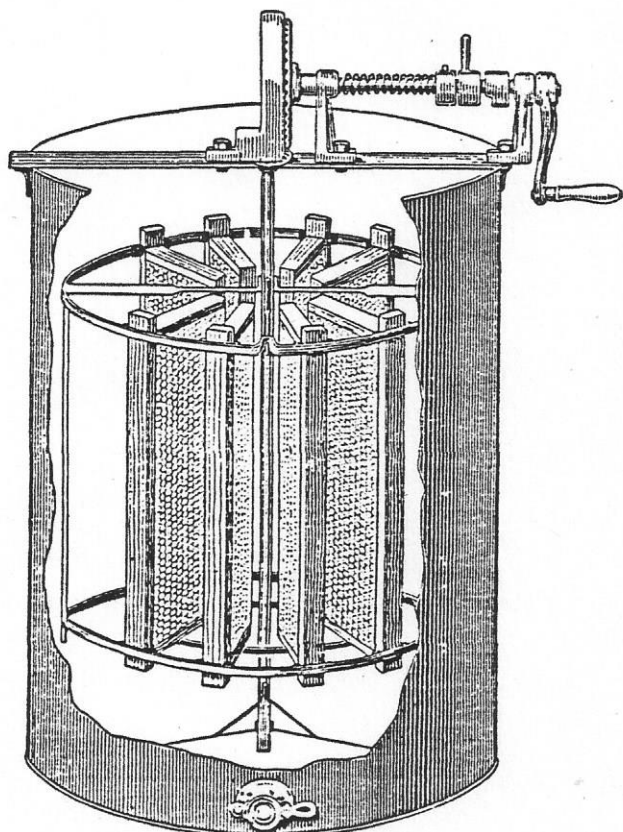


PROF. G.F. TOWNSEND

Intermediate movable-comb hive.

extra-long box accommodating about 30 frames, instead of several movable-frame hive boxes, each holding about 10 frames, and used one above the other.

Another intermediate hive is also a long hive, but it has vertical sides, and is fitted with partial frames (top-bars with end-bars). The partial frames are of a size that will fit a Langstroth hive, so beekeepers can progress from movable-comb to movable-frame beekeeping by transferring their partial frames into Langstroth hive boxes. A few beekeeping equipment manufacturers make these intermediate hives, but otherwise almost the whole of the beekeeping equipment on sale is for movable-frame beekeeping with *Apis mellifera*. This beekeeping is, after all, the basis of the world's honey-producing industry. Movable-frame hives and fittings for *Apis cerana* are on sale in India.



Radial extractor for spinning honey out of the cells in the comb.

## PURCHASE OF EQUIPMENT

### When equipment should be purchased

Beekeeping is carried out on a small scale (up to 20 hives), medium scale (20-200 hives) and large scale (200-50,000 hives under one control). When thinking in terms of equipment appropriate for different scales of operation, the position is made easier by the fact that *the hive is the unit in beekeeping*. In movable-frame beekeeping the hive box is the unit within the hive. Increasing the scale of the operation requires more hives, and more hive boxes and fittings, more bee suits and smokers, more hives set aside for queen rearing, and so on, but it does not use larger hives. Increasing the honey production per hive requires more frames and boxes for each hive.

Increasing the total honey production directly affects the scale of the honey-handling equipment needed. Whether beekeepers produce 100kg of honey a year or 100 tonnes, they must follow similar procedures in handling it, but the equipment must be appropriate for the amount handled. In general, fairly small-scale equipment is described here, on the grounds that beekeepers who have moved on to large-scale operation are likely to have more knowledge of what is available.

Many users of this catalogue are likely to live and work in areas outside those where movable-frame *Apis mellifera* beekeeping is the rule — or indeed is appropriate. For this reason items in the catalogue are arranged in the following order

- Useful for any type of beekeeping, pages 221, 224: protective clothing, smokers, hive tools;
- Used only in movable-frame beekeeping, pages 222-226: hives and fittings, etc., (movable-comb beekeeping, page 222);
- Used for handling hive products, pages 227-230: honey and beeswax extractors, etc.

Some of the equipment for handling hive products is designed for use with the larger yields obtained with movable-frame hives. But, provided a sufficient quantity of honey or wax is to be processed, much of it could be used for other types of beekeeping.

In beekeeping, benefits from using the more expensive precision-made equipment are based on the fact that such equipment allows more and better *management* of colonies of bees. The modern beekeeper aims to manage his or her colonies so that they do not swarm, and their energy is diverted instead to storing more honey which he or she can harvest.

### Advantages of purchasing equipment

Purchase of the equipment listed, from reliable suppliers, has the following benefits:

- The equipment is made in large quantities, using machines that guarantee precision where this is needed.
- The equipment is made of appropriate and well prepared materials (wood, metal, plastic, etc.).
- Some of the materials used are not obtainable in every country. Examples are high quality stainless steel and moulded polyurethane. For the latter, very large numbers of each article must be produced and sold to cover costs.

However, few of the specialist suppliers listed below will be in the same country as the would-be purchaser. It may therefore be necessary to buy a specific piece of equipment from a foreign country. The following are some of the circumstances which would make a

purchase from a foreign country especially useful:

- The equipment is manufactured from materials superior to those available locally, for example from spring steel or stainless steel.
- The design is superior to local design, e.g. honey gates (valves for obtaining a controlled flow of honey from a honey tank, etc.).
- The operation of the equipment depends on critical factors not easily understood from a description, and hence not easily copied by a local manufacturer, e.g. some beeswax processors and pollen traps.
- Manufacture is viable only if large numbers are produced, e.g. moulded plastic honey tanks and containers.
- The precision required, for example for making frames for hives, is not available locally.
- Purchase helps to raise the standard of bee management, e.g. an effective smoker, or to raise the quality of honey and beeswax, e.g. fine-mesh honey strainers.

On the other hand, readers should be warned against purchasing unnecessary gadgets. Some beekeeping suppliers list a few such gadgets to satisfy a local demand — created possibly by publicity in the beekeeping press — but such items do not form part of the basic equipment which is needed everywhere, and their use may waste much time as well as money.

The advantages listed apply to competently run groups and enterprises (including development projects) which have access to capital, revolving funds or loans. They also apply to an individual with some capital, provided he or she has gained enough knowledge to make full use of the equipment, or can be sure of getting instruction whenever he or she needs it. For this individual, acquiring such equipment may be an opportunity to be seized, bringing considerable benefit.

It is different for poor peasant farmers who win their livelihood by using their environment to the best advantage for their crops and animals. A factory-made 'improved' hive of any sort is an alien intrusion in this environment. Unless they can receive constant support in their hive management from outside, they may revert to the familiar hives they made themselves, or they may use the new hive *as though it were* a traditional hive, and thereby forego any benefits from it.

## Indicative costs and benefits

Costs vary from country to country, and according to the quality of materials and workmanship — both of which affect the precision which is essential to effective modern beekeeping. The only manufacturer to quote prices for three types of hive (movable-frame, top-bar, and long African), is John Rau & Co. Ltd. in Zimbabwe. A frame hive with brood box and two honey supers (all fitted with frames) is quoted at (Zimbabwe) \$50, and a top-bar hive or a long hive at \$26. A traditional hive made by the beekeeper from local materials could cost little or nothing.

A competently managed movable-frame hive might yield more or less twice as much honey as a top-bar hive or long hive, and ten times as much as a traditional hive. If the capital and the competence are assured, in many circumstances an upgrading of the level of operation to the most efficient available will give more than a proportionately higher return. If not, then beekeeping

even at the traditional level provides extra food, and modest amounts of honey and wax to barter or sell, with virtually no capital outlay.

## HEALTH AND SAFETY

Accidents constitute the chief hazard to both beekeepers and honey hunters. In one of the few quantitative studies made, the death certificates of 520 male beekeepers in the U.S.A. were examined, names being obtained from obituary notices. Only one cause killed a significantly higher proportion of the beekeepers than of males in the general population — accidents — which killed 32 of the 520, whereas only 19 would be expected. Many of the 32 died after a road accident, but one suffered fatal burns when smoking his bees, and another was asphyxiated when he used a plastic bag to protect his face from stings. Another cause of accidental death among beekeepers has been poisoning by cyanide when killing wasps' nests, or colonies of bees.

In traditional beekeeping in tropical Africa (where hives are sited in trees for safety), and in honey hunting everywhere, the greatest common hazard may be falling in attempting to reach and work at the bees' nest. In any community that harvests honey from wild nests, a honey hunter's rope is likely to be the strongest one the community possesses.

There is a real need for the development of methods and equipment for reducing the mortality among those who collect honey from *Apis dorsata*, as well as for obtaining cleaner and better quality honey from this bee. It might also be possible to make the honey hunter's lot easier by providing efficient smokers, and effective protective clothing, which would however be very hot.

In at least one area another hazard is responsible for most deaths. Honey collectors in the swampy Sunderbans forest at the mouth of the Ganges in India numbered from 913 to 1495 each year in the years between 1963 and 1972. Of these there were 96 casualties from carnivorous animals, an average of at least 1 per cent a year.

The layman might think that stings would be the chief hazard in beekeeping. But apart from the tiny minority of people who are allergic to bee venom, stings present little hazard to the health of beekeepers. Reactions are limited to local swelling and itching, and even these may be absent. Beekeepers normally acquire considerable immunity to stings, and 20 or even 50 stings on one occasion would not necessarily cause more than temporary inconvenience. The greatest number of stings known to have been received by a person who survived them is 2243; other survivors have received 500 or 600.

In the tiny minority of people who become allergic (hypersensitive), general bodily reactions occur: rash, much swelling, difficulty in breathing, and even unconsciousness. Anyone who suffers a general reaction should give up beekeeping and avoid future situations where he or she might be stung. Medical advice should be sought, and in countries where a desensitization course is available, this should be discussed with a medical specialist.

It is always better to avoid being stung, and protection against stings — especially in the eyes or mouth — is strongly recommended. Protective clothing is the first item of equipment described below.



# Beekeeping

## SOCIO-ECONOMIC IMPACT OF CHANGING THE TECHNOLOGY

Beekeeping development does not need high investment or complicated technology. Simple hives can be made from a variety of natural products which are familiar to the rural populations in different parts of the world. Some are already used for traditional hives. Colonies of bees to populate new hives can be obtained by collecting swarms, or by dividing existing colonies. In some places a subsistence farmer can get a higher income from beekeeping than from all the other work he does during the year. Also, in rural areas with subsistence agriculture, beekeeping raises the social standing of successful beekeepers and, by producing honey, beekeepers broaden the food basis of the population.

Whether it is done to produce food for the family or to provide a cash crop, beekeeping allows great flexibility in the amount of time it occupies. According to the number of hives kept, it can be spare-time, part-time, or full-time. Through the formation of co-operatives, beekeeping can stimulate professional and social contacts for the benefit of an entire group of people.

In its simplest form, beekeeping needs no imported technology or investment. If the technological capability is available, the beekeepers' requirements for hives, honey containers and other equipment can stimulate production by local craftsmen. At higher levels of operation, it may be necessary to import technical equipment for beekeeping, and for processing honey and beeswax.

Where beekeeping becomes a large-scale operation carried out at a modern technological level — with movable-frame hives — it ceases to be a means whereby subsistence farmers can improve their lot through use of local materials and traditional crafts. Capital investment is needed, and labour requirements will probably be minimized in order to increase profits. Honey is produced for sale in the larger towns, or for export (earning hard currency), but the lowest income groups are unlikely to benefit from this.

There is one gain from any increased beekeeping which can benefit the whole rural population. Through pollination, the food-gathering activities of bees improve both the quantity and quality of many cultivated crops. The intensification of agricultural production frequently includes a greatly increased use of fertilizers and

Table 1. The world honey industry, as represented by figures for 13 countries.

Country	1 Colonies × 1000	2 Yield per colony	3 Total honey × 1000	4 Net exports × 1000	5 Honey per capita	6 Sugar per capita
<b>Europe</b>					0.4	45
France	1200	12.7	18.5	- 6.7		
German F.R.	1118	12.6	15.0	- 62.9		
U.K.	212	6.3	1.2	- 20.8		
<b>North America</b>					0.7	49
Canada	657	51.3	34.8	+ 9.5		
U.S.A.	4275	22.8	93.0	- 37.9		
<b>Australia + New Zealand</b>					0.5	57
Australia	405	56.0	21.5	+ 1.1		
New Zealand	191*	30.0*	7.6	+ 2.0		
<b>Latin America</b>					0.1	42
Argentina	1300	25.5	28.0	+ 29.9		
Brazil	1800	13.3	22.0	+ 0.6		
Mexico	2300	25.5	64.0	+ 40.0		
<b>Africa</b>					0.26	11
No single country of world importance						
<b>Asia</b>					0.0004	7
China	5700	19.6	100.00	+ 58.1		
Japan	299	21.4	6.5	- 28.1		
<b>U.S.S.R.</b>	8000	23.0	190.0	+ 16.0	0.5	45
<b>Total</b>	27457		602.1	157.2	156.4	
<b>World total</b>			896.3	214.3	224.7	
<b>% of world represented by the 13 countries</b>			67%	73%	70%	

\* from the same source as column 5

Column 1 Colonies × 1000 gives the number of occupied hives in thousands in 1983.

Column 2 Yield/colony gives the average honey yield in kg per colony, 1979-83.

Column 3 Total honey × 1000 gives the estimated total honey production for the country in 1983, in 1000 tonnes.

Column 4 Net exports × 1000 gives the country's estimated honey exports less honey imports, in 1000 tonnes, for 1982. Figures prefixed by + are net exports, and figures prefaced by - are net imports.

