



CENTRE FOR
INTERNATIONAL
ECONOMICS

Future directions for the Australian honeybee industry

Prepared for the

Department of Agriculture, Fisheries and Forestry

*Centre for International Economics
Canberra & Sydney*

September 2005

ABOUT THE CIE

The Centre for International Economics is a private economic consultancy operating out of Canberra and Sydney. It undertakes economic analysis for clients around the world.

The CIE solves problems for clients by rigorously analysing markets and regulations, appraising risks and evaluating strategies. We build economic and strategic frameworks to distil complex issues to their essentials. In this way we are able to uncover new insights about emerging developments and assess payoffs from alternative strategies.

The firm has been operating since 1986. Contact details are set out below and more information on what we do and our professional staff can be obtained from our website at www.TheCIE.com.au.

The CIE also co-produces a quarterly report called Economic Scenarios. This analyses global risks and scenarios and can be accessed from www.economic.scenarios.com.

CANBERRA

Centre for International Economics
Ian Potter House, Cnr Marcus Clarke Street & Edinburgh Avenue
Canberra ACT 2601

GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800 Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au
Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Suite 1, Level 16, 1 York Street
Sydney NSW 2000

GPO Box 397
Sydney NSW Australia 2001

Telephone +61 2 9250 0800 Facsimile +61 2 9250 0888
Email ciesyd@TheCIE.com.au
Website www.TheCIE.com.au

Contents

Acknowledgements	vii
Glossary	ix
Executive summary	ix
The honeybee industry	ix
Industry strengths and weaknesses	x
Taking advantages of opportunities – key strategic directions	xii
1 Introduction	1
Our approach	2
A framework	3
<i>THE HONEYBEE INDUSTRY – PROFILE AND PERCEPTIONS</i>	7
2 Industry profile	9
Introduction	9
Structure of the industry	9
Industry economic value	11
Industry production	13
The world market for honeybee products	22
3 The industry’s perceptions: a SWOT analysis	33
Initial assessment of industry profile	33
SWOT analysis	38
Perceptions of what the industry can do	38
<i>ASSESSMENT OF THE KEY ISSUES</i>	43
4 Marketing opportunities	45
What is the ‘honey market’?	45
Consumer market	46
How can the industry increase its domestic retail market share?	53

International consumer market	60
Industrial market	64
Promotion	65
Pooled pricing	66
Key conclusions	68
5 Diversification	70
Pollination	70
Queen bees and package bees	74
Other honeybee products	77
Key conclusions	82
6 The industry resource base	83
Flora resources	84
Analysis of factors affecting resource supply	91
Future industry focus	94
Key conclusions	97
7 Apiarists, the environment and EMS	98
Regulatory framework of public land access in Australia	99
Impacts of public land restrictions and inconsistencies on beekeepers	101
An industry national code of practice?	102
Key conclusions	108
8 Pest and disease management	111
Exotic pests and diseases	111
Endemic diseases	114
Steps the industry could take	118
Key conclusions	119
9 Contamination and quality control	121
Contamination	121
Labelling	123
Key conclusions	126
10 Education issues and options	127
Educating the industry	127
Educating the public and government	133

Key conclusions	134
11 Risk analysis and assessment	136
<i>APPENDIXES</i>	139
A The resource base in each state	141
B Regulatory framework of public land access in Australia	149
References	157
Boxes, charts and tables	
1.1 The framework for the honeybee industry	4
2.1 Distribution of apiarists by state, 2002	11
2.2 New South Wales beekeeping registrations, 2001	11
2.3 Share of industry economic value, by product	12
2.4 International bulk honey prices	13
2.5 Honey production, 1998-2000	15
2.6 Average production per hive	16
2.7 Average distribution of honey production by state, 1998-2000	16
2.8 Portion of queen bees purchased by apiarists	17
2.9 Estimated annual production of honey for major producing countries, 2004	23
2.10 Major honey export and import countries, 2003	24
2.11 Quantity of exports and average export price for honey	26
2.12 Value of honey exports to top ten destinations	27
2.13 Quantity and average import price for honey	28
2.14 Imports of honey from top five source countries	28
2.15 Ad valorem tariffs faced by Australia's honey exporters	29
2.16 Terms of trade for Australian honey	30
2.17 Volume and price of beeswax exports and imports, 2000 to 2004	31
2.18 Value of beeswax exports and imports, 2000 to 2004	32
3.1 Industry segment perceptions of the performance of their own segment	36
3.2 Industry segment perceptions of the overall performance of the honeybee industry	36

3.3	The honeybee industry: summary of SWOT analysis	39
4.1	Australian honey market	46
4.2	Market share for marketers and packers in Australia, 2004a	47
4.3	Value of the spreads market in Australia	48
4.4	Consumption of spreads in Australia, 1994 and 2004	48
4.5	Total retail consumption of honey in Australia, 2002 to 2005a	49
4.6	Value of honey consumed in Australia	50
4.7	Market share of spreads, 1994 and 2004	50
4.8	Average annual price change and total price change, 1994 to 2005a	51
4.9	Average retail price and consumption of honey	51
4.10	Difference between average retail price and wholesale price	52
4.11	Cumulative change in wholesale price compared to inflation	53
4.12	Advantages and disadvantages of alternative 'on the ground' export strategies	63
6.1	Floral species supporting honey production by state	85
6.2	Canola areas in Australia have increased	90
7.1	Environment challenges for the honeybee industry	99
7.2	Environmental Management Systems	100
7.3	Pathway to EMS for the Australian honeybee industry	105
7.4	The potential benefits and costs of an EMS for the honeybee industry	108
8.1	List of incursions and potential incursions involving honeybee pests	115
11.1	Identified risks in the Australian honeybee industry	137
11.2	Risk assessment matrix of the Australian honeybee industry	137

Acknowledgements

This report is the result of the collaborative efforts of many people. The study was funded by the generous support of the Industry Partnerships Programme, which is administered by the Australian Government Department of Agriculture, Fisheries and Forestry. Vicki Manson, who is in charge of this program deserves special praise for her encouragement and assistance.

The principle authors are George Reeves and Henry Cutler from the Centre for International Economics, but Doug Somerville from New South Wales Agriculture was the main author of chapter 6, and Michael Williams from Michael Williams and Associates Pty Ltd, provided valuable advice on chapter 7.

Many people in the honeybee industry provided valuable assistance during the course of the study and comments on earlier drafts. Their contributions are gratefully acknowledged.

Special thanks are due to Stephen Ware, Executive Director of the Australian Honey Bee Industry Council, and to all members of the Council for their enthusiasm and support. Thanks are also due to the beekeepers who attended workshops and others who provided a wealth of information on all aspects of the industry.

Thanks are also due to Vanessa Eccles and other CIE support staff for assistance with preparation of the manuscript and other organisation matters.

Glossary

ACF	Australian Conservation Fund
AFB	American foulbrood
AHA	Animal Health Australia
AHBIC	Australian Honey Bee Industry Council
ANTA	Australian National Training Authority
AQF	Australian Qualifications Framework
AQIS	Australian Quarantine and Inspection Service
BMP	Best Management Practice
CIE	Centre for International Economics
CPI	Consumer Price Index
DAFF	Department of Agriculture, Fisheries and Forestry
DNRE	Department of Natural Resources and Environment
DPI	Department of Primary Industries
ECC	Environment Conservation Council
EFB	European foulbrood
EMS	environmental management systems
EMDG	Export Market Development Grant
GVP	gross value of production
IPP	Industry Partnerships Programme
OTC	oxytetracycline

GLOSSARY

QPWS	Queensland Parks and Wildlife Service
RFA	Regional Forest Agreements
RIRDC	Rural Industries Research and Development Corporation
RTO	Registered Training Organisation
SWOT	strengths, weaknesses, opportunities and threats
VET	vocational education and training

Executive summary

This report is a stocktake for the Australian honeybee industry. It identifies the strengths and weaknesses of the industry, how it can capitalise on opportunities and address particular threats. Key issues are addressed in detail and future directions identified.

This project has been funded under the Industry Partnerships Programme (IPP) of the Australian Department of Agriculture, Fisheries and Forestry (DAFF) and undertaken by the Centre for International Economics (CIE). The study has involved discussions with a large number of beekeepers and other industry officers, government officials and others, and involved workshops with the four main industry segments, apiarists, queen bee producers, marketers and packers, and pollinators.

The honeybee industry

The industry has an overall gross value of production (GVP) of \$65 million a year, with an estimated GVP of honey production of around \$50 million. Other products include, paid pollination services, beeswax production, queen bee and package bee domestic and export sales, pollen and propolis (although there are very few, if any, producers of propolis in Australia). As such it could be classed as a relatively small industry, but its value to the rest of agriculture and the economy through pollination services and, potentially, the value of honey and honey products in medicinal uses, far exceeds the value based on GVP estimates. The industry needs to capitalise more on this fact.

There are around 9600 registered beekeepers with around 500 000 hives. However, over 70 per cent of hives are operated by commercial beekeepers with more than 200 hives. Most commercial apiarists operate between 400-800 hives but some have more than 3000 hives. A commercial apiarist with around 20 bee sites on an occasional basis would require a foraging area of native flora of around 16 000 hectares per annum. This emphasises the dependence of beekeeping on native flora on public and private land.

About half the accessible apiary sites in native forests are on private land and half on public land.

New South Wales accounts for around 41 per cent of honey production in some years, whereas Tasmania, which relies on leatherwood honey, accounts for only 5 per cent of total production. About a third of honey produced is exported to over 38 countries. Key markets are the United Kingdom, Indonesia and other South East Asian countries, North America and Saudi Arabia. Generally, honey imports are quite small but rose to 9000 tonnes in 2003 when there was a shortage of honey in Australia. Australian honey is mostly high quality and commands a significant premium over honey from other countries. Most honey is exported in bulk form, but there is a significant and increasing proportion of exports shipped as retail packs.

The drought in Australia throughout 2002 and 2003 coincided with high international honey prices, resulting in substantial increases in wholesale prices in Australia. These prices have now declined but in the longer term, honey prices have increased at a rate slightly more than the Consumer Price Index (CPI). Consumption of honey has followed an inverse relationship to honey prices.

Queen bee breeding is quite specialised and there are growing markets, especially in North America, for queen bees and package bees. This sector of the industry is quite profitable and there are good prospects for expansion – the major constraint is the number of queen bee breeders.

There is also a growing market for pollination services, especially with the expansion of the almond industry centred in South Australia and Victoria.

Industry strengths and weaknesses

All industries have particular strengths and weaknesses. The performance of industries, based on criteria such as profitability, sustainability, competitiveness, resilience and flexibility and self-reliance, depends on how those industries capitalise on their strengths and opportunities and address their weaknesses and risks or threats.

The honey industry has many strengths

As revealed at strengths, weaknesses, opportunities and threats (SWOT) workshops, beekeepers have a good appreciation of the strengths of their industry. The key strengths are listed below.

- Skills, enthusiasm and mobility of commercial beekeepers.
 - Perhaps one of the industry’s greatest strengths.
- The industry is free from varroa mite (*Varroa destructor*).
- Australia has diverse national flora.
- A reasonable organisational structure.
- Reputation for high quality product: some good brands have been established.
- Some honey and honey products have medicinal uses that can be better exploited.
- Through pollination services, the industry provides major benefits to the rest of agriculture: there is strong demand for these services.
- Industry has a good quality assurance program: however, more beekeepers need to adopt this.
- Industry has good research capacity: there are several highly skilled researchers (but the industry needs to look to encouraging young researchers).

The honey industry also has several weaknesses

The main identified weaknesses within the industry are listed below.

- Public relations between beekeepers and the public and with land managers could be improved.
- The industry lacks dynamics in selling its ‘good story’ image to the public and policy makers.
- Many beekeepers are not vigilant on controlling endemic diseases especially American foulbrood (AFB).
- The high mobility of the industry is conducive to spreading of pests and diseases.
- Hive productivity is not as high as it could be. There is scope for greater adoption of best management practices (BMPs).
- The industry’s workforce is ‘ageing’. Not many young people are attracted into the industry, and there is some reluctance to pass on skills in a formal way.
- There is a lack of standards that are adhered to in provision of professional pollination services.

- The industry is having difficulties in enhancing the supply of queen bees to meet growing demand.
- Industry cohesion and cooperation is not as strong as it could be.

Exotic incursions and reduced access to native flora are the main threats

An incursion of varroa mite or other serious exotic pests would devastate this industry. This is undoubtedly the major threat faced by beekeepers. As the industry is highly dependent on native flora for about 70 per cent of honey production, trends over the last decade of restricting beekeepers' access to native conservation areas are also a huge threat to the industry, as the scope for alternatives is somewhat limited. This also emphasises the opportunity to enhance productivity in hives.

Other major threats to the industry include:

- spread of AFB through bad hive management and state government agencies withdrawing resources from enforcing state legislation and regulations which are aimed at controlling AFB;
- greater inappropriate use of antibiotics and chemicals to control foulbrood diseases could cause contamination and severely tarnish Australia's 'clean green' image;
- beekeepers' image in managing environmental issues could be tarnished unless the industry adopts an environmental management system (EMS);
- threat of exotic incursions from some beekeepers illicitly importing material;
- rising fuel prices will affect profitability; and
- loss of skills and talent as current generation of beekeepers and researchers retire.

Taking advantages of opportunities – key strategic directions

Overview

A risk-impact analysis clearly points to the industry needing to address two key issues as a matter of priority. These are: first, to ensure that everything possible is being done to protect the industry from an exotic incursion of varroa mite or other serious exotic diseases; and second, to influence governments to ensure that access to native flora resources is not

further restricted and hopefully reversed. The latter will require a concentrated effort by industry leaders to influence policy makers on sound, professional and well-presented arguments and will also require the industry to establish its own environmental credentials through the adoption of an EMS.

Because of its mobility and the large number of non-commercial beekeepers, the industry is vulnerable to spread of endemic diseases, particularly AFB. With state governments withdrawing resources in this area, the industry needs to address how it can minimise this risk. Better hive management and increased productivity is one way, but the challenge is to discipline the activities of the few who have high disease risk management practices. Control of AFB is also closely linked to the contamination issue. Any increase in use of chemicals or antibiotics to control broad diseases runs an increased risk of honey contamination.

On the market development side, there are many opportunities and it is more a question of there being sufficient supplies to meet demand. This applies particularly to queen bees and pollination. The industry's challenge on honey is to maintain or enhance its reputation as a supplier of top grade branded honey which is 'clean and green' – and so continue to command a premium on the domestic and international markets. This means being able to differentiate Australian honey by brand. Australia cannot compete on price alone against honey from China and Argentina. Efforts by packers and marketers need to continue to export more honey in retail pack form and less in export bulk form. There are exciting prospects for developing and marketing medicinal honey.

Keep exotic diseases out

The honeybee industry is well served through the Australian Quarantine and Inspection Service (AQIS), Biosecurity Australia, AUSVETPLAN and Animal Health Australia (AHA) in its efforts to keep out varroa mite and other exotic diseases. But the risk is ever present.

In addition, the industry is taking the initiative to run an exercise simulating the incursion of varroa mite to test its response capabilities. The industry should also:

- have experts from New Zealand heavily involved so that all concerned can learn from New Zealand's experience;
- undertake an in-depth assessment of New Zealand's experience, as a RIRDC project;

- publicise to all beekeepers the risks of an incursion and the importance of being alert; and
- adopt the recommendations of the recent Biosecurity Australia review of the National Sentinel Hive Program.

Secure access to nature floral resources

Without access to native flora the commercial beekeeping industry would not exist. Continued access to native flora is the essence of the Australian beekeeping industry. Even though, at present, the number of sites in national parks is not great, these lands contain important species and the threat is that over time, more forest land which is now accessible to beekeepers will be made inaccessible with the spread of national parks and other conservation reserves. The debate on the future of beekeeping in national parks and other conservation areas needs to be engaged by the industry but any industry efforts must be based on sound factual arguments and efforts to raise the level of general understanding of the value of beekeeping to agriculture and the economy and as a source of a range of health products. Key strategies include the following.

- Production and wide publicity of booklets summarising the facts and the equivocal nature of research findings on impacts of beekeeping on native flora. The industry is commendably starting on this path.
- Enhance the above through a panel of well-respected scientists with expertise in this area. The distinction between feral bees and managed bees would need to be addressed, as well as the contribution beekeepers could make to controlling feral bees near sensitive areas in conserved areas.
- Wide publicity should be given to well-presented documents on the value of the honeybee industry to the economy – through pollination. But pollination depends on native flora to strengthen colonies and on honey production to maintain the viability of beekeepers. This should also include the beneficial aspects of honey and its derivatives for medicinal purposes.

Publicity and reasoned argument is only part of the story. The industry also needs to put its own house in order, and improve its own environmental credentials. This means the industry should formally adopt an EMS. With many other rural industries going down this path, the honeybee industry will stand out if it does not. EMS is a process designed for continual improvement. The industry should start from a conservative base consisting of a self-managed and self-assessed system. Over a period of years the industry can then graduate to third party auditing systems for

some growers who see a need for this. Some may even eventually reach ISO 14000 status. What is essential is that the industry can claim with credibility that it is addressing environmental issues in a sensitive way, through a code of practice. A detailed set of steps for the industry to follow is presented in chapter 7.

A further strategy the industry should adopt is to form alliances with professional environmental groups such as the Australian Conservation Foundation. Beekeeping depends on the conservation of native floral and especially old growth forests and has similar objectives in this regard to ACF.

Queen bee breeding and improved productivity

With the threat of reduced access to conservation areas, there is increasing emphasis on increased productivity per hive. RIRDC maintains productivity as one of its key research areas for honeybees but more needs to be done by the industry to encourage adoption of research results and BMPs. This can be done through skills courses and user-friendly education and website material.

Some key aspects are to improve the genetics of queen bees, enhance the production of queen bees and enhance the purchase of queen bees by apiarists. Queen bee breeding is quite profitable but it requires particular expertise and long hours of dedicated work. There is no shortage of demand for queen bees. The main problem is on the supply side. The challenge is for the industry to address this issue.

Strategies include the following.

- Education and skills classes to develop more expertise among beekeepers on the science and art of queen bee breeding and better use of queen bees purchased from expert queen bee breeders. Also encouraging existing queen bee breeders to pass on their skills. (The industry could apply to various government programs to fund this strategy).
- Expand queen bee breeding programs, including introduction of overseas genetic material that has resistance traits.
- Expand production of queen bees by encouraging other beekeepers to produce queen bees after appropriate attendance at courses.

Marketing initiatives

The industry is gradually moving away from bulk honey export sales to product differentiation and branding of 'retail' packs. This trend needs to continue. Australia will not compete on price in the bulk honey market. Australian honey has unique qualities and flavours and this needs to be capitalised on by marketing and promoting branded Australian product.

Generic promotion is not recommended but there are exciting prospects for export sales into Asian markets where rising incomes are associated with increased honey demand and in North America where varroa mite has devastated the local industry and left honey supply shortages.

The industry should invest more – through RIRDC – in market intelligence, statistics and market information.

The industry also needs to encourage the research and production of honey and honey products with medicinal products. Jelly bush honey has particularly exciting prospects.

On the domestic market, the recent decline in honey consumption is mainly due to the relatively large price increases over 2002 and 2003 compared to other spreads. Whether consumption continues its trend will depend in part on the reaction of retail prices to the recent decrease in wholesale prices.

The main competition on the domestic market is from other spreads. Gaining a greater share of the spread market is best achieved by promoting Australian honey's positive health attributes. In addition, the industry should further promote the use of honey in other areas of cooking.

Australian honey needs to differentiate itself in terms of quality if it is to compete with cheaper imported honey. Although the taste of Australian honey is already preferred by Australian consumers, the industry needs to increase quality in other areas right across the supply chain.

The industry's main strategy should be brand promotion of Australian honey.

Quality control

Quality control in honey is closely related to control of brood diseases in the hive. Inappropriate use of chemicals to control these diseases can mean increased honey contamination.

The industry's efforts in B-Qual, a quality assurance program, are commendable, with already about 600 beekeepers signed up. But only relatively few of these have gone through an audit process. Many more need to sign up to ensure that the risks of contamination are minimised.

Key strategies include:

- greater promotion of B-Qual to enlist more beekeepers to join the program;
- continual updating of the emergency response plan to reduce risk of impact from any contamination and ensure the crisis management plan sets out practices and procedures to mitigate any negative publicity from contamination, and is accessible to all industry participants;
- continued testing of both imported and domestic honey and greater efforts to inform beekeepers of the importance of good beekeeping practices and of keeping a clean green image; and
- work with governments to tighten labelling laws and improving compliance.

Education strategies

There are many areas where the industry needs to improve its human capital. Key strategies include the following.

- Developing an education outlook for the industry should be a priority in order to remove any impediments to planning for ongoing industry growth. Although a number of issues relating to education were identified in the workshop, any formal education program developed to address the needs of the honeybee industry must be based on a detailed analysis on the expected future industry training and education requirements. This requires an understanding of both the current numbers and age structure of participants within the industry and how they might change in the future.
- Any formal education within the honeybee industry should be undertaken by registered educational organisations. This means the organisation must be able to demonstrate that it employs qualified personnel, that it has the necessary beekeeping equipment and class resources, and that the course is accessible to the industry. This will build greater confidence in educational standards within the beekeeping industry and help promote the standardisation of courses and the transfer of skills.

- Educational training needs to be accompanied with promotional activities to develop an educational brand that represents quality and consistency and is recognