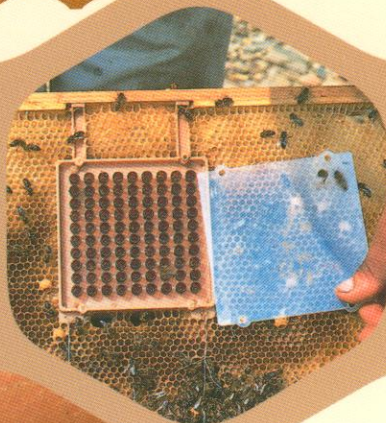
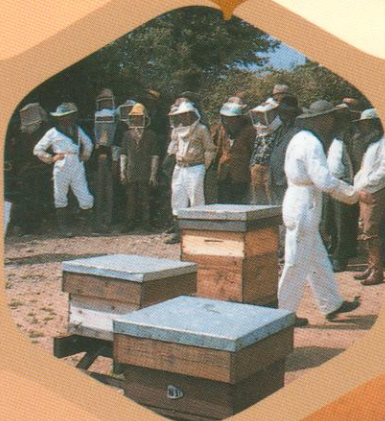


Profitable Honey Production



A decorative dotted line in a light yellow color, starting from the left edge and curving upwards towards the right.

Profitable Honey Production



Published by:

Teagasc,
19 Sandymount Ave.,
Ballsbridge,
Dublin 4.
July 1996

© Copyright 1996

Acknowledgements

The material in this booklet was prepared by Teagasc staff members John Burke, Richard Dunne, Patsy Bennett and Pádraig Mac Giolla Rí.

The help of John Keating and Bridget Murphy in the preparation and production of this booklet is also acknowledged.

The photographs used in Varroasis in honeybees were kindly supplied by Dr. Peler Flurí, The Federal Dairy Research Institute, Bee Department, CH-3097 Liebefeld, Switzerland.

The financial support of the Federation of Irish Beekeepers' Associations in the publication of this booklet is gratefully acknowledged.

While occasional reference is made to trade names and proprietary products in this booklet, no endorsement of named products is intended, nor is any criticism implied of similar products which are not named.



Chapter	Page
Introduction	5
Inmates of the hive	6
Sources of Food	8
Getting Started	9
Management of the colony	10
Harvesting the Honey Crop	14
Stock Replacement	17
Diseases Control and Diagnosis	22
Calender of Events	28
Appendix 1a	30
Appendix 1b	30
Appendix 2	31
Appendix 2a	32
Appendix 3	33
Appendix 4	34
Appendix 4a	35
Appendix 4b	36
Appendix 5	37
Appendix 5a	38
Appendix 5b	38
Appendix 5c	39
Appendix 6	40
Appendix 7	41



Introduction

Beekeeping can be practised almost anywhere in Ireland, but naturally there are localities more favourable than others. Our climate imposes a severe but practical test of beekeeper's capabilities. However, that should not prevent any interested and committed person from embarking on a pursuit which is immensely rewarding in terms of personal fulfilment and achievement.

There are in excess of 2,000 beekeepers in Ireland managing 22,000 colonies of bees and there is a ready domestic market for the honey produced. Irish honey is of particularly good quality in both flavour and appearance and is superior to any available from other sources. The prospects for beekeeping were never better. The introduction of the REPS scheme and the extensification of many farming systems increases the flora available for bees to forage.

Honey is greatly influenced by seasonality. However, a beekeeper who attends to the basic principles, as set out in this booklet, should be able to achieve an average of 20 kg per hive per annum. The yields obtained at the Teagasc Beekeeping Research Station at Clonroche, Co. Wexford confirm this view. The yield from 75 colonies managed commercially at Clonroche has been 25 kg per colony per annum. This has been achieved by working to a planned programme of management and disease control.

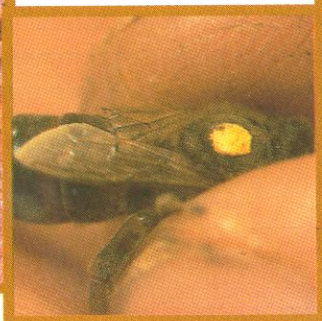
Inmates of the hive

The honeybee is an insect belonging to the order of Hymenoptera which, in addition to bees, also contains wasps, ants and many groups of parasitic insects. It is a social insect that has evolved a system of food storage which enables the whole colony to overwinter.

A honeybee colony consists of a queen (the reproductive female); the workers (infertile females) numbering about 10,000 individuals in winter and rising to about 50,000 in summer; and a number (200-1,000) of male bees or drones that do not overwinter. In addition to these adult bees the colony contains a variable number of immature bees (larvae and pupae) housed individually in honeycomb cells and referred to collectively as the "brood". After egg hatching, the grub is fed by the worker bees for 5 to 8 days and the mouth of the cell is then sealed over (capped).



Worker



Queen



Drone

Queen, drone and worker bees have a different length of life cycle, an appreciation of which is important in beekeeping.

Table 1: Stages of Life Cycle

	Approximate number of days in each stage			Age when Bee leaves the cell
	Egg	Grub or Larva	Larva and Pupa in Sealed Cell	
Queen	3	5½	7½	16
Worker	3	6	12	21
Drone	3	6½	14½	24

Queens can live for 3-4 years, drones from 22-59 days and workers from 38 days to 6 months, the longer periods in winter. A newly emerged worker bee remains in or near the hive for the first 20 days of its life before it becomes a forager, collecting nectar, pollen, water and propolis (bee glue) for the use of the colony. In our climate, the main active foraging period is often only three weeks in length.

The survival strategy of a colony is to build up its population using the output of the early flowers and then for this population to collect a large store of honey for the winter. There is little egg laying by the queen over the winter period, but it increases rapidly during April to early May, leading to a very steep rise in brood population by June. The bulk of the brood is reared by the end of June and subsequent food collection is largely devoted to storage for winter use. In our exploitation of the honeybee, we remove honey from the colony when the main honey flow has ended. The colony may be able to gather further supplies to build up a winter food resource. If the winter storage is insufficient when the honey crop is removed, supplementary feeding of sugar syrup should be given



Sources of food

There are many sources of nectar, such as sycamore, horse chestnut, dandelion, blackthorn, hawthorn and fruit trees of different types. The main sources that can be relied on to give good yields are the blackberry and white clover.

Blackberry and Clover

The blackberry and the clover crop give the best quality honey under most Irish conditions. In warm seasons this source of nectar is the most reliable and accounts for the vast bulk of honey produced in Ireland. The quality is excellent with a beautiful clear colour.

Oilseed Rape/Field Beans

In recent years the necessity to break traditional agriculture crops perhaps with oilseed rape and field beans has become common practice in many Irish farms. This acts as a valuable source of nectar. It is necessary to bring colonies of bees to these sources of nectar supply. It should be noted, however, that honey obtained from oil seed rape, in common with all brassica honeys, granulates very rapidly. The beekeeper needs to be vigilant to remove and extract the supers of oil seed rape honey before granulation takes place. It is a most useful source of building up strong colonies for the later nectar flow obtained from clover and blackberry.

Heather

Beekeepers in heather or knapweed areas will have an additional source of nectar in August and September. Others, outside these regions can also share in this harvest by moving stocks to these areas in early August. If it is decided to transport colonies to the heather, strong stocks should be selected. The hives are prepared by fastening a super of empty combs to the brood chamber while the latter is secured to the floor board using crate stables in both cases. A screen of perforated zinc should be secured on top of the super for ventilation. The hives are best moved in the early morning, the entrances being closed with a strip of foam before loading. The selected area should be reached early to allow the bees to be released by 9 a.m..

The hives can be brought back anytime after 10th September. Surplus honey is taken by cutting out the comb and pressing it in a honey press, or as cutcomb or chunk honey.



Getting started

It is advised that any prospective beekeeper should engage in a training course before commencing. Information on courses can be obtained from Teagasc and from The Federation of Irish Beekeepers' Associations. Both organisations have representatives at local level. The experience obtained from a beginners course will give the entrant confidence, practical skills and the opportunity to evaluate if they have the interest to pursue beekeeping further.

Site

In locating bees, it is important to take cognisance of the effect they will have on neighbours. It is also important to have adequate protection around the apiary to ensure that straying animals can not disturb or knock over the hives. Shelter is important to ensure that bees will forage in all reasonable weather conditions. It is necessary to select an area with an adequate flora to enable bees to forage for nectar and pollen. Before commencing handling bees, it is essential to obtain correct protective clothing. This will consist of veil, white overalls, gloves, hive tool and smoker and proper boots.

Layout

The typical layout of an apiary is shown in Appendix 1a. The hives should be mounted on supports so that they are above ground level. Specifications for a suitable hive stand are set out in Appendix 1b.

Hive types

There are many types of hives available on the Irish market. However, in selecting a hive type it is important to determine that the component parts for the brood chamber and supers are readily available. The most common type of hives used in Ireland which would measure up to these requirements are The National, The Smith Hive and Modified Commercial Hive. Detailed drawings of each type are shown in Appendices 2, 3, 4. Fit out the brood chambers with waxed frames. Details of frame types and how to wax are outlined in Appendix 5. You are now ready to introduce a stock of bees to the brood chamber.

Obtaining your first colony

It is essential that you start with a healthy and productive stock of bees. It is suggested that you contact a reputable beekeeper in your region for assistance in obtaining your first colony. While it is also possible to start by obtaining a swarm, this is an unreliable method and you have no assurance of the health status of the resulting colony.

Management of the colony

The aim of the beekeeper should be to manage colonies so as to have the maximum number of bees available to coincide with the start of the main nectar flow. The nectar flow will vary with location within the country, but for the majority of Irish beekeepers will commence in the last week in June and continue until the end of July under favourable weather conditions. The beekeeper has to ensure that the colonies are disease-free, well-fed and that swarming is controlled so as to have strong viable stocks to gather the maximum amount of nectar in the short period available to the bees. The following management procedures will assist in this process.

Records

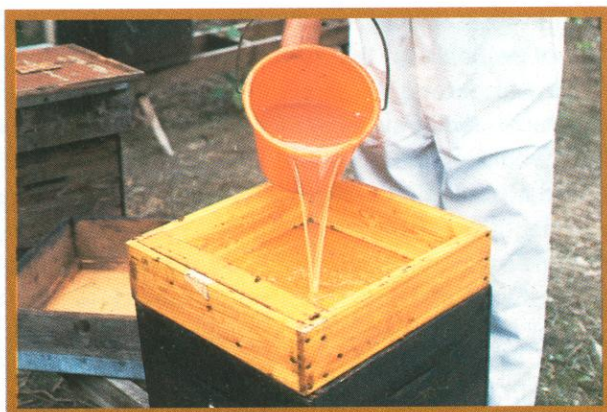
As an aid to successful beekeeping, it is essential to keep hive records. Good records ensure elimination of poor stocks.

The beekeeper's year ends when he takes off the surplus honey and a new season commences with autumn feeding to prepare stocks for the coming year.

Good management is basically related to feeding, swarm control, building up for the honey flow, supering and extraction of the honey crop.

Feeding

A beekeeper must be prepared to feed bees at any time if the necessity arises. Sugar syrup is used for autumn, spring and summer feeding and fondant or soft candy is given if colonies have to be fed in winter.



Feeding a full colony

Autumn feeding

Beekeepers should check the supply of stores in each hive in mid-September. A colony of bees requires 18-20 kilos of food to carry them over the winter and allow for spring development. If this quantity is not present, the deficiency must

be made up by feeding sugar syrup. When calculating the amount of stores, remember that a well-filled Smith, National frame contains 2-2.5 kilos and a commercial frame 3-4 kilos.

Sugar syrup for autumn feeding is made by mixing 2 units (by weight) of sugar with 1 unit of water (e.g. 8 kilos sugar to 5 litres water) and stirring until the sugar is fully dissolved. Syrup for spring and summer feeding is made by mixing 1 unit of sugar to 1 unit of water (e.g. 4 kilos sugar to 5 litres water).

Winter feeding

If, for any reason, autumn feeding has been neglected and food supplies are known to be low during the winter months, colonies may be fed by placing 2-3 kilos of fondant or soft candy immediately over the frames.

Spring and summer feeding

A regular check must be kept on food stores from early spring up to the main honey flow. Losses from starvation frequently occur at this time. Brood rearing is at its highest during this period and colonies consume large quantities of food. The amount of stores should never be allowed to go below 5 kilos. Thin syrup may be fed from mid-March onwards. This often has a pronounced effect on honey yields later.

Feeding stimulates brood-rearing and on occasions when a build-up of colony strength is desirable, stimulative feeding is given. Feeding is also recommended during stock division, when making nuclei and for newly hived swarms. In cold, dull or wet summers, feeding may be required to prevent starvation.

Feeders

Feeders holding from 5 to 10 litres are the most convenient. Plastic feeders holding from 5 to 7.5 litres are suitable. Millar feeders, made of timber and holding 10 litres, while expensive, are very suitable.

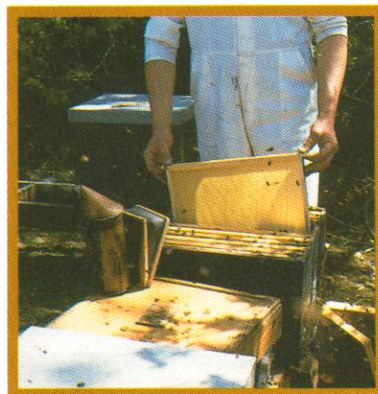


Frame feeder

Robbing

The following precautions should be taken when feeding to prevent robbing:

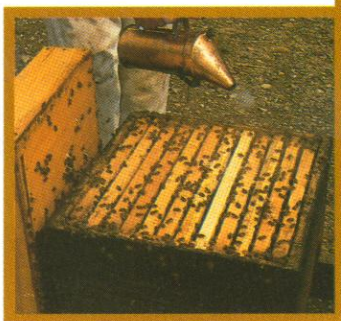
- Feed preferably in late evening after bees have ceased flying
- Reduce hive entrance to about 1cm
- Avoid spilling syrup or leaving it exposed to flying bees
- Feed a number of colonies at the same time
- Ensure that hive parts are fitting well and allow no entrances for robbing bees



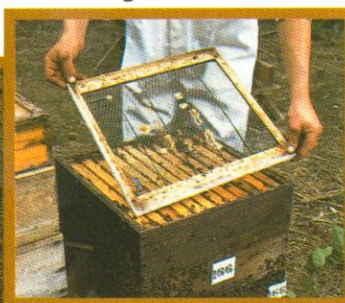
Renewing comb

Building up for the honey flow

The aim of every beekeeper is to have his stocks at peak strength for the main honey flow. This is achieved by feeding where necessary from spring onwards to develop brood production. Having built up the colony, the bees must be kept from swarming. Many successful beekeepers renew 2 combs in the brood chamber each season. The new combs, it is claimed, satisfy the bees' urge to draw comb and thus alleviate swarming tendencies.



Colony ready for "super"



Placing queen excluder



Placing "super"

Supering

The first super should be put on in early May in any normal season. The queen excluder is placed in position underneath the super to prevent the queen from laying in the latter. As the colony increases in strength, a second super should be added. Frames containing foundation should be placed in the super immediately above the brood chamber.

Swarm control

Swarming is the bees' natural method of increase and for this reason it cannot be suppressed entirely. Some strains are much more prone to swarming than others. However, by careful selection of non-swarming strains in re-queening, those prone to swarming can be eliminated over a few years. On the other hand, if stocks are built up from swarms without subsequent re-queening the swarming strains will be further propagated.

It is also well known that stocks headed by a queen hatched the previous season are not as likely to swarm as colonies having 2 or 3 year old queens.

However, some system of swarm control must be operated if valuable bees are not to be lost for the honey flow. Many systems of swarm control are advocated by various authorities on beekeeping and most of them succeed in their main purpose of preventing swarming.

The system put forward here is a fairly standard one and, if followed, will give almost 100% success. It does involve regular inspections but, as the beekeeper becomes experienced and is able to assess the swarming tendencies of his colonies, he/she will be able to short-circuit the routine examination quite a bit.

Briefly, the system is as follows:

Each hive is examined every 9 days from 1st June to mid-July. The operator looks at 3 frames in the middle of the brood chamber. If there are no queen cells on these the remaining frames need not be examined. If queen cells are found, all frames must be examined and all queen cells must be destroyed. If queen cells are found in this stock at the next visit, they are again destroyed and the queen must also be removed. At the next inspection, all queen cells are removed except one. This will hatch and head the colony. Alternatively, a queen cell from a known good strain or a young laying queen may be given. In the latter case, none of the hive's own queen cells must be left.

Marking and Clipping Queens

Some beekeepers like to mark their queens each year and at the same time clip the tip of one of the queen's wings to prevent her absconding with a swarm. Late April to mid-May is a suitable time to carry out this operation.



Clipped and marked queen



Harvesting the honey crop

It is all important for quality honey to ensure that frames are well-capped before being taken off. Most beekeepers leave them on until the end of the season, which is about 10 days after the main honey flow is ended.

Extracting Liquid Honey

A tangential extractor is suitable for up to 20 stocks. Above that number a radial extractor is usually necessary. The job of extracting is a straightforward one and should be carried out in a bee-proof house.

Where the honey crop is offered for sale, it is important to note that the conditions under which the honey is extracted, bottled and prepared for market comply with local health regulations. An uncapping tank or tray is required to separate the honey from the wax cappings. The wax resulting from capping is also a valuable product and should be kept for manufacture into bees wax foundation.

Straining

Honey should be strained into the final container. Suitable material can be obtained from specialist beekeeping suppliers (nylon cloth 54 mesh per 2.5 cm²).

Heating of Honey

Where honey has to be heated to fill into jars or other containers, the temperature should not exceed 40°C (108°F) in a water bath.

Preparation For Sale

Honey to be sold in jars should be harvested in the following manner. In addition to the points mentioned above, the honey room should be maintained at a temperature of 20°C. This ensures ease of extracting the honey from the combs. The honey should be allowed settle for a number of days after extracting and then skimmed. Where honey is to be stored prior to bottling the following criteria should be adhered to. Air tight containers made from food quality plastic with a capacity of 25 kgs are ideal for this purpose. Honey absorbs moisture and taints. It is therefore important to avoid introducing any product which could contaminate the honey while in storage. A cool dry storage area is essential. Overheating will damage the honey.

Bottling

If an interval of time has elapsed from extraction to preparation for bottling, it will be necessary to preheat the honey to a temperature of 40°C. The honey should be strained prior to bottling.

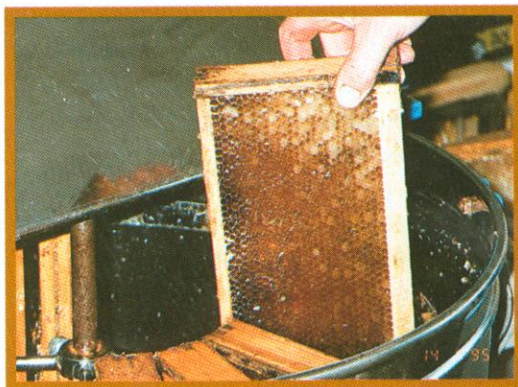
Types of Jars

There are many types of jars available. These range from the traditional 454g to a 30g mini jar. The size should be selected to suit particular markets.

Presentation and labelling

The presentation and the labelling are most important features in marketing. The label should clearly state that it is 100% pure Irish honey and not a mixture, to enable customers to discern the purity of the product. The label should also indicate that granulation of pure Irish honey is possible. This can be remedied by placing the jar in hot water for a period of time.

The label must state the honey net contents, the name and address of the manufacturer, packer, distributor or vendor of the honey.



Placing uncapped frame in extractor



Uncapping steam knife

E.U. Standards

Producers should refer to the standards laid down for honey in Codex Alimentarius. See Appendix 6.

Section Honey Production

The production of section honey is not as economically attractive as the production of liquid honey. The necessity to crowd bees in order to work in sections predisposes to more difficult swarm control. The tendency for sections to remain unfilled is more likely to occur in the average nectar flow season experienced under Irish conditions. The expense of buying new sections each season adds to the cost. It is generally accepted that the amount of honey obtained

from this system is not as good as that obtained from the liquid run honey system of management. However, it must be stated that for the smaller beekeeper there is no need to purchase expensive extracting equipment and the market has a very distinct preference for section honey.

Cut Comb & Chunk Honey

Cut comb is an alternative and a cheaper method of producing honey on the combe. This is produced on the standard frames. A special thin sheet of wax foundation should be inserted into the frame. These "special frames" are placed over the Queen excluder. It is best to place "super" used for cut comb production immediately above the brood chamber. The well-filled comb is cut into pieces of approximately 0.25 kg and placed in special plastic containers. Smaller pieces may be placed in a honey jar and then surrounded by liquid honey and marketed as chunk honey.



Stock replacement

It is generally agreed that beekeepers do not make sufficient provision for replacing stocks which are lost for one reason or another during the winter. As a result, beekeepers end up with less stocks than they have equipment for and many rely on getting swarms to restock empty hives. Usually swarms in any quantity are not available in time to obtain a surplus in the same season. In any event, it is a haphazard method of stock replacement and unlikely to prove very successful in the long term. There is, of course, always the risk of introducing disease to the apiary.

Early Stock Division

To replace colonies which have died out during the winter or stocks which are too weak to build into production stocks in time for the main honey flow, a beekeeper can practise Early Stock Division.

Procedure

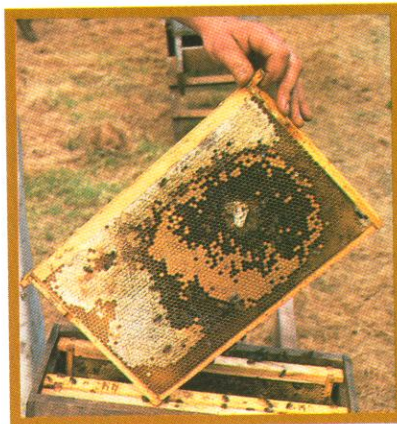
During the first week of May, very strong stocks (i.e. those with 5 or 6 frames of sealed brood) can be selected for division.

Place the queen, two frames of sealed brood and one frame of stores including pollen with adhering bees in a nucleus box. Shake in bees from two other frames. Remove to another apiary. Feed both parts. Transfer nucleus to full hive after 7 days. The queenless portion should have a laying queen by mid-June. As it will need assistance in the form of sealed brood from other strong stocks (4 frames approximately) it is recommended that only 20 percent of stocks be divided. The abstraction of sealed brood from strong stocks has the effect of delaying swarming or, in some cases, preventing it altogether.

Both portions will give crops of honey in areas where the main flow occurs in late June.

Making Nuclei during the Season

In early June a nucleus of two frames of brood with bees, but without the queen, can be taken from strong stocks without undue risk to the honey crop. Shake in bees from two other frames, add a frame of food and remove to another apiary. A queen cell can be added from a stock of known performance or a young mated queen given. In a moderately good season, this little stock will maintain itself and in a good season will provide itself with sufficient stores for winter.



Good queen cell



Introducing queen cell

Late in the Season

In late June and early July the queen and one frame of brood can be taken out of a strong stock and placed in a nucleus box. Shake in bees from two frames. Remove to another apiary. The queen will continue to lay and build up into a stock sufficiently strong to overwinter.

The queenless portion will need to be checked for queen cells four or five days later and a well-nourished unsealed cell left to hatch out a new queen or introduce a young laying queen.

Advantage can be taken to re-queen from a good strain by replacing the stock's own queen cells with a cell from the best strain.

Division Toward End of Honey Flow

For beekeepers who have difficulty in finding the queen, the following method of making increase is suitable.

Towards the end of the main honey flow, any strong stock with 7 or 8 frames of brood can be divided without finding the queen.

Procedure

Place 4 frames of mixed brood with adhering bees in a new hive. Shake in bees from two other frames. Move to another apiary.

The queenless portion will raise its own queen. Check both portions 4 or 5 days later. Leave one queen cell in the queenless portion or introduce a young laying queen.

If the division is done during the latter stages of the honey flow, the yield will not be unduly affected.

Queen Replacement

Annual replacement of queens is recommended for two reasons: (i) vigorous young queens build up better, (ii) young queens are not as prone to swarming.

Queen Rearing: Jenter Method and Mini Hive

The plastic Jenter kit is fitted into the centre of any normal deep barframe. It is then put into a strong colony to get the wax coated plastic frame drawn out. The front of this special plastic frame is covered with a queen excluder. The cells for the queen to lay in are inserted from the back, which has a plastic cover.

The selected breeder queen is put into the frame and is confined there by the queen excluder. In a few hours (overnight) the queen will fill the small frame area with eggs. The queen is then released and the frame is left in the hive for 2-3 days. Then the plugs containing the just hatched larvae are extracted from the back of the frame, placed into the starter cups and inserted into the cup holders on the rearing frames. The barframe containing these rearer bars is then put in a queenless cell-building colony to get the queen cells built. The principal advantage of this method is that the larvae are all of the right age and will be fed correctly to give good quality queens. This eliminates the problem of grafting and is a technique that most beekeepers could adopt.

The polystyrene mini hive is very compatible with this system. Fourteen days after commencing queen rearing, the cells are removed from the cell-building colony and they are fitted into the round hole in the crown board of the mini hive. The mini hive is populated with a cupful of bees and the feeder is stocked with fondant. The mini hives are then brought indoors for three days. Then, late in the evening, they are put out in the mating apiary. It is important to ensure that the hive has a supply of food at all times. The small amount of bees necessary to populate the mini hive means that a supply of young queens from selected colonies can be obtained with no effect on the honey-gathering capabilities of the beekeepers' stocks.

Step-by-Step to Queen Rearing



Jenter frame



Batch of queen cells



Queen cell to mini-nucleus



Queen hatched



Mini-nucleus frame

Preparation for Winter

When feeding has been completed and the feeders removed, stocks should be got ready for winter.

For best results a colony should contain:

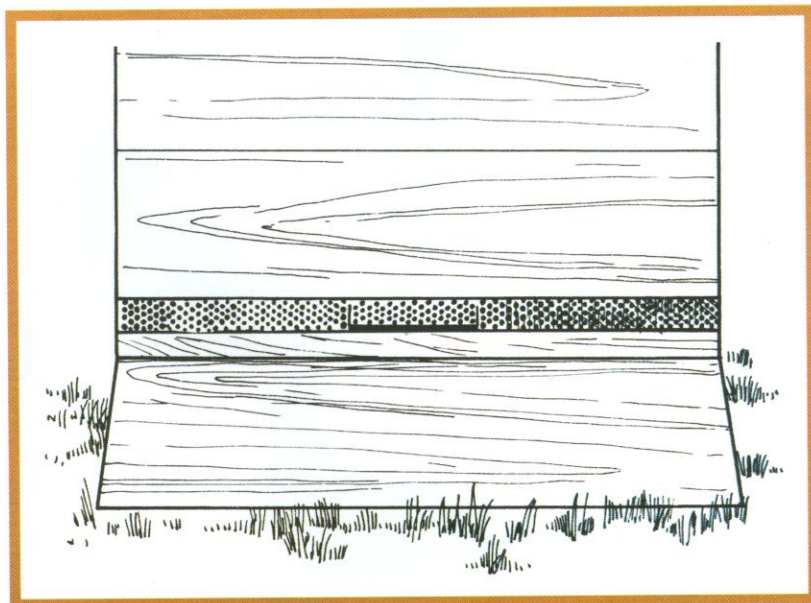
- A young, fertile queen
- Bees in sufficient numbers to cover both sides of at least five frames
- Adequate stores to last until late Spring

The hive should be waterproof, be provided with ventilation top and bottom and have a dependable mouseguard inserted in the entrance.

If a super is used to augment the brood chamber during the winter, make sure to remove the queen excluder. Otherwise, the bees may cluster in the super leaving the queen trapped below.

The hives should be mounted on stands and tied down securely to prevent them being blown over in winter gales.

Lastly, check that the apiary itself is stock-proof and in no danger from flooding.



Hive doorway prepared for winter with perforated zinc "mouse excluder". Note full width is given but the bees are allowed only an entrance of approximately 50mm x 10mm. This ensures adequate ventilation and gives a reasonable entrance to defend against robbing bees



Diseases control and diagnosis

Bees, similar to all living creatures, are subject to certain diseases, both of the brood and of the adult. The beekeeper comes in contact with all colonies and should be very vigilant to ensure that hygiene standards are maintained. This is essential to avoid spreading disease. Robbing and drifting are two other sources by which bees can become contaminated.

Sampling For Disease

The beekeeper should send samples of bees for disease diagnosis. This is the only reliable method of disease detection. Approximately 30 bees in a match box is required and on no account should plastic containers be used as the bees decompose rapidly in these containers. If the beekeeper suspects any of the brood diseases are present, a portion of comb, at least 100mm x 100mm, should be sent also in a paper container.

Taking samples for diagnosis.



Acarine Disease

Acarine disease is caused by the mite *Acarapis woodi*. The mites affect the trachea of the honey bee. Presence of the mite is best detected by sending samples as outlined. At the present time, there is no recommended chemical treatment.

Nosema Disease

This is caused by *Nosema apis*, which attacks the gut of the adult honey bee. This disease may reduce the vigour of the colony, particularly after a poor season. Failure of a colony to build up in Spring is a typical symptom of an affected colony.

Control

Fumidil B should be included in the Autumn feed as per instructions of the manufacturers.

Fumigation of Combs — As a routine, all empty combs should be fumigated with Glacial Acetic Acid (80%) to kill *Nosema* spores and Wax Moth grubs before they are stored away for the off season. The technique is as follows — turn a roof upside down and place a box of frames in it: pour 140 c.c. (1/4 pint) of acetic acid onto a pad of any absorbent material and place it on top of the frames. Add another box of frames and repeat the treatment. Continue stacking the boxes on top of each other with a pad on each to a convenient height and then cover the top box with a roof. Block any holes in the boxes to prevent fumes escaping. The stack should be made in the open. Rubber gloves should be worn as acetic acid can burn the hands.

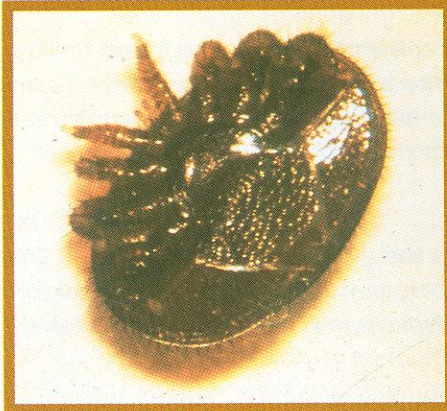
Varroasis

Varroasis in honeybees results from infestation of the honeybee colony by a parasitic mite, *Varroa jacobsoni*.

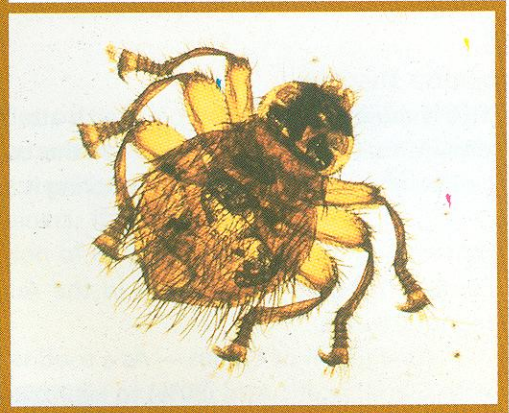
The varroa mite feeds exclusively on the haemolymph ("blood") of honeybees, *Apis mellifera* and *Apis cerana* (Asian honeybee). It is not known to be a parasite of other bees.

Description of *Varroa jacobsoni*

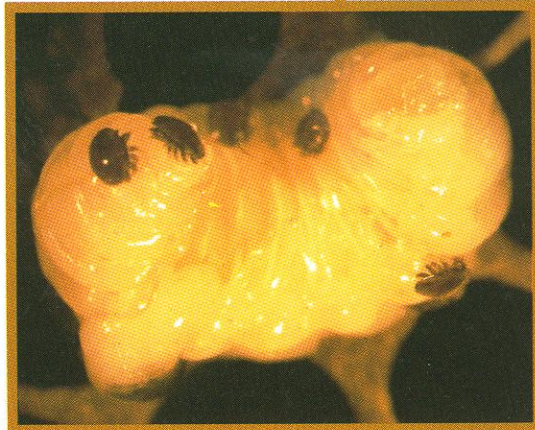
The adult female mite is elliptical in shape with a raised body (like an oval upturned saucer) red brown in colour, about 1.6 mm wide and 1.1 mm long (just visible to the naked eye). With magnification the eight legs are seen protruding from under one of the longer edges of the body. Males are smaller than the female and pale in colour.



Varroa Adult (female) 8 legs



Braulacoeca (adult) 6 legs



Drone Pupa showing Varroa Mites

Biology of *Varroa jacobsoni*

The mites breed best in a drone brood, but worker brood is also a satisfactory host. In the absence of brood for dissemination they survive on adults.

A mated female mite enters the brood cell soon before it is capped by worker bees. The mites shelter in brood food until it is eaten and then commence egg laying on the host.

The first egg laid develops into a male, subsequent eggs developing into females with which the male mates when they reach maturity. Males mature in

about 5 days, females in about 7 days. Consequently, only 1-2 mated female mites per female have time to develop before the worker bee emerges while up to 3 can emerge from a drone cell as drones take 3 days longer than workers to reach the adult stage. Male mites do not feed and die after the bee emerges.

Female mites can survive away from their host for at least 5 days. Mites live about 2-3 months during summer but during autumn and broodless periods they may live for up to 8 months.

How Varroa Spreads

Mites spread naturally on robbing or drifting bees, especially drones, and with swarms. Natural spread would, however, remain local in the short term, long distance spread being caused by beekeepers moving colonies or importing infected stock.

Warning: There is a total embargo on the importation of bees and queens in operation by the Department of Agriculture, Food and Forestry.

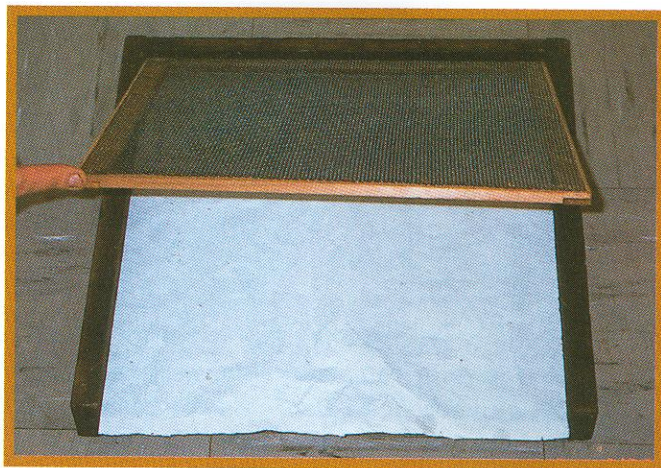
Impact of Varroa

It is believed that mites weaken adult bees, reducing their life span by up to half (depending on the number of mites) if they infest them within 10 days of emergence or if 5 or more mites plus their offspring are present during development. In heavy infestations, adult bees may emerge with stunted or deformed bodies, legs and wings. Larvae and pupae may be killed in their cells.

Colonies

Low mite numbers do not cause obvious effects on colonies. Heavily infested colonies can collapse within 2 years, but it may take 3-5 years. Untreated infested colonies will inevitably die. It is considered by some experts that it takes 5-10,000 mites to cause colony death — a level that can be reached in 3-4 years in northern Europe as a result of the introduction of one fertilised female mite.

Colony collapse usually becomes evident either in autumn or spring. Colonies weakened by varroa may show increased susceptibility to bee diseases such as chalk brood, foul brood and viruses.



Insert plus screen

Varroasis Detection

There are five basic diagnostic techniques:

1. In mid to late July place a sheet of light coloured paper or card on the floor of the hive and protect with a firm 3 mm aperture metal or plastic mesh supported by a thin wooden frame. Leave in place for a 6 week period at the end of which debris on the sheet is sent for examination.
2. Slide the prongs of a honey uncapping fork under the domed cappings of drone brood at the red-eyed stage and examine the brood for mites. Alternatively, uncap drone comb with a knife and strike the frame sharply on a light coloured flat surface to eject the pupae for examination. Examine at least 100 drone brood cells per colony.
3. Use a proprietary varroa diagnostic treatment such as flumethrin (Bayvarol) as directed by the manufacturer. Flumethrin is believed to be best when used at the end of September. Strips are left in colonies for a maximum of 6 weeks.
4. During October or March, smoke with proprietary pipe tobacco after inserting a sheet of paper or cardboard on the hive floor and blocking the hive entrance. Full colonies should be smoked for two minutes and nucleus colonies for one minute using a small handful of tobacco for every 2-3 hives. If possible, use a mesh screen to separate bees from debris. Send debris for microscopic examination.
5. At the spring inspection, scrape hive floor debris from each colony in the apiary and send for examination.

Varroa samples only should be sent to:

R. Dunne

Teagasc

Kinsealy Research and Development Centre

Malahide Road

Dublin 17

Phone: (01) 846 0644

Other samples for disease and pest diagnosis to:

P. Bennett

Teagasc

Clonroche

Co. Wexford

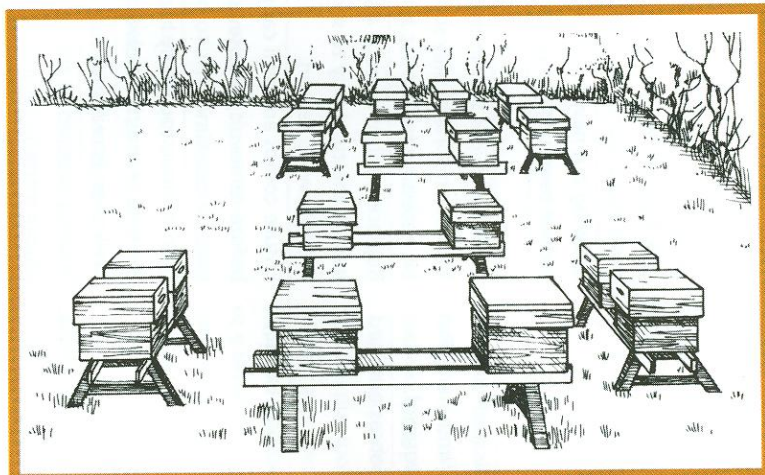
Phone: (054) 44106

Calendar of events

Month	Operation	Method	Comment
Mid-Sept to mid-Oct.	Feeding	Mix 2 parts of sugar to 1 part of water by weight. Stir until dissolved and feed in containers of 4.5-9.0 litres (1-2 gals.) at a time. Narrow entrance to prevent robbing.	Feed several stocks at the same time. Feed to ensure that stocks have a minimum of 15kg (35lb) of food for winter stores.
Sept-Oct	Fit mouse guards	Strips of perforated zinc 45cm x 50mm (18" x 2") are fastened along the entrances with thumb tacks. A gap of 50mm x 9.5mm (2" x 3/8") is cut out at one point to allow the bees in and out.	Mouse guards should be put on before autumn feeding as they prevent robbing as well. They may be left on until early May.
Sept-Oct	Treatment of stocks for Nosema Disease, if necessary	175mg (1 teaspoonful) of Fumidil B in 4.5-9.0 litres (1 to 2 gals) syrup.	Treatment can be carried out in conjunction with autumn feeding.
Sept-Oct	Treatment of combs for Nosema should be a standard treatment	140cc (1/4 pint) glacial acetic acid on a small pad over the frames in each box and stack boxes 6 to 8 high in the open. Prevent fumes from escaping.	Best results are obtained before temperatures fall in late autumn.
Sept-Oct	Storing of combs	Boxes of combs should be stored over one another with a queen excluder at the bottom and top of the stack. A single sheet of newspaper between every two boxes or some crystals of P.D.B. prevent wax moth. Paradichlorobenzene crystals are not recommended if the frames contain any liquid honey.	
November	Treatment of Acarine Disease	No treatment available.	
Jan-Feb	Check stocks at intervals re: food stores. Apply hive preservative	Feed fondant if necessary.	
March-April-May	Spring feed (if required). Varroasis detection.	Mix equal parts sugar and water and feed as described for autumn feeding.	Feed when stocks go lower than 4.5kg (10lb) per hive any time from March to main honey flow.

Mid-April to mid-May	Spring cleaning. Mark and clip queen (opt.)	Remove mouse guards, clean floorboards. It is sufficient to clip the tip of one wing only. A spot of queen marking paint in one of several colours can be put on the thorax before the queen is released.
May	Early stock division	See page 17
Late May	Building up for honey flow	Replace old brood combs. Put on queen excluder and place honey super above it.
June	Nuclei formation	See page 17
1st June to mid-July	Swarm control. Putting on additional supers. Fit varroa diagnostic inserts into hive	Examine stocks at 9 day intervals and take steps as outlined if swarming is imminent. Put on a second or third super as required.
July to mid-August	Stock improvement — make up nuclei	Recommended that the operation as outlined be carried out. See page 18
Mid-August	Removal and extraction of honey	Use clearer board with 2 bee escapes. Extract as outlined in beeproof house.
Early August	Move colonies to the heather (optional)	Prepare stocks and transport hives as outlined — under heather honey production.
Mid-Sept.	Bring stocks back from heather. Test for disease and varroa	Send samples of bees for examination for disease.

Appendix 1a



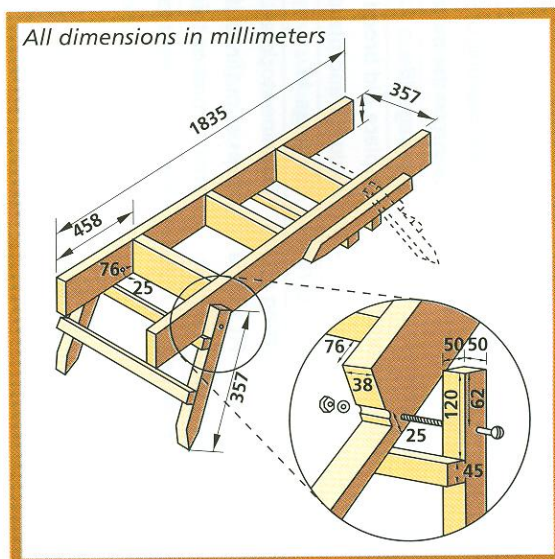
Apiary site showing good hive arrangement and shelter.

Appendix 1b

Specification for a Beehive Stand

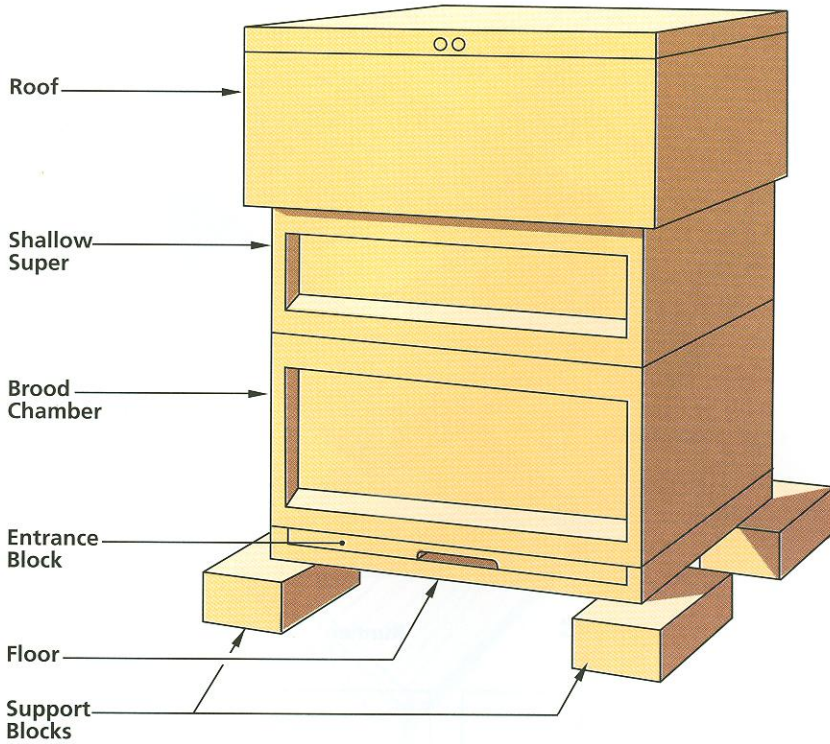
Type in use at Beekeeping Unit, Teagasc, Clonroche, Co. Wexford.

The stand, which supports two hives, facilitates management and ensures dry hives. The legs of the stand fold flat underneath the frame by means of pivoting bolts, thus ensuring easy stacking or transportation if moving to the heather. The stands should be assembled with tanalised timber to ensure long service.



Hive stand

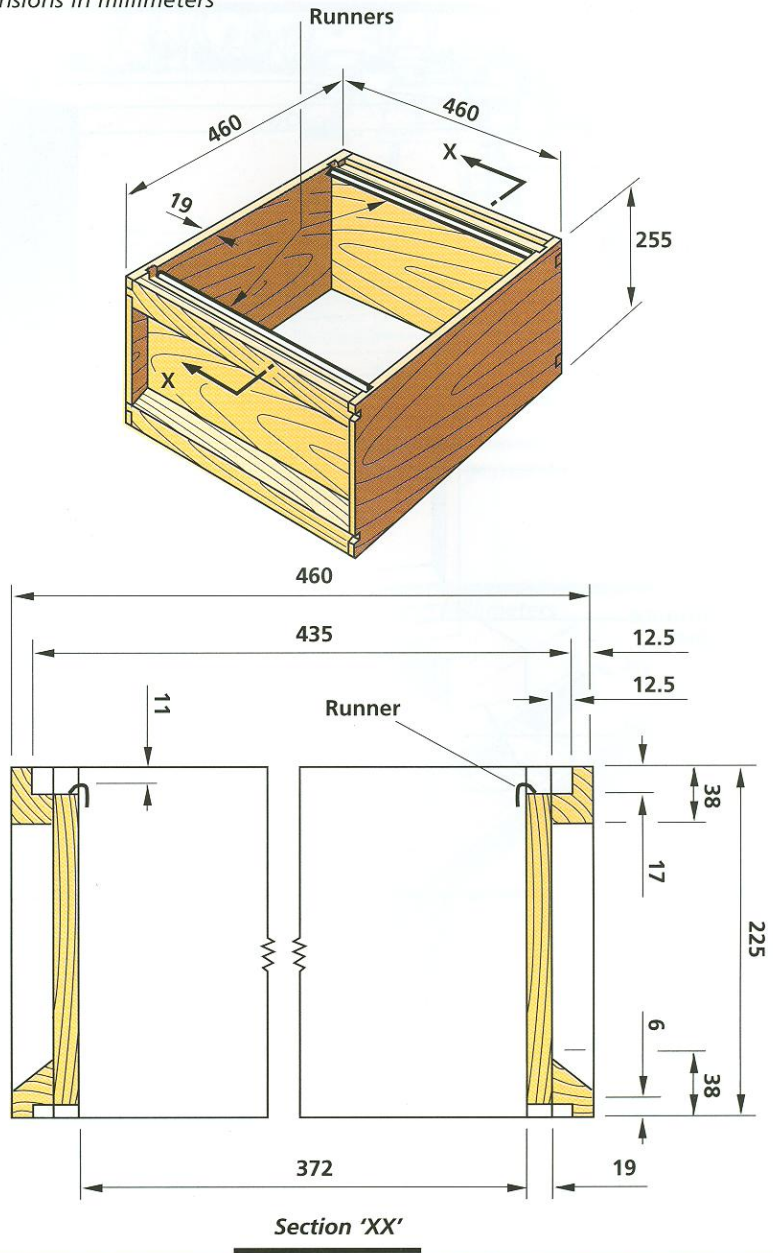
Appendix 2



National Hive

Appendix 2a

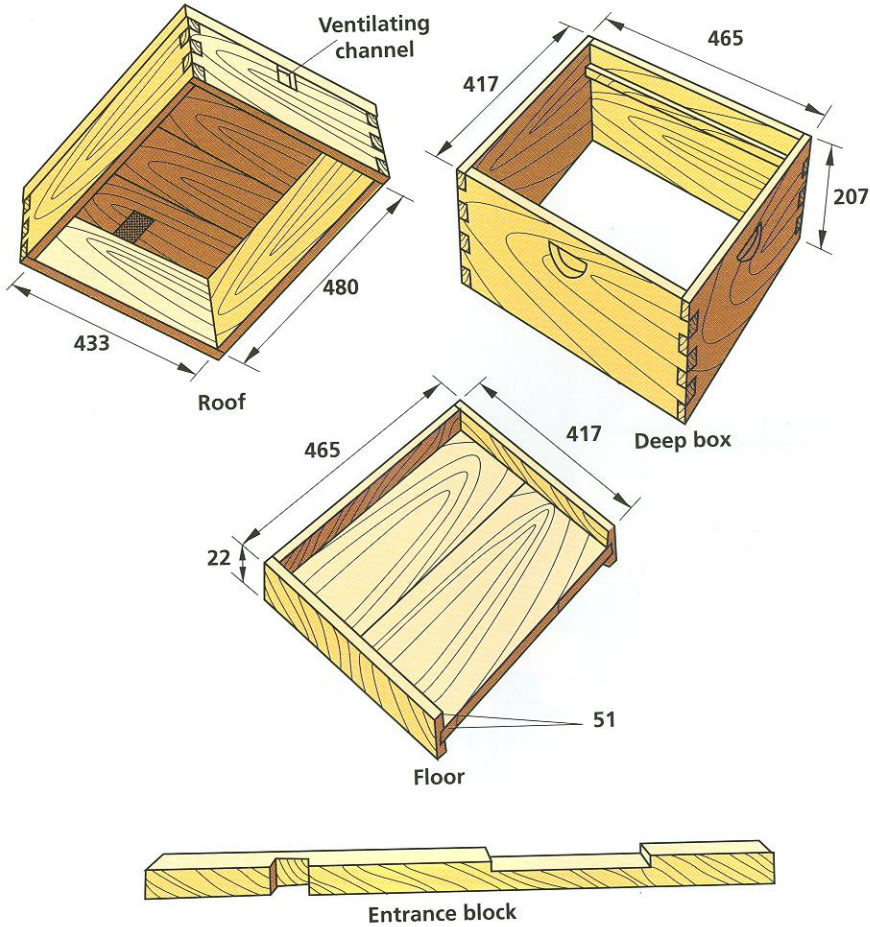
All dimensions in millimeters



National Brood Chamber

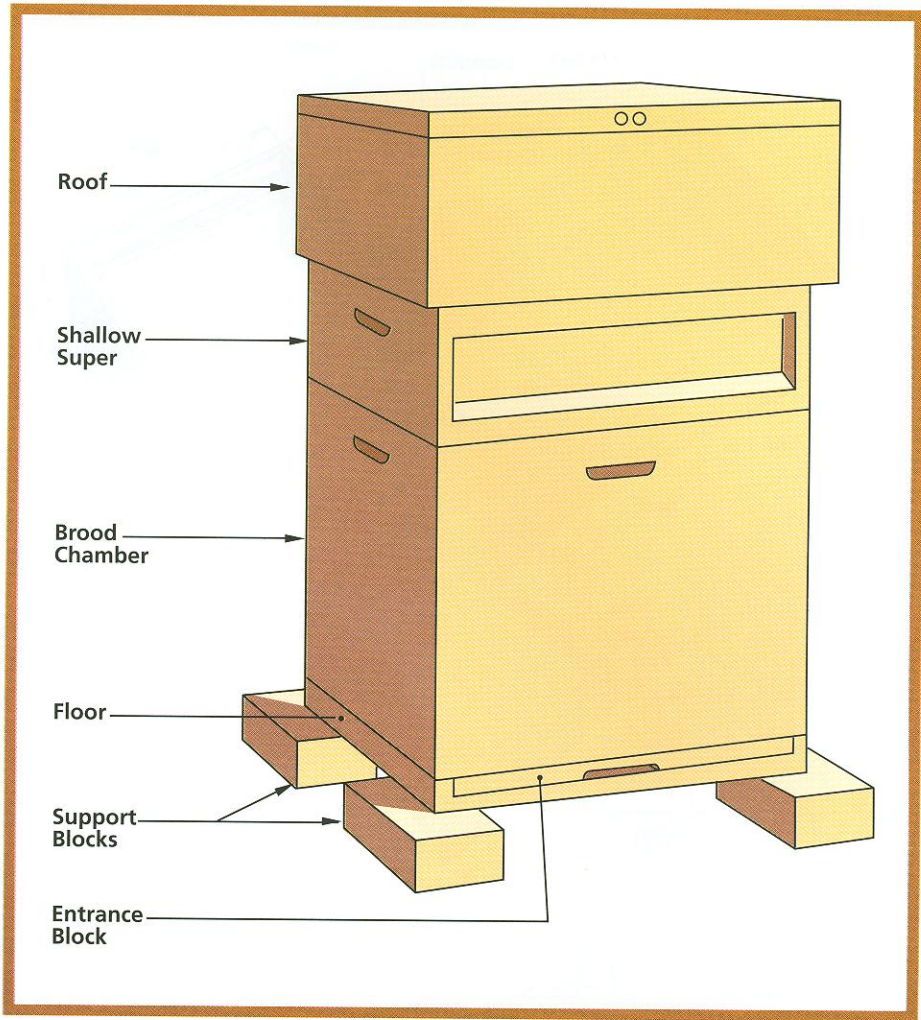
Appendix 3

All dimensions in millimeters



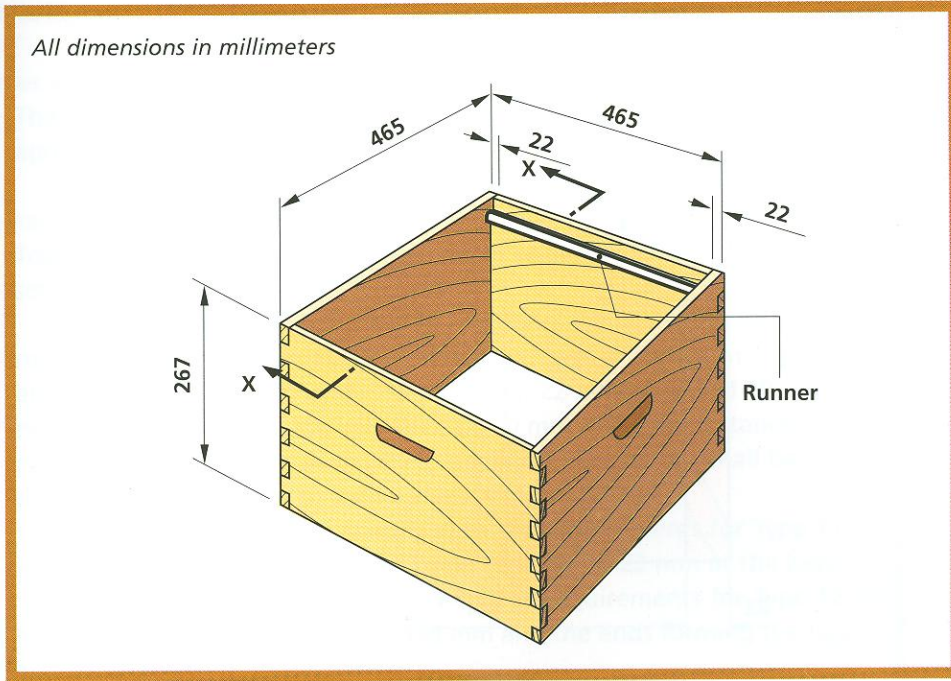
Smith Hive

Appendix 4



Modified Commercial Hive

Appendix 4b



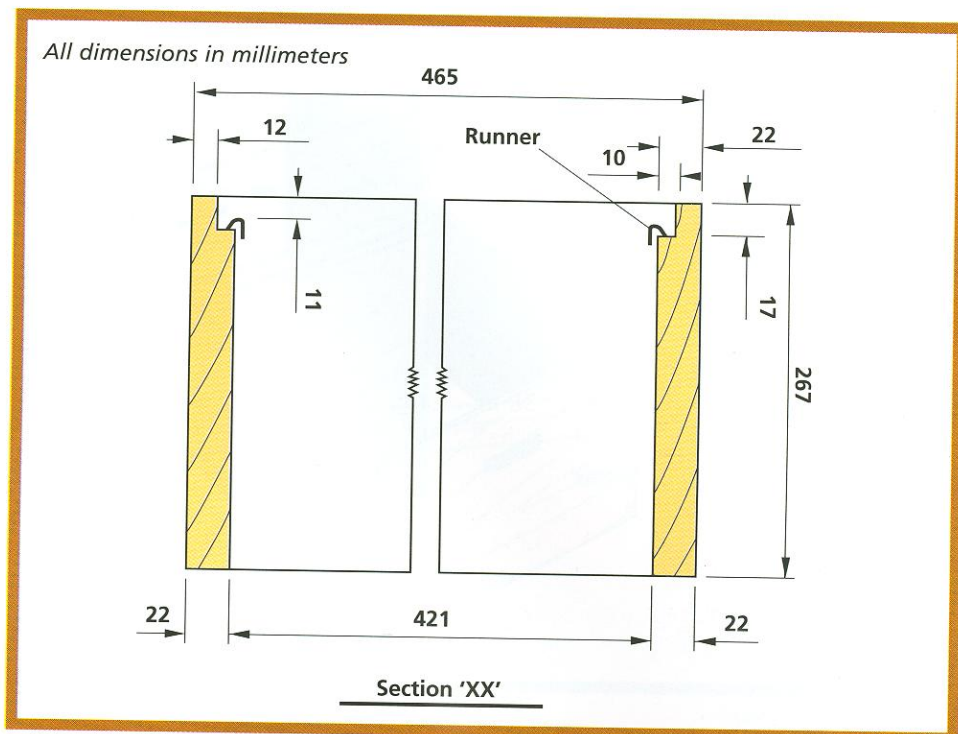
Brood Chamber

Modified Commercial Hive

Brood chamber.

The brood chamber shall be square and designed to take 406mm x 254mm frames. The outside dimensions shall be 465mm, the thickness of the timber 22mm and the depth 267mm. The end walls shall be rebated 10mm on the inner side at the top, the rebate being 11mm deep or where runners are used 17mm deep. The corners shall be lock-jointed and finger grips shall be provided, one on each face, each at least 89mm long by 12.5mm deep located 64mm clear of the top edge, preferably D-shaped.

Appendix 4c



Brood Chamber c Modified Commercial

Shallow super.

The shallow super shall be in all respects similar to the brood chamber except that the depth shall be 162mm. It is designed to take 406mm x 152mm frames.

Other hive parts. The section rack, crownboard, roof, floor and entrance block and queen excluder for the Modified Commercial Hive are common to both National and Modified Commercial Hives.

Appendix 5a

Frame Types

Frames and their component parts.

The designations of frames and of their component parts shall be as set out in appendix 5b & 5c.

Top bars of frames.

Top bars shall be of Types T1, T2 or T4 as appropriate to the types of frame as set out in appendix 5c.

Type T1 top bars shall be 432 mm long, 22 mm wide and 17 mm deep reduced to 10 mm deep at the notches and lugs as shown in appendix 5b. The ends forming the lugs shall be 38 mm long, 22 mm wide and 10 mm deep. The notches to receive the side bars shall be 10 mm wide, the distance between the notches being 12.5 mm as shown in appendix 5b. The bar shall be rebated and shall have a wedge-slip to secure the wax foundation.

Type T2 top bars shall comply with the requirements for Type T1 top bars except that their width shall be 27 mm reduced to 22 mm at the lugs.

Type T4 top bars shall comply with the requirements for Type T2 top bars except that their length shall be 438 mm and the ends forming the lugs shall be 16 mm long.

Side bars of frames.

Side bars shall be of Types S2, S4, S5, S7 and S10 as appropriate to the type of frame as set out in appendix 5c. The thickness of all side bars shall be 10 mm and there shall be a 3 mm x 3 mm groove in the centre of the inner face.

The length and width of side bars shall be as set out for the type below.

Type S2 side bars shall be 216 mm long with the winged part 35 mm wide and 51 mm long, the lower part being 22 mm wide. One wing of the bar shall have a V-edge so that when the frame is assembled, the V-edge of the side bar on the left faces the observer when the frame is viewed right way up from either side.

Type S4 side bars shall comply with the requirements set out for S2 side bars except that the length shall be 140 mm.

Type S5 side bars shall be 140 mm long and 41 mm wide throughout the whole length.

Type S7 side bars shall comply with the requirements for Type S2 side bars except that the length shall be 254 mm.

Type S10 side bars shall be 152 mm long and 41 mm wide throughout the whole length.

Bottom bars of frames.

Bottom bars shall be of Types B1, B2, B3 or B4 as appropriate to the type of frame as set out in Appendix 5c. Bottom bars shall be of the 2-piece pattern, each piece being 8 mm deep and of the length and width as set out below.

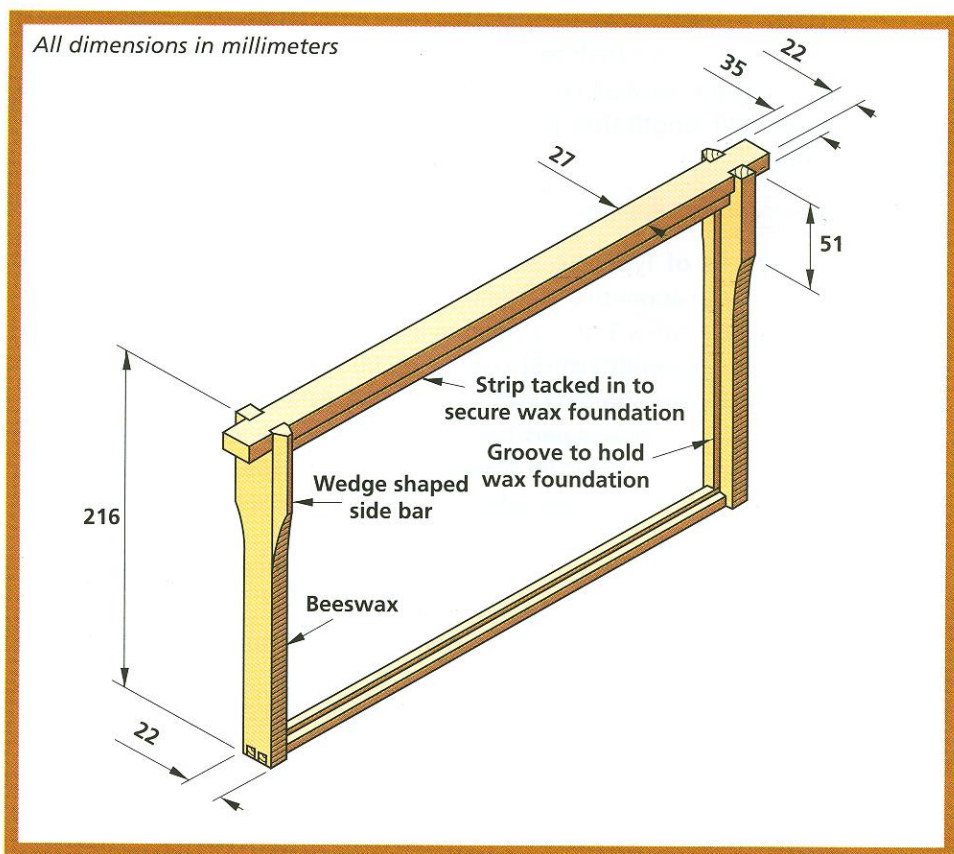
Type B1 bottom bars shall be 356 mm long and 6 mm wide.

Type B2 bottom bars shall be 356 mm long and 12 mm wide rebated at each end to leave a tongue 6 mm x 8 mm.

Type B3 bottom bars shall be 406 mm long and 6 mm wide.

Type B4 bottom bars shall be as Type B2 bottom bars except that their length shall be 406 mm.

Appendix 5b



Frame and parts

Appendix 5c

Designations of Frames and of their Component Parts

Type of frame	Type number of frame	Dimensions	Designation of component parts			Method of spacing
			Top bar	Side bar	Bottom bar	
National Deep	DN/4	356mm x 216mm with 38mm lugs	T1	S2	B1	Hoffman
	DN/5		T2	S2	B1	Hoffman
National Shallow	SN/4	356mm x 140mm with 38mm lugs	T1	S4	B1	Hoffman
	SN/5		T2	S4	B1	Hoffman
	SN/7		T2	S5	B2	Closed-end frame
Modified Commercial Deep	DM/2	406mm x 254mm with 16mm lugs	T4	S7	B3	Hoffman
Modified Commercial Shallow	SM/3	406mm x 152mm with 16mm lugs	T4	S10	B4	Closed-end frame

Dimensions of Component Parts of Frames

Type of frame	Type Number of frame	Dimensions mm						
		A	B	C	D	E	F	G
National Deep	DN/4	216	356	432	38	22	35	22
	DN/5	216	356	432	38	22	35	27
National Shallow	SN/4	140	356	432	38	22	35	22
	SN/5	140	356	432	38	22	35	27
	SN/7	140	356	432	38	41	41	27
Modified Commercial Deep	DM/2	254	406	438	16	22	35	27
Modified Commercial Shallow	SM/3	152	406	438	16	41	41	27



Appendix 6

Council Directive 74/1409 EU of 22/7/74

Compositional Criteria for Honey

1. Apparent reducing sugar content, calculated as invert sugar

Blossom honey not less than 65%

Honeydew honey and blends of honeydew honey and blossom honey not less than 60%

2. Moisture content

In general not more than 21%

Heather honey (*Calluna*) not more than 23%

3. Apparent sucrose content

In general not more than 5%

Honeydew honey and blends of honeydew honey and blossom honey, acacia, lavender and *Banksia menziesii* honeys not more than 10%

4. Water-insoluble solids content

In general not more than 0.1%

Pressed honey not more than 0.5%

5. Mineral content (ash)

In general not more than 0.6%

Honeydew honey and blends of honeydew honey and blossom honey not more than 1%

6. Acidity

not more than 40 milli-equivalents acid per 1000 grammes

7. Diastase activity and hydroxymethylfurfural content (HMF) determined after processing and blending

(a) Diastase activity (Schade scale)

In general not less than 8

Honeys with low natural enzyme content (e.g. citrus) and a HMF content not more than 15 mg/kg

(b) HMF not more than 40 mg/kg (subject to the provisions of paragraph (a) second indent).