Column 5 Honey per capita gives the estimated average honey consumption in kg per capita for the continent as a whole, from sources quoted in E. Crane, *Honey: a comprehensive survey*, published in 1975, but relating to various earlier years. Figures for Africa and Asia are less reliable than others.

Column 6 Sugar per capita gives the average sugar consumption in kg per capita for the continent as a whole, from the United Nations Statistical Yearbook (1970); most figures relate to 1969.



## Beekeeping

pesticides. The latter often kill the population of wild insects that serve as pollinators of cultivated crops. The only remedy is to provide a pollination service, by moving hives of honeybees to the agricultural production areas during the flowering of the crop, and not killing the bees with insecticide while they are there.

### SUMMARY OF THE WORLD HONEY INDUSTRY TODAY

Table 1 gives figures for 13 countries. Columns 1-4 are taken from the statistics of the United States Department of Agriculture (*USDA Foreign Agriculture Circular FS3-83*). The totals at the foot of Table 1 show that the data for the 13 countries represent two-thirds to three-quarters of those for the world as a whole, and therefore help to present a world picture.

Table 1 shows high honey yields per colony in Canada and Australia and low ones in Europe. It also shows the high total honey production of the large countries, U.S.S.R., China and U.S.A. (190, 100, 93 thousand tonnes, respectively). The high honey-exporting countries are China, Mexico and Argentina (58, 40, 30 thousand tonnes), and the high net importers are the German Federal Republic, U.S.A., Japan and U.K. (63, 38, 28, 21 thousand tonnes). Until 1981 Japanese imports exceeded those of the U.S.A.

The three largest exporters are thus in the subtropics, and countries in which the European honeybee is not native. All of the four largest importers are comparatively rich countries, and all are in the north temperate zone. Germany and the U.K. belong to the traditional 'bees-and-honey' region in Europe, and the U.S.A. was peopled from

this region. Japan, alone, has developed as a honey-eating country since the Second World War. In the final two columns in Table 1, figures for honey and sugar consumption per capita for the continents as a whole are lower for Asia than for any other continent. This situation may change as honey production increases, but only when incomes also rise: Table 1 suggests that purchased honey is now a food of affluent societies.

### HOW TO PURCHASE BEEKEEPING EQUIPMENT

Beekeepers can much more easily purchase equipment from a supplier in their own country, if it is available, than from abroad. Beekeepers are urged to try to see a supplier's equipment — if possible in use — and to discuss it directly with the supplier before any purchase is made. In different areas, paramount qualities may vary — for example suitability of hives for hot, dry conditions, maintenance of metal equipment in year-round high humidity, or resistance to termite damage. The following pages are a descriptive, illustrated catalogue of 66 types of equipment. With each description is the name and address of a specialist supplier (if possible one known to manufacture it), or an indication that it can be obtained from most general suppliers.

Some of the general suppliers worldwide are listed below, and further suppliers and manufacturers can be found in the catalogue.

Dr Eva Crane  
International Bee Research Association

# General beekeeping equipment suppliers

## ARGENTINA

MIGUEL A BREJOV  
Nazca 4058/74 (1419)  
Buenos Aires  
ARGENTINA

EL PANAL  
S.A.C.I.F.I.Y.A.  
Humahuaca 4229  
1192 Buenos Aires  
ARGENTINA

MECANIZACION APICOLA SRL  
Calle 35, No.407  
La Plata (B.A.)  
ARGENTINA

TERZA HNOS  
S.A.C.I.F.I.Y.A.  
Floor 5, Corrientes 1312  
1043 Buenos Aires  
ARGENTINA

## AUSTRALIA

JOHN L. GUILFOYLE (SALES) PTY.  
LTD.  
772 Boundary Road, Darra  
Brisbane P.O. Box 18  
Queensland 4076  
AUSTRALIA

PENDER BROS. PTY. LTD.  
Elgin Street, P.O. Box 20  
Maitland, NSW 23200  
AUSTRALIA

## AUSTRIA

STEFAN PUFF GmbH  
Neuhofdaugasse, 8011 Graz  
AUSTRIA

## BELGIUM

RAYMOND DE BIE  
Mechelsbroekstraat 21  
2800 Mechelen  
BELGIUM

## BRAZIL

CAPEL  
Parque de Exposição de Animais —  
DPA  
Av. Caxangá, 2200  
CEP 50 000 Recife (PE)  
BRAZIL

## CANADA

BEEMAID  
625 Roseberry Street  
Winnipeg, Manitoba, R3H 0T4  
CANADA

F.W. JONES & SON LTD  
44 Dutch Street  
Bedford, Quebec, JOJ 1A0  
CANADA

## CHILE

CRATE  
Casilla 6122, Correo 22  
Santiago  
CHILE

## COLOMBIA

PROAPICOLAS LTDA  
Near Pitalito, Huila  
COLOMBIA

## DENMARK

PSTJYDSK, BIAVLSCENTER ApS  
Vejle Landevej 147 (A 18)  
Pjedsted 7000, Fredericia  
DENMARK

ANNE MARIE & BERNHARD SWIENTY  
Skovbrinken 12  
6400 Sønderborg  
DENMARK

## EGYPT

HASSAN ALLAM  
17 Boutros Street, Tanta  
EGYPT

HOUSE OF BEES AND AGRICULTURAL  
ACTIVITIES  
6 Sekket El Manah Street  
Opera Square, Cairo  
EGYPT

MOHAMED EZZ  
7 Army Street, Cairo, EGYPT

## FRANCE

APICULTEUR ALPHANDERY  
Château de Brignan  
84140 Montfavet (Vaucluse)  
FRANCE

APICULTURE NEVIÈRE s.a.r.l.  
BP 15  
Route de Manosque, 04210 Valensole  
FRANCE

GAURETTE  
139 Rue La Fayette  
75010 Paris  
FRANCE

EUROPRUCHE  
Boulevard De L'Industrie  
Z.I. des Loges  
53940 St. Berthevin-les-Laval  
FRANCE

LEROUGE  
91 Rue Mangin  
60130 St. Just-Chaussée  
FRANCE

MAX MENTHON  
36-38 rue du Commerce  
74200 Thonon-les-Bains  
FRANCE

CHRISTIAN NICOT  
Maisod, 39260 Moirans-en-Montaigne  
FRANCE

ETS THOMAS FILS SA  
65 Rue Abbé Georges Thomas  
BP No.2, 45450 Fay-aux-Loges  
FRANCE

## GHANA

TECHNOLOGY CONSULTANCY  
CENTRE  
University of Science and Technology  
University Post Office, Kumasi  
GHANA

## GREECE

MELISSOKOMIKI  
57 Makrygianni Street  
Nea Chalkidon, Athens  
GREECE

## HUNGARY

HUNGARONEKTAR ORSZAGOS  
1054 Budapest, Garabaldi u.2  
HUNGARY

## INDIA

ALL INDIA BEEKEEPERS  
ASSOCIATION  
1325 Sadashiv Peth, Pune 411030  
INDIA

EASTERN SCIENTIFIC COMPANY  
New B.D. High School  
Ambala, Cantt 133001  
INDIA

KHADI & VILLAGE INDUSTRIES  
COMMISSION  
Carpentry and Blacksmithy Workshop  
Post: Dahanlu, Dist. Thane  
Maharashtra  
INDIA

LOTLIKAR AND SONS  
A-1/4 Pioneer Co-op Society  
Panvel 410206, Kurlaba M.S.  
INDIA

PARAGANA BEEKEEPERS CO-  
OPERATIVE SOCIETY LTD.  
Post Baraipur, West Bengal  
INDIA

RAJ CARPENTRY WORKS  
Pathankot, Dist. Gurdaspur  
Punjab  
INDIA

RAWAT APIARIES (Himalayas)  
Ranikhet, Dist. Almora, UP  
INDIA

SARVODAYA SAMITI  
Gandhinagar, Koraput 764020  
Orissa  
INDIA

TRIPURA STATE KHADI AND VILLAGE  
INDUSTRIES BOARD  
Post Agartala 799001, Tripura  
INDIA

## IRELAND

IRISH AGRICULTURAL WHOLESALE  
SOCIETY LTD.  
151-156 Thomas Street, Dublin 8  
IRELAND

MIL AN ISULÁIN  
Cúil-Aodha, Magcromtha  
Co. Chorcaighe  
IRELAND

## ITALY

LEGA SDF  
Via de Crescenti 18, 48018 Faenza  
ITALY

SAF, s.n.c.  
Via Liguria 17, 36015 Schio (VI)  
ITALY

## JAPAN

AKITAYA HONTEN CO. LTD.  
Kano-fuji-machi, Gifu 500  
JAPAN

FURUZAWA BEE KEEPING  
MANUFACTURER  
752 Gifu  
JAPAN

GIFU YOHO CO. LTD.  
Kano-sakurada-cho 1  
Gifu-Shi, Gifu 500-91  
JAPAN

NONOGAKI APIARY  
Oku-machi  
Ichinoabuyo-shi, 490-02 Maya  
JAPAN

## KENYA

MINISTRY OF AGRICULTURE &  
LIVESTOCK DEVELOPMENT  
Beekeeping Branch  
P.O. Box 68228 Nairobi  
KENYA

## MEXICO

MIEL CARLOTA, S.A.  
Ap. Postal 161-D  
Queretaro III, Cuernavaca, Mor.  
MEXICO

## MOROCCO

AGRICOLA  
34 Rue Beni Amar, Casablanca  
MOROCCO

## NETHERLANDS

BIJENHUIS  
Grintweg 273  
6704 AP Wageningen  
NETHERLANDS

HONINGZEMERIJ HET ZUIDEN BV  
Ladonkseweg 9, Postbus 2  
5280 AA Boxtel  
NETHERLANDS

H.T. VAN DAM & ZN  
P.W. Janssenweg 35-37  
8411 XR Jubbega, Friesland  
NETHERLANDS

## NEW ZEALAND

A. ECROYD & SON LTD.  
P.O. Box 5056  
25 Sawyers Arms Road  
Papanni, Christchurch 5.  
NEW ZEALAND

## NORWAY

HONNINGCENTRALEN A/L  
Østensjøv 19, Oslo 6  
NORWAY

## PHILIPPINES

IMELDA'S BEEKEEPER SUPPLIES  
1910 F. Tirona Benitez Street  
Malate, Manila  
PHILIPPINES

## SPAIN

APICENTER S.A.  
Vizcaya 383, Barcelona (27)  
SPAIN

VICENTE MENDIPOZO  
Avda España 4, Logroño  
SPAIN

MIELSO S.A.  
Poligono Industrial "El Mijares"  
Calle No.7, Apartado 38  
Almazora, Castellón  
SPAIN

MODERNA APICULTURA SA  
La Apartado 9.008, Madrid 28  
SPAIN

VICENTE MENDI POZO  
Avda Espana 4, Logrono  
SPAIN

AUGUST PERPINYA  
Carretera L'Hospitalet 45  
Cornellà, Barcelona  
SPAIN

## SWEDEN

OSCAR GUSTAFSSON & CO  
Biredskapsfabrik AB  
4385 Tofta, 432 00 Varberg  
SWEDEN

HEBE STÅL AB  
Fack 32, 684/01 Munkfors  
SWEDEN

## SWITZERLAND

BIENEN-MEIER  
5444 Künten (AG)  
SWITZERLAND

## U.K.

ROBERT LEE (BEE SUPPLIES) LTD.  
Beehive Works  
High Street, Cowley  
Uxbridge, Middlesex UB8 2BB  
U.K.

R. STEELE AND BRODIE  
Stevens Drove, Houghton,  
Stockbridge, Hants SO20 6LP  
U.K.

E.H. THORNE (BEEHIVES) LTD.  
Beehive Works  
Wragby, Lincoln LN3 5LA  
U.K.

## U.S.A.

COWEN ENTERPRISES  
P.O. Box 396, Parowan, UT 84761  
U.S.A.

DADANT & SONS, INC.  
Hamilton, IL 62341  
U.S.A.

WALTER T. KELLY CO.  
Clarkson, KY 42726  
U.S.A.

A.I. ROOT COMPANY  
P.O. Box 706  
623 W. Liberty Street  
Medina, OH 44258  
U.S.A.

SUNSTREAM  
P.O. Box 225  
Eighty four, PA 15330  
U.S.A.

## W. GERMANY

CHR. GRAZE, KG.  
Strümpfelbacherstraße 21  
7056 Weinstadt 2, (Endersbach)  
W. GERMANY

C. KOCH  
Hauptstraße 67  
7603 Oppenau/Schwarzwald  
W. GERMANY

MÜNGERSDORFF  
An St. Agatha 37, 5000 Köln 1  
W. GERMANY

ERHARD & MARKUS SCHEHLE  
8999 Maierhöfen/Allgäu  
W. GERMANY

FRIEDRICH WIENOLD  
Dirhammer Straße 20  
Postfach 15  
6240 Lauterbach/Hessen  
W. GERMANY

## ZIMBABWE

JOHN RAU & COMPANY (PVT.) LTD  
2 Moffat Street  
P.O. Box 2893, Harare  
ZIMBABWE



## PROTECTIVE CLOTHING

Every beekeeper should have adequate protective clothing, even if he or she sometimes chooses not to wear it all. The most important part to protect is the face, especially the eyes and mouth. Whether arms and hands are covered is a choice to be made by the beekeeper according to the occasion and the work to be done, and the character of the bees to be dealt with. Individual items of clothing *must* be impermeable to bee stings, and every joint between them *must* be bee-tight — If not, it could be safer to strip completely than to risk getting bees caught inside the clothing.

Modern fastening devices such as zip fasteners and Velcro have made it possible for a beekeeper to be completely enveloped in a single garment. Alternatively, separate parts may be used: veil supported by hat or hood; gloves; an appropriate coverall or boiler suit and boots, or cooler body

clothes — which, however, will not give as much protection.

Except for the vizor of the veil, which must be black to give good vision, all cloth for garments worn when working with bees should be light in colour and of smooth, close-mesh material. For working with tropical African and Africanized bees, it may be best to use a veil with the outside of the wire-mesh vizor painted white, otherwise bees are likely to fly against the black mesh and obscure vision. With these bees, also, stout plastic gloves may be necessary, although they are hot and clumsy to wear. All general beekeeping suppliers stock protective clothing, but it is worth seeing *and trying on* different types, to find out what is suitable for you and for the conditions under which you work. The outfit shown is one used for working with 'aggressive' tropical African bees.

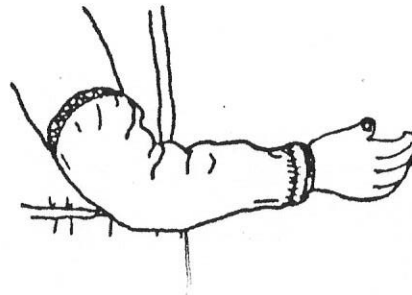
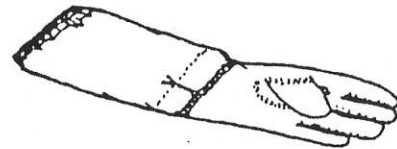
If, in spite of precautions, you find you have a bee inside your protective clothing, go well away from the bees before you investigate. A similar rule applies to removing the clothing.



## GLOVES AND GAUNTLETS

Gloves (upper illustration) should be light in colour, soft, and sufficiently well fitting to allow the wearer to work delicately when moving frames, etc., in order not to disturb the bees. The material covering the hands should be impervious to stings, and soft leather is ideal; the wider gauntlet part can be of close cotton weave. The upper hem of the gauntlet is elasticated, to be worn over a long sleeve. In no circumstances wear black gloves. Rubber gloves are sometimes advertised, but they are hot and can be clumsy. On the other hand thin cotton gloves are easily penetrated by a bee's sting.

Some beekeepers prefer to wear gauntlets only (lower illustration), in which case the lower hem is also elasticated and fits snugly over the wrist. Either gloves or gauntlets may reach below or above the elbow as required.



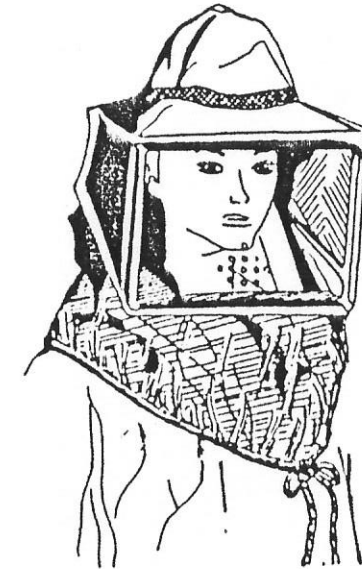
Available from:  
GENERAL SUPPLIERS

## BOOTS

Many beekeepers tuck trouser bottoms into gumboots. They can be purchased at a shoe shop. Alternatively, trouser bottoms are tucked into smooth, light-coloured socks worn with shoes.

You can be stung badly round the ankle through lack of care in ensuring a bee-tight join in the protection there, and bees inside a dark space instinctively run upwards.

Available from:  
GENERAL SUPPLIERS



## HAT AND VEIL

The choice must depend on the type of work to be done, the temperature and wind, and personal preference. The drawing shows a folding veil in which the vizor is made up of 3 rigid sections of black wire mesh. The tapes at the front are tied round the waist in such a way that the bottom edge of the cloth is drawn tightly against the clothes beneath; alternatively the cloth below the veil can be tucked inside a sleeved jacket at the neck. The brimmed hat shown is soft, but a rigid brimmed hat (with ventilation slits if wanted) is preferred by many. The veil may be integral with a cloth hat, or separate, and held over the brim by an elasticated hem at the top.

Woven horsehair or nylon net is used for the vizor in light-weight veils. This is satisfactory, except that in windy weather it may blow against the face or neck.

Available from:  
GENERAL SUPPLIERS

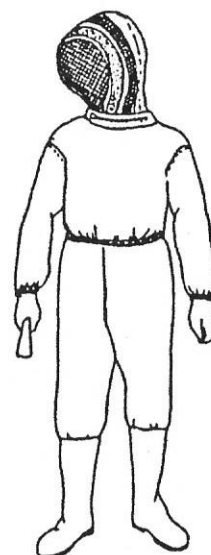


### COVERALL

A standard coverall can be used, of a white close-weave material. Custom-made bee suits incorporate elasticated wrists and trouser cuffs. One maker sells coveralls (illustrated) of rip-stop nylon for working with Africanized bees that sting readily. They are large enough to be worn over clothing and are thin; they are reported to be 'bee-secure' although hot.

These are made by:  
Mrs D OLSEN  
115 South First East  
Providence, UT 84332  
U.S.A.

Coveralls (and other such clothing for bee work) should be washable, and washed as often as necessary. This is not only to remove any gross dirt, but to remove odours to which bees might respond by stinging, and to minimize the possibility of carrying disease infection from one apiary to another.

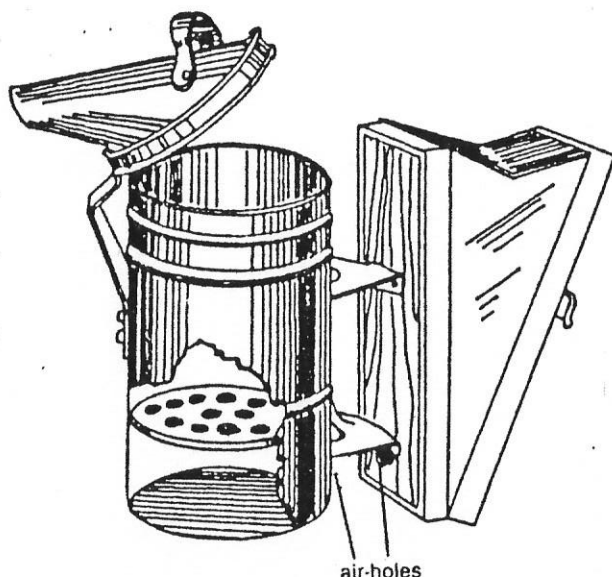


### ALL-IN-ONE SUIT WITH HOOD

The drawing shows a two-piece suit, but it can be purchased as a single coverall. The wrists are elasticated. The hood is attached by a zip, (and sewn on at the back of the neck), and can thus be thrown back when not required, without removing the suit. The vizor is of black nylon net, and is kept off the face by nylon boning round the edges and by the self-supporting hood. Garments are made by:

B.J. SHERRIFF  
Five Pines, Mylor Downs  
Falmouth, Cornwall TR11 5UN  
U.K.

By tradition, hoods have been used in certain countries such as the Netherlands, and there has recently been a swing towards them in some other countries. If possible try on a veil with a hood and with a hat, to see which you prefer.



### SMOKER

A good smoker is essential in beekeeping with frame hives or top-bar hives. In traditional beekeeping, smouldering twigs or grass are used to smoke bees, but this does not give the directional flow of cool smoke that is most effective, and best for keeping the bees quiet. (The bees respond to the smoke by gorging themselves with honey, and are then less likely to sting.) Some traditional beekeepers and honey hunters would probably find a modern smoker very helpful.

The metal fire box on the left has a directional funnel hinged to the top, which allows the fuel to be inserted. The fuel is kept off the base of the fire box by a perforated metal shelf above an airhole. The bellows on the right, which contain a spring, are used to blow air into the fire box through two holes opposite each other.

The aim is to produce a large and steady supply of cool smoke from the funnel without the need for frequent

refuelling. Success depends on the design of the smoker and the use of a large fire box (say 25cm high and 12cm diameter), and on the fuel used. According to what is available, beekeepers use old sacking, decayed wood, wood shavings or other vegetable matter, and corrugated cardboard.

It is important that only smoke, and no flame, should emerge from the smoker, and that the fire should be extinguished immediately after use.

A few suppliers offer a smoker with a clockwork mechanism to maintain a constant flow of smoke, but such a device is not necessary.

Available from:  
**GENERAL SUPPLIERS**

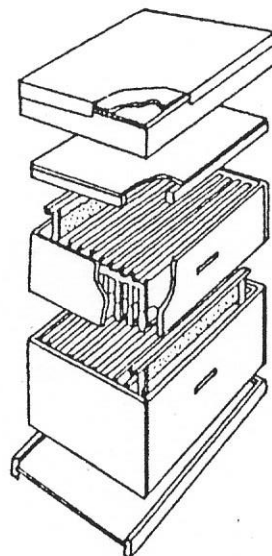
# Hives

## MOVABLE-FRAME HIVES

### MOVABLE-FRAME HIVES FOR 'APIS MELLIFERA'

Types of movable-frame hives that are in wide enough use to be considered appropriate are Langstroth, which is the most widely used throughout the world especially in English speaking countries, and Dadant or Dadant-Blatt. Both these are for the European bee *Apis mellifera*.

In both, the bee-space between hive boxes is at the top of each box. This is preferable to a bee-space at the bottom, in which case frames are flush with the hive box at the top. With a top bee-space, a flat wooden cover, (e.g. to support a feeder), can be placed directly on the top hive box. (With a bottom bee-space a cover must have a frame below it to lift it above the top of the frames.) Also with a top bee-space, one hive box can be slid into position on top of the one below without crushing the bees.



## LANGSTROTH HIVE

This is the most widely-used hive in the world. The frames are separated from the hive wall (and from each other) by a bee-space.

The illustration on the left is an exploded view of the Langstroth hive, showing the parts in detail (from the bottom): bottom board, brood box or chamber, super or honey chamber, inner cover, roof. Most Langstroth hives have boxes to accommodate 10 frames, but 8-frame and 12-frame hives are also made.

Standard dimensions, and certain details of design, vary slightly from country to country, and it is therefore wise to purchase all hives and hive fittings from one supplier. Langstroth hives are sold by general beekeeping suppliers. In addition, one firm in Egypt specialises in their manufacture, and two general suppliers in India produce them.

MAKHTAR HAMED YASEEN  
1 Aziz Fahmy Tanta  
Garbeya Governorate  
EGYPT

ALL INDIA BEEKEEPERS  
ASSOCIATION  
1325 Sadashiv Path  
Pune 411030  
INDIA

RAWAT APIARIES  
Ranikhet  
Dist. Almora  
U.P.  
INDIA

## MODIFIED DADANT AND DADANT-BLATT HIVE

This hive is on a similar principle to the Langstroth, but has eleven deeper frames. They are used very successfully by some large-scale beekeepers. The greater weight of each box when full makes them less generally popular, and the extra size is of no advantage unless bees can be managed appropriately. C.P. Dadant, the originator of this hive, was born in France and wrote in the beekeeping press of France and other countries. As a result, a variant of this hive (sometimes known as Dadant-Blatt) is used in many French-speaking countries.

ETS THOMAS FILS SA  
65 Rue Abbé G. Thomas  
BP No. 2  
45450 Fay-aux-Loges  
FRANCE

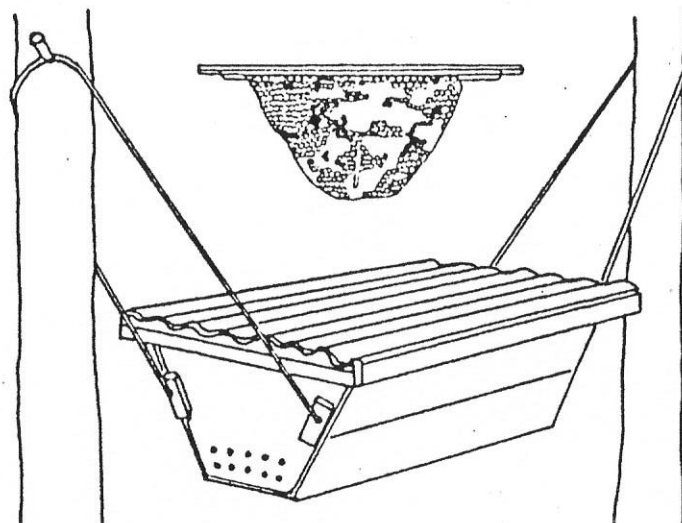
LEGA SDF  
Via Armandi 19, 48018 Faenza  
ITALY

## INDIAN STANDARD HIVE FOR 'APIS CERANA'

Hives on the same principle as the Langstroth and the Dadant-Blatt are manufactured for use with the smaller Asiatic hive bee *Apis cerana*; each hive box usually accommodates 9 frames. Beekeeping suppliers in India manufacture (or supply) these hives.

SEE INDIA  
GENERAL SUPPLIERS

## TOP-BAR HIVES



## MODIFIED LONG HIVE

This hive was developed from the Kenya top-bar hive, and has been used there and in Tanzania. The sides are vertical, and each top-bar has 2 end-bars, but instead of a bottom-bar like a frame, a horizontal strut is fixed between the two end-bars; with them, it gives support to the comb. The Kenya top-bars fit this hive, and the partial frames can be used in a standard Langstroth hive, so the 'long hive' provides a useful step in advancing from the top-bar hive to a frame hive.

The hive (below) is supplied by:

For tropical African bees:  
JOHN RAU & COMPANY (PVT.) LTD  
2 Moffat Street  
P.O. Box 2893, Harare  
ZIMBABWE

For European bees:  
AMERICAN-KENYA RESEARCH AND  
DEVELOPMENT CORPORATION  
1204-2956 Hathaway Road  
Richmond VA 23225  
U.S.A.

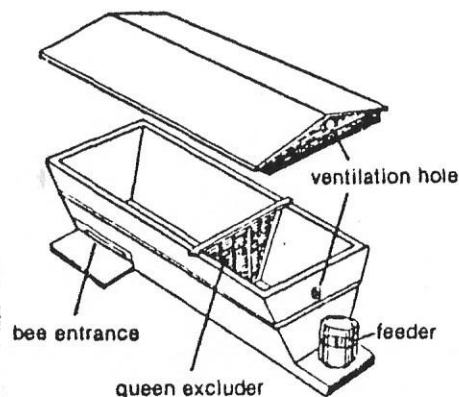


Top-bar hives are 'movable-comb' hives; they have no frames, but properly distanced top-bars. The bees build combs down from the top-bars, but they do not attach them to the hive walls, which slope inwards towards the bottom.

### KENYA TOP-BAR HIVE, FOR TROPICAL AFRICAN 'APIS MELLIFERA'

This design was developed in Kenya before and during the Canadian International Development Agency project (1971-1982). Internal measurements are 88.9 x 44.3cm at the top and 88.9 x 18.9cm at the bottom, height 28.6cm. It has a complement of 28 top bars 3.2cm wide and 48.3cm long, supported by runners. Top-bars touch each other and there is no space between them. This is an important feature when handling tropical African bees, since only one bar-width is open at once, and this can be continuously smoked, so that flight by the bees (and stinging by them) is minimized.

The drawing (above) shows the entrance holes, roof, and suspension method of support — to prevent damage by ants and other enemies.



These hives are manufactured by:

**MINISTRY OF AGRICULTURE & LIVESTOCK DEVELOPMENT**  
Beekeeping Section  
P.O. Box 274, 68228 Nairobi  
KENYA

They are also sold by:

**BROTHER BURKE**  
Farmer Training Centre, Mola  
KENYA

**JOHN RAU & COMPANY (PVT.) LTD.**  
2 Moffat Street  
P.O. Box 2893, Harare  
ZIMBABWE

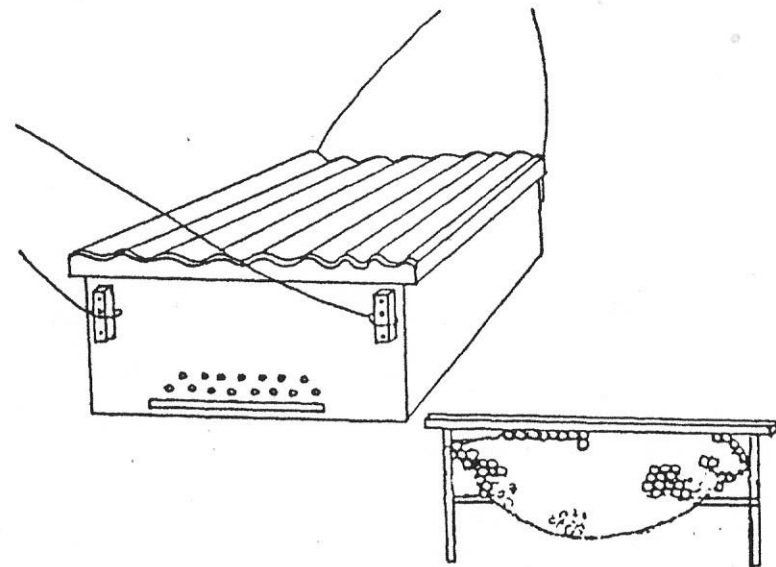
The following firm will make top-bar hives to order:  
**BUDGET BEEKEEPING**  
Gillbrow Apiaries  
Kirkcaldy-on-Eden  
Carlisle CA5 6DW  
U.K.

### TOP-BAR HIVE FOR 'APIS CERANA'

Several attempts have been made to use top-bar hives for *Apis cerana* in Asia. The hive described here (illustrated left) is two-thirds (linear) the size of the Kenya hive above. It was designed by the late Father B.R. Saubolle, Kathmandu, and is currently being distributed in Nepal under a UNICEF/Agricultural Development Bank programme. It is suspended, for the same reasons as in Africa. It has full-width top-bars, although *Apis cerana* is very little inclined to sting. The slit entrance is taken from an earlier type of the Kenya hive, which was discarded there in favour of a series of holes (as in the Kenya hive above) which the bees can more easily protect.

A strong wire queen excluder is provided with this hive, which is made by:

**GANA FURNITURE**  
Gana Bahal, Kathmandu  
NEPAL



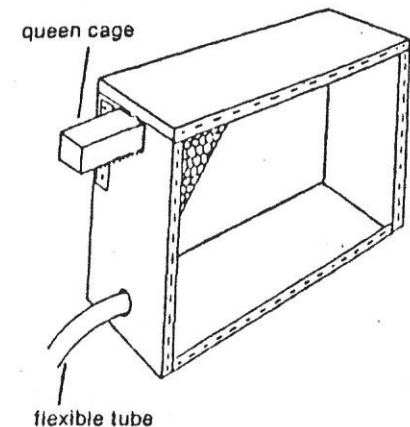
### OBSERVATION HIVE

Many beekeeping supply firms manufacture a tall narrow observation hive, in which 2 or 3 frames are mounted one above the other, so that both sides are visible through the glass. These hives are excellent educational aids, but it can be difficult to keep the bees in good condition, especially in hot weather.

The drawing on the right shows a simpler hive in which bees build their own comb from a small piece of foundation (top left of box). The manufacturer below provides detailed drawings and instructions for assembling the hive from the kit supplied.

The hive can be populated with bees from a special travelling box, through the flexible tube (bottom left). The queen is introduced in the queen cage (top left). But do not order live bees except from within your own country.

**HERMAN KOLB**  
P.O. Box 183, 737 West Main  
Edmond, OK 73034  
U.S.A.



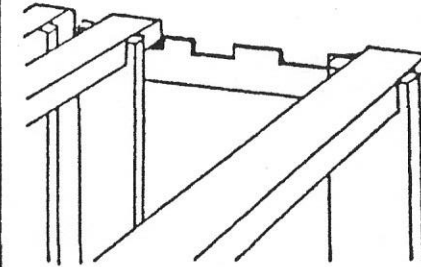
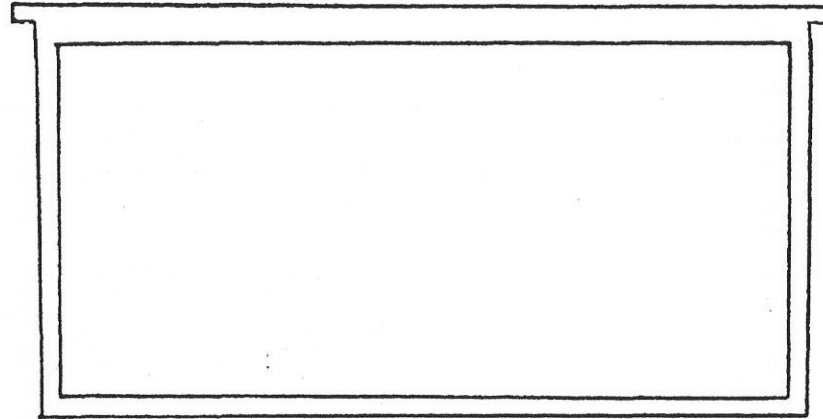
## HIVE FITTINGS

The items featured on this page are for frame hives, and all of them must be of the correct *dimensions* for the hives in which they are to be used.

### FRAMES

These support the wax foundation (see p.255) and the comb the bees build from it, and maintain the bee-space gap between frames/combs and hive walls; see Frame spacers. Frames are usually made of fine-grained wood, with tongue and groove or other very strong joints between bottom and end bars, and where the end bars join the top bar. This is necessary because of the weight of honey in full combs, and the strains to which frames are subjected in bee management and in honey extraction. Available from:

GENERAL SUPPLIERS:



### FRAME SPACERS

Some frames are spaced by their end-bars, which are widened out so that when they are touching, the combs are at the exact spacing required. Hoffman is one type. Alternatives are to put a plastic or metal 'end' on each end of the top-bar to space them correctly, or to use 'castellated' metal runners, one type of which is shown above; the frame top-bars fit into the depressions. Bees tolerate a greater variation in cell depth, and in comb spacing, in honey supers than in the brood nest. Castellated spacers are made by several firms, including the two below. The first sells many types, so send full details of what you want.

STOLLER HONEY FARMS, INC.  
Latty, OH 45855  
U.S.A.

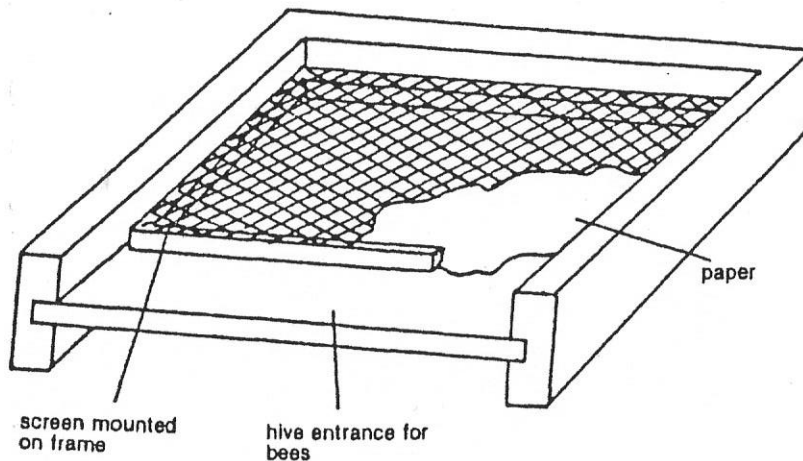
B.J. ENGINEERING  
Swallow Ridge, Hatfield  
Norton, Worcester WR5 2PZ  
U.K.

### VARROA DETECTOR

This item is included in view of the publicity given to the spread of the mite *Varroa jacobsoni* to different regions of the world as a parasite of *Apis mellifera*. The drawing shows a device to be incorporated with the floorboard of any frame hive. A plastic grid is mounted above a sheet of white paper laid on the floorboard; dead *Varroa* mites fall on to the white paper and can be seen with the naked eye when the paper is inspected after a dearth period during which brood rearing is minimal.

The plastic grid (to be mounted in a frame that fits inside the hive used, as shown in the drawing) is obtainable from:

S.A.M.A.P.  
1 rue du Moulin BP 1  
Andolsheim  
Neuf-Brisach, 68600  
FRANCE



## QUEEN EXCLUDER

This is a flat perforated screen, of the same size as the cross-section of the frame hive in which it is to be used. It is inserted above the brood box to separate it from the honey super above, and the slots in it are of such a size that workers can pass through but not the queen. The honey supers are thus kept free from brood.

The dimensions of the slots are critical, and vary according to the type of bee used. For tropical *Apis mellifera* they are smaller than for European *Apis mellifera*, and for *Apis cerana* they are smaller still.

Queen excluders are made in two

types: (left) a flat sheet of metal or plastic with slots stamped out by machine; (right) a series of parallel wires soldered to cross-strips, and the whole mounted in a wooden frame. The first is cheaper, but the second is more robust and bees pass through the holes more easily.

Queen excluders must be treated with care. If the grid is distorted it may let a queen through, and is thus useless. Before this fault is discovered, however, a honey super may be half full of brood.

For European *Apis mellifera* the slots should be 4.14mm wide. (For tropical *Apis mellifera* coffee screen can be used.)

Excluders may be purchased as follows:

*plastic sheets*, 42.5 × 51.0cm, said to fit 'all 10-frame hives', thickness 0.8mm:

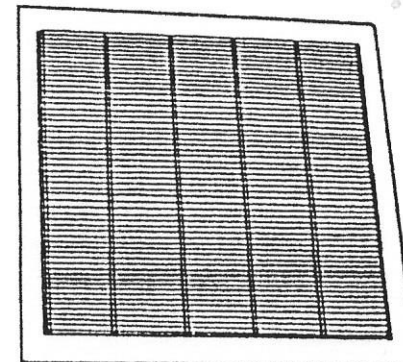
C. ICKOWICZ  
Quantier Saint-Blaise  
84500 Bollène  
FRANCE

*metal sheets*, many suppliers including:

STEFAN PUFF GmbH  
Neuhofdaugasse, 8011 Graz  
AUSTRIA

*framed wire grids*, for example:

B.J. ENGINEERING  
Swallow Ridge, Hatfield  
Norton, Worcester WR5 2PZ  
U.K.



## BEE ESCAPE BOARD

A 'bee escape' board (left) is the same size as the cross-section of the hive. It is placed on the hive *below* honey supers that are to be removed to harvest the honey, and it contains a device which ensures that worker bees will pass from boxes above it to those below, but not vice versa, so that the supers can be removed empty of bees. Different devices suit different circumstances — according to whether speed of action, certainly that the device will not be blocked by bees, or some other factor is the prime consideration. Any device relying on a spring mechanism can become ineffective if the spring becomes distorted. Nevertheless the Porter bee escape of this type (illustrated right, with the upper part slid back) is the one most commonly sold. The bees 'escape' from above to below by pushing through the gap between two very light springs, but they are unable to return. Multiple Porter escapes are available.

Bees will usually pass through an

escape board between one day and the next. They take less time if there are multiple exits. In cool weather they are slow to move. It is *essential* that all honey supers above the escape board are bee-light, or they will quickly be emptied by bees from other hives.

An escape board with no moving parts is preferred by many. It incorporates holes so shaped and positioned that bees will enter from above (and so 'escape') but do not enter them from below, to return. Such conical escape boards are sold by:

A.I. ROOT COMPANY  
P.O. Box 706  
623 W. Liberty Street  
Medina, OH 44258  
U.S.A.

Porter escapes are available from:

GENERAL SUPPLIERS

