Honeybee Disease Barrier Management Systems

Case Studies

A report for the Rural Industries Research and Development Corporation

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In July 1998, a national honey bee disease workshop was convened to develop suitable management programs to control and reduce the level of the notifiable honey bee brood disease, American Foulbrood. One of the recommendations arising from the workshop was that the use of disease barrier management systems in apiaries should be encouraged.

In addition to barrier management systems, there has also been a growing interest in the apiary industry about the use of hot wax dipping to sterilise beehive components originating from hives infected with American Foulbrood disease. A project was funded to develop beekeeper focused guidelines regarding these two management practices.

This publication considers best practice of honey bee disease barrier management systems for the prevention and control of American Foulbrood disease. It presents information from case studies of selected apiarists who successfully practice these strategies as part of their disease management programs.

This project was funded from industry revenue which is matched by funds provided by the Federal Government.

This report, a new addition to RIRDC’s diverse range of 700 research publications, forms part of our Honeybee R&D program, that aims to support innovative and focused research and development projects which will contribute to the productivity and profitability of the Australian beekeeping industry.

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- downloads at www.rirdc.gov.au/reports/Index.htm
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Peter Core
Managing Director
Rural Industries Research and Development Corporation
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## 1. Introduction

**Introduction**

Welcome to the honey bee barrier management - case studies for apiarists.

**What is a barrier?**

*Definition*

A barrier is defined as ‘something that separates’.

One dictionary defines a barrier as ‘anything serving to obstruct or to maintain separation, such as a fence or gate’. (Collins English Dictionary, 1994).

**Purpose of barrier management in beekeeping**

Successful barrier management systems minimise the spread of bee disease within a beekeeping enterprise.

Barrier management systems are primarily targeted to the prevention of spread of the honey bee brood disease, American Foulbrood.

**What is barrier management in beekeeping?**

Barrier management in beekeeping involves the separation of single hives, groups of hives or even entire apiaries into distinct and separate units. The barrier prevents the interchange of bees, honey and beehive components from one unit to another.

A variety of barrier management systems are used by Australian beekeepers. The systems may be developed to suit individual needs.

The system requires good record keeping and the ability to conduct traceback investigations to determine the source of disease.

**Effectiveness of barrier management**

Under barrier systems, the apiarist limits the transfer of beehive components, bees and honey to the defined unit of hives. The unit may be a single hive, group of hives or entire apiary (or load of hives). Barrier management is a proven method of containing the spread of American Foulbrood disease (AFB) within the unit established by the barrier.

It is extremely important to note that the barrier can never prevent the spread of AFB that occurs when robber bees take honey from an infected hive to other hives within the unit or even outside the unit. Robber bees are only remove honey in this way when the colony of bees in the infected hive is left to weaken or die out.

**Inspection of brood still required!**

Barrier management systems are not a replacement for good beekeeping and bee disease management.

Inspection of brood for the presence of AFB disease signs and laboratory honey culture tests for detection AFB spores remain very important disease management strategies.
As mentioned before, AFB must still be detected before the disease advances to the stage where robber bees can gain access to the sick or dying colony.

**Barrier management not new**

Basic forms of barrier management systems have been practised by apiarists in South Australia’s Naracoorte district for more than 40 years (Cotton 1999). In these systems, combs of honey are extracted in mobile extracting plants and placed back in the hives from which they were taken.

**Development and adoption of barrier management**

Barrier management is widely practised in Western Australia and also to a large degree in South Australia. Adoption of barrier management systems in the eastern States has been slow and few apiarists use this management procedure.

Barrier management was introduced to the Western Australian apiary industry during the 1980s by Lee Allan, Senior Apiculturist with Agriculture Western Australia (Allan 1996). Approximately 80% of commercial apiarists in that State now use the system described by Allan (1996) or a variation of it.

Readers are encouraged to obtain a copy of his work (see References) to obtain full details of the Western Australian system and the principles of barrier management.

**This RIRDC report**

This RIRDC report does not attempt to duplicate the work of Allan (1996). It presents some case studies to demonstrate how some apiarists have incorporated barrier management as part of their disease management strategies.

The information presented in this report has been given freely by a number of Australian apiarists willing to share their experiences in adopting and practicing barrier management as part of their normal apiary management.

Readers will be able to glean the best ideas of barrier management and adapt them for their own particular apiary management system. In one or two cases, the systems described are still evolving and readers may identify ways of improving or perfecting the techniques.

Every reasonable care has been taken to accurately report the finer details of barrier management as operated by the apiarists cooperating with this project. There may be occasions where the author’s interpretation of the information may present some minor variations in the reporting of the operations practised. In several cases, some cautions pertinent to AFB disease prevention and management have also been added by the author.
## 2. American Foulbrood Disease

### What is American Foulbrood disease?
American Foulbrood (AFB) is a bacterial disease of honeybee brood caused by the bacterium, *Paenibacillus larvae*.

### Where does AFB occur in Australia?
AFB is endemic in all States of Australia.

### Effect on the honey bee colony
AFB kills honey bee colonies by killing honey bee brood (larvae and sometimes pupae).

Usually, AFB infected colonies die slowly, sometimes over a period of several months.

At first, AFB may not be obvious in the brood because the disease may occur in only a few honey bee larvae.

As the infection spreads within the hive, more and more larvae die. The number of adult bees in the colony begins to slowly decline as more brood becomes infected with the disease. The colony weakens further as the disease progresses and it eventually dies.

### How is AFB spread?
American Foulbrood is spread by spores formed by *P. larvae*, the bacterium that causes AFB. The spores contaminate the bees, combs, honey and other components in the hive.

The life-cycle of *P. larvae* may be summarised as follows. Honey bee larvae swallow AFB spores with their food. When conditions are favourable in the gut of an individual larva, the spores germinate to form the vegetative stage of the disease. As the infection spreads, the larva dies, and new spores develop in the remains of the larva.

AFB may be spread by:
- interchange of AFB contaminated combs and hive components from hive to hive. It is particularly important to note that when only a few honey bee larvae are infected in the early stages of an outbreak, the disease may not be easily detected and combs may be transferred to other hives by the apiarist who believes the colony to be healthy
- use of AFB contaminated hive material
- robber bees taking AFB contaminated honey from a sick or dying hive for use by their own colony.

### More facts about AFB spores
There are approximately 2,500 million *P. larvae* spores in the remains of one infected honey bee larva.
The spores may remain viable for at least 35 years. This is true for spores found in honey, on beehive combs and other components. The spores are very resistant to heat,
desiccation, sunlight and many chemical disinfectants and therapeutic drugs.

AFB spores cannot be seen with the naked eye. It is important to note that previously used beehive components may be contaminated with AFB spores even though the equipment looks sound and serviceable.

All hive components, plus honey and pollen in a hive infected with AFB become contaminated with *P. larvae* spores. These contaminated items can transfer the disease when placed in healthy hives.

<table>
<thead>
<tr>
<th><strong>The barrier minimises the spread of early disease infections</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB is not easily detected when the disease first appears in a hive. It may go unnoticed. Transfer of combs and hive components to other hives at this time may result in the spread of the disease. The barrier is an important tool in containing the spread within the defined unit of hives.</td>
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<thead>
<tr>
<th><strong>Secondhand equipment not to be introduced to hives within the barrier</strong></th>
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<tbody>
<tr>
<td>The introduction of secondhand beehive components to a unit of hives protected by barrier management could introduce AFB. The equipment should first be sterilised by gamma irradiation to ensure it is completely free of viable AFB spores before it is moved into the apiary.</td>
</tr>
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<tr>
<th><strong>AFB and use of antibiotic for the control of European Foulbrood disease</strong></th>
</tr>
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<tbody>
<tr>
<td>Antibiotic used for the control of European Foulbrood has no effect on the viability of AFB spores. However, when antibiotic is inadvertently applied to a hive infected with AFB it affects the vegetative stage of <em>P. larvae</em> and in effect suppresses or masks the AFB disease signs. As a result, the brood appears healthy and free of the disease symptoms even though viable spores remain in the honey and on combs and hive components. Movement of these apparently healthy combs and components to other hives will spread the disease which will reappear when the effect of the antibiotic wears off. An effective system of barrier management will prevent the spread of AFB from hives in which the disease is masked by antibiotic treatment.</td>
</tr>
</tbody>
</table>
3. An Important Summary

Key Statement:

“Barrier management systems are not a replacement for good beekeeping and good disease management”

The summary

- A barrier management system does not prevent AFB occurring in an apiary, but it certainly enables the apiarist to control the outbreak and its spread.

- Once AFB is in a hive, the beekeeper can be the prime cause of further spread within the apiary or to other apiaries through the interchange of combs and other hive material.

- Be on the look out for AFB and inspect brood frequently.

- Avoid robbing. AFB infected colonies that get weak and die out are easy pickings for robber bees.

- Destroy AFB hives quickly to remove the infection and prevent further spread of the disease.

- Keep good records of hive movements so that if something goes wrong you can successfully traceback to the source of the problem.

- An effective system of barrier management provides good insurance - it prevents the apiarist from spreading AFB the across the barrier.
4. Barrier Management By Apiary or Load of Bees

This system is used by Geoff Cotton, Keith, South Australia.

"No hive part is transferred to another load - consequently disease is not transferred to other loads”

<table>
<thead>
<tr>
<th>A simple barrier management system</th>
<th>In this system, every comb and hive component is interchangeable from hive to hive within the load. The barrier applies to the load of hives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The key to disease containment</td>
<td>Interchange of combs and other hive parts to other loads is not permitted. As a result any disease that occurs in a load is not transferred to another load.</td>
</tr>
</tbody>
</table>
| Identify loads to keep them separated | Each load of hives is identified by:  
  - an identification number specifically allocated to that load 
  - branding, or painting, supers (boxes) in the load with that number. The number is placed on more than one side of the box. Although it is preferable, not all supers are numbered.  
  Identification of material in a load can be assisted by:  
  - using a distinct, different colour for the identification number on supers belonging to each specific load even though the supers are different  
  - placing the identification number in a different position on the supers that belong to different loads. |

![Photo 1. For this load, the identification number is painted near the top right hand side of the super (See arrow).]
Equipment and storage  
Set aside a specially marked bee-proof area in the shed for supers and combs of an individual load. The areas may be marked by white painted lines on the concrete floor. These specific areas should be available for boxes of combs:
- waiting to be extracted
- stored and ready for reuse after extracting.

Photo 2. Stored supers and combs belonging to separate loads in specially marked floor areas. Note the white lines painted on the concrete floor.

Label drums of honey for traceback purposes  
The load identification number and product line number (floral source) is placed on every drum of honey extracted from each load. This action enables identification and traceback if a honey culture test confirms presence of AFB spores in a line of honey.

Photo 3. A honey drum marked with honey line number and load identification number.

Extracting  
All combs containing honey are spun to remove as much honey as possible.

Early spring inspection of all hives  
The brood in all hives in a load is inspected for signs of American Foulbrood disease in early spring. This should preferably occur as soon as possible after winter and before removal of any honey crop or before hives are transported to another site.
**Records - a key to success!**

Keep written records. These will enable traceback of disease outbreaks.

Keep details of all movements of loads of hives and equipment (eg supers of honey) including the following:
- date of removal of honey from hives
- date of extraction of honey
- date hives moved to apiary site
- location of apiary site and flora worked by the bees
- date and location of any crop pollination service provided to growers.

**Be on the look out for AFB!**

Always check for AFB in the broodnest when removing honey from the hives. Prevent bees gaining access to honey as it is being robbed, uncapped and extracted.

**Immediate actions if AFB is found**

When AFB is found, or suspected, put the hive back together. Thoroughly clean your hands, gloves, hive tool and smoker before opening another hive or going to another load. Notify the nearest apiary inspector as required by State legislation.

Close the hive to make it bee-proof when the bees have stopped flying. Deal with it in accordance with directions of the apiary inspector and the relevant State or Territory Livestock or Apiaries Act.

**Steps to be taken if AFB is confirmed in a load**

Follow these steps:
- inspect the brood in all hives belonging to the load
- mark all hives where AFB is found or suspected
- observe disease clean-up measures in line with you State or Territory legislation and directions of an apiary inspector.

**Clean the extractor**

Wash and clean the extractor after each load has been extracted. This will remove the risk of cross-infection of AFB between loads. Make sure the plant is thoroughly cleaned after extracting honey from a load that is suspected or found to be infected with AFB.

**Nucleus colonies**

In emergency situations, nucleus colonies may be cut from loads of hives that are known to be free of disease and introduced to a load where AFB has been recently found and removed. The excess combs resulting from the uniting of nucleus colonies should be sterilised by gamma irradiation before reuse. After irradiation, the material may be used in any load.
No matter what the emergency, material belonging to diseased
loads or loads suspected of being diseased should not be
introduced to other loads.

Pollination

If a number of hives are taken out of a load to provide crop
pollination services to growers, they are returned to the same
load after the period of pollination. Full records as detailed
above are kept on all hive movements.

Advantages of barrier
management by apiary or
load of bees

The following is a summary of the advantages:

- simple because each load is worked as a separate unit with
  its own distinct identification
- there is no spread of AFB from one load to another
  because all hive components are kept in the one load at all
  times - there is less worry!
- special management resources can be directed to the
  load(s) where AFB has been detected; loads where disease
  has not been detected can be managed normally
- trace back of disease outbreaks are easy because written
  records of movement of loads of hives and extraction of
  honey are kept for reference
- having supers of combs for every load means that the
  combs of honey may be removed from the hives in all
  loads without the need to immediately stop and extract the
  honey to provide empty combs for the next load.

Disadvantages of barrier
management by apiary or
load of bees

- a large number of spare supers with combs, pallets (if
  used) and covers are required for every load
- sufficient room must be available to store the extra
  equipment in a manner that will prevent mix-up of hive
  material
- effective means of protection from wax moth infestation is
  required for a large number of combs.
5. Barrier Management By Individual Hive

"No hive part is transferred to another hive - consequently disease is not transferred to other hives”

A simple design but a more intense system than barrier management by apiary or load

In this system, the rules are simple. There is no interchange of hive components to any other hive. It is an effective means of preventing the spread of AFB from one hive to another.

The key to disease containment

The barrier applies to individual hives.

Each hive has its own individual supers and hive components. Combs and other hive components are not moved to another hive within the load or to hives of another load.

A proven system

This system of barrier management has been used for over 40 years. Details of two case studies are presented below.

Suitable for a range of apiary enterprises

Barrier management of individual hives is practised by commercial, sideline or hobby apiarists and can be used effectively when honey is extracted on site using a mobile extracting plant, or at a centrally located fixed extracting facility.

In the past, apiary inspectors have encouraged hobbyists to use this method of barrier management following a clean up of AFB in their apiaries. In some situations, hobbyists are able to wash the uncapping knife and extractor after the honey from each hive has been extracted. Cleaning honey from equipment in this way removes any risk of cross contamination of combs that belong to other hives as they pass through the extractor. Cleaning extracting equipment in this way is impractical in larger enterprises due mainly to the amount of time required to complete the task.

Case study 1 - Introduction

On-site or mobile honey extraction is used in this commercial apiary managed by Ian and Ross Zadow, Tintinara, South Australia. Uncapping of combs and extracting of honey is conducted in the mobile caravan especially designed for the purpose.
Robbing hives

Combs of honey are taken from the hives and placed in batch lots in a long barrow ready for wheeling to the extracting van. Each batch is made up of combs that belong to an individual hive and is separated from other batches by a space (see photo 6). The supers which held the combs either remain on the hives or are placed immediately adjacent to them.

Extracting the honey

The combs are uncapped in the order they were placed in the barrow. They are then placed in one of the two, 24 frame extractors. One basket in each extractor is marked to indicate the position for the first comb of the first batch in the barrow. The remaining combs of that batch are then loaded into the extractor followed by combs from other hives in sequential order.

Returning the combs after extracting

When the combs are empty, they are unloaded from the extractor in the same sequence as they were loaded. This ensures they return to the barrow and then to their hives in the appropriate order.
The system does not change regardless of the number of combs robbed from an individual hive.

Photo 7. The extracted combs ready to be returned to their hives.

Case study 2 - Introduction

A central honey extraction plant at the home base is used in this commercial apiary enterprise managed by John Edmonds of Mt Duneed, Victoria.

The hives

During the honey production season, hives comprise 3 boxes. All the boxes of an individual hive are painted with the same colour. Each hive is numbered in sequential order. In the apiary, hives are positioned in groups of four. Each of the four hives is painted with a different colour, namely, blue (hive 1), red (hive 2), green (hive 3) and white (hive 4).

Robbing the hives

When the hives are robbed, a super is removed from each of the four differently coloured hives (hives 1 to 4) in a group and stacked on the one honey pallet. A box is always removed from each hive regardless of whether it is full or only partially full. It is important to take boxes even though they may not be full as this maintains the sequence of the groups of four throughout the extracting cycle. Failure to do this will result in supers not being returned to the correct hives.

Extracting the combs

The uncapped combs are placed in a 32-frame extractor. Each quadrant (quarter) of the extractor reel is painted to correspond to the four colours used on the hives. The frames from the coloured boxes are placed in the corresponding coloured quadrant of the extractor.

Returning the combs

When the extracting cycle is completed, the combs are loaded
back into the corresponding coloured super. The supers are then restacked on the honey pallet to form the same group of four boxes.

The combs are returned to the correct hives by matching the number and colour of the super and hive. In fact, it is only necessary to find one of the four numbered hives of each group and the other three supers distributed by colour.
6. Barrier Management by Individual Hives on Pallets and Central Plant Honey Extracting

This system is used by Barry Pobke, Cooke Plains, South Australia.

**Hives moved on pallets**

Four hives are placed on a single pallet. Each load comprises 16 pallets (64 hives). Two-storey, 10 frame hives are operated, each honey super has 9 combs.

**Layout of hives in the apiary**

Hives are positioned in exactly the same layout every time a load of hives is moved to another apiary site.

Pallets are spaced about 2 metres apart and rows of pallets are spaced approximately 3 metres apart. A greater distance is allowed for truck movement between the two centre rows. These measures are designed to minimise drift of field bees from one hive to another. The hives are positioned with their entrances facing east-west.

*Photo 8. The layout of the apiary.*

**Identifying the load and hives**

The following identification marks are applied to each load of hives as follows:

- a separate colour for each load
- each pallet is allocated a number, 1-16
- the four hives on each pallet are allocated one alphabetical letter, A, B, C, or D.
Photo 9. Stored supers and their identification numbers. Note the circle indicating the hive identification letters and the figure 1 immediately above each letter indicating the pallet number. The supers have been painted the same colour except for the dark ones which have been hot wax dipped and not painted.

**Inspection of brood for AFB**

Detailed inspections of brood are conducted in:
- autumn, usually prior to May
- late spring, or early - mid summer.

At all times when honey is removed from hives throughout the season, the queen excluder is lifted and one or two combs of brood are given a quick check. If a hive appears to be weak, all combs are thoroughly inspected to determine if it is free of disease.

**Colony strength**

The aim is to have all colonies of equal strength (adult bee population). As for all methods of beekeeping, particular attention is paid to the quality of queens.

If a colony is weak, one or more of the following actions may occur:
- the colony is requeened
- a *healthy* nucleus colony united to the colony to boost numbers of adult bees.

Four to six nucleus colonies are usually attached to each load for restocking weak colonies. If these nucleus colonies are used they are replaced from the back-up yard (see below).

**Uniting nucleus colonies and excess combs**

When a nucleus colony is added to a hive, a number of combs (usually four) are removed to make room for those of the nucleus. The excess combs may be:
- melted down to prevent their reuse
- used in a separate (or quarantined) apiary for a period of time until it is established that they are not diseased.

*Note:* It is essential that the excess combs are not
immediately placed into other production hives which are
protected by barrier management. To do so would break
down the barrier and open the possibility of introduction of
AFB to that protected unit.

Supply of nucleus colonies from the back-up yard
Nucleus colonies are obtained from an additional yard of
approximately 30 hives that are kept on a site that has good all
year nectar and pollen supplies. Honey from this yard is
subjected to regularly honey culture testing to ensure freedom
of AFB spores.

It is essential that this yard is kept disease free as it is used as
a source of nucleus colonies for the other loads. Any
breakdown here will put at risk the health status of all yards
receiving nucleus colonies.

The yard is close to the home base and isolated from sites
used by other apiarists.

Harvesting the crop – removal of honey
Supers of honey are removed in a predetermined order.
Starting with pallet No. 1, supers are removed from the four
hives and stacked on a single honey tray to catch any drips of
honey. The super from hive ‘A’ is lifted first and placed on a
day on a pallet. Similarly, the supers from the remaining 3
hives are placed on the stack in alphabetical order.

Sixteen supers are placed on the one pallet for transport to the
central extracting plant.

Every super is removed from its hive regardless of whether it
is full or only partially full of honey. In this way, the supers
are kept in order.

Adding a box of empty combs honey
Each hive has a spare super of empty combs which is put on
the hive when the super of honey is lifted off. Each super is
numbered as described above and is only placed on the same
numbered pallet and hive for that particular load.

Extracting the honey
Starting with super ‘D’ of pallet No. 1, the combs are
uncapped and extracted.

Broken frames and combs
Any broken frames or combs are immediately replaced with
new ones. This usually happens before or immediately after
uncapping.

Replacement of broken combs is very important at this stage.
Failure to replace a broken frame that has been withdrawn
from service at this time will cause the following frames to be
placed in the wrong box and be returned to a different hive.
**Identifying combs in the extractor**

The extractor has four banks, each of which holds 18 frames (that is, combs from two supers). Each bank is numbered. Numbering the 1st and 9th frame of every box may be helpful to ensure that all combs are returned to the right box. The combs are always loaded into the extractor in the same order.

**Loading combs from the extractor**

The combs are put into their boxes and replaced on the correct honey tray for storage and later use when honey is next robbed from the load.

**Bee escape boards**

Escape boards are cleaned in a bee-proof area before they are used on the next load. Honey is scraped off the board which is then thoroughly washed.

**Hygiene in the apiary**

Honey is not allowed to spill onto the ground as this could be a source of AFB infection (if present) to bees from other hives. Drip trays are used to catch any honey that might drip from the combs.

**Loads kept intact for pollination**

When hives are supplied to growers for crop pollination the load always remains intact. If there are more hives than required for pollination, the whole load is still taken to the crop. The fee for the excess hives may be waived.

**Information recorded**

The following information is recorded to enable traceback of any disease outbreaks:

- date honey removed from the hives
- date hives moved and location of apiary site
- date AFB detected.
7. Barrier Management by Individual Free-Standing Hives for Central Plant Honey Extracting

This system was developed by Allan Heath, Clare, South Australia.

**The Key**

This apiary enterprise consists of 13 loads, each with 120 hives. Manley supers are used.

Each hive has its own labelled supers and bottom box. Supers are only placed on the hive labelled with the same number. Detailed records of all hives are kept on a computer database.

**Identifying the load and hives**

Loads are labelled alphabetically from ‘A’ to ‘M’. Hives within each load are labelled with a number from 1 to 120.

**Layout of hives in the apiary**

Hives are positioned in exactly the same layout every time a load of hives is moved to another apiary site. The positioning of hives in the apiary corresponds with the method of unloading supers of empty combs and loading supers of full combs of honey to and from the truck.

Each load of 120 hives is positioned in four groups of 30 hives in the apiary. When the hives are unloaded from the truck, the four groups are placed almost end to end.

Hives 1 to 60 are positioned on the ground on the right hand side of the truck while hives 61 to 120 placed on the left hand side.

An example of the layout of hives in one of the 4 groups of 30 hives is shown immediately below. The wide centre passage is for movement of the truck and unloading or loading of the hives and supers using the boom loader.

**An example of hive layout in one of the 4 groups**

<table>
<thead>
<tr>
<th>112</th>
<th>Front of truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>52</td>
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<td>117</td>
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<td>118</td>
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<td>117</td>
<td>51</td>
</tr>
</tbody>
</table>

**Carting empty supers of**

Supers of combs are strategically positioned on the truck to
combs on the truck

ensure they follow a pre-determined order at every stage of the production cycle. For example, supers 1 to 60 are placed on the left hand side of the truck and supers 61 to 120 are placed on the right hand side. The positioning of stacks of supers on the vehicle corresponds with the layout of hives on the ground.

Stacks of 7 supers of empty combs are placed on the truck for transport to the apiary for under-supering hives. The supers are taken from stacks of 14 high stored in the shed after the previous extraction of honey.

The diagram below indicates the layout of the stacks of 7 supers on the truck. For each stack, the super with the lowest number is placed on the vehicle tray. For example, the stack made up of supers 113 to 120 will be positioned with super 113 on the vehicle tray. The other supers are added sequentially until super number 120 is placed at the top of the stack.

Under-supering hives

Supering of hives (the addition of a box of empty combs for storage of honey) begins with hive number 120 on the left hand side of the truck and concludes with hive number one on the right hand side.

Robbing hives

The first hive to be robbed is hive number 120.

Loading supers of honey on the truck

The super numbered 120 is placed on the tray of the truck and supers 119 to 115 are placed on top in sequential order to make up a stack of six supers.

Unloading supers of honey from the truck

The stacks of supers are placed in the hot room of the central honey extracting plant in such an order that the stack of supers numbered 1-6 is available for extracting first and the stack of supers numbered 115-120 is available last.

Extracting the honey

Super number one is extracted first and then the other supers in sequential order. All pass in the correct order through the deboxer (a devise for lifting combs out of the super) and uncapper before reaching the extractor.

The horizontal extractor has 4 reels numbered 1 to 4, each holding 24 combs from 3 supers. When the combs are emptied of honey they are pushed into a holding bay in the correct order. The combs are then placed in their correct super by the reboxer.

Avoiding mistakes

Frames are numbered on each end bar to provide a second
check that the combs are returned to the super of the same number.

**Storage of empty combs**

After the honey has been extracted, the supers of empty combs are placed in stacks of 14 and stored in the shed until required for the next round of supering hives.

**Honey drums washed before filling**

Honey drums are thoroughly washed internally and externally before they are filled with honey. This action ensures that only the honey just extracted is in the drum. If a honey culture test identifies AFB spores then there is no doubt that the problem originated in the hives from which the honey was sourced.

**Drums are labelled**

After filling with honey, all drums are labelled to enable traceback to be conducted in the event of AFB spores being detected in the honey.

**Use of extra supers**

If a hive is producing extremely well, an extra super may be placed on it. In these cases, the super does not belong to the hive and has a different number. Full details of the number on the extra super and dates it was placed on the hive and later extracted are recorded on a computer data base for purposes of traceback.

**Recording of information**

The following information is recorded on the computer data base for each load:

- date hives moved to apiary site
- site name
- property on which site is located
- flora worked by bees
- date supers placed on hives
- date honey robbed from hives.
8. Barrier Management – But Not Always!

The following case study examines the partial use of barrier management techniques in a Victorian commercial beekeeping enterprise that provides significant honey bee crop pollination services to growers of horticultural and seed crops.

Introduction to the apiary

Each yard or load has 160 hives. Hives are moved on pallets. Honey extracting is done on site using a mobile extracting van or at a central honey extracting plant.

Type of barrier

Barrier management is by apiary or load of bees. No attempt is made to put combs back in the same hive after they have been extracted.

Use of hives for pollination

Approximately 1,000 hives are needed for crop pollination, mostly during late winter and spring. The pollination hives are required to meet certain standards including the number of combs of adult bees, honey bee brood and honey. Hives are standardised to ensure they meet these criteria and they capable of achieving optimum pollination.

Loads of suitable hives that meet pollination standards are assembled from the over-wintering loads. Hives that don’t meet the standards and any whose colonies have died as part of normal winter losses are removed. In addition, hives that are too strong (that is, too many bees) may also be removed from the load. Nucleus colonies may also be cut from hives that have too many bees for pollination. This process applies to loads of hives supplied for almond, cherry and nashi fruit pollination.

It is at this point when hives are brought together from other yards that there is no barrier system in operation.

Hives not required for pollination are assembled into loads of 160 hives for build-up and honey production.

Barrier management after pollination

When pollination of almond, cherry and nashi fruit has finished, the hives are reassembled into loads of 160 hives which remain intact for the remainder of the season. It is at this point that the barrier, by apiary or load, is established. Some of these complete loads are then moved to kiwi fruit orchards for pollination after which they used for honey production.

Nucleus colonies

Nucleus colonies, split from hives in spring, are built-up as
production hives to form two new loads of 160 hives each. These hives replace losses of colonies that occur during winter and pollination together with any culling of failing colonies. Barrier management is then applied to these hives on a load basis.

**Future developments**

The manager of this enterprise, Bob McDonald of Castlemaine, is investigating possible application and use of electronic reading of barcodes on beehive pallets to identify and record details of hive movements. If successful, the application would provide a means of traceback of movement of hives in the case of outbreaks of AFB and other quality assurance issues.

It would be necessary to allot a name or identification number to all apiary sites and record them on a data base and wall map.

A back-up recording system would also be maintained in a paper diary in case of electronic system failure.
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10. References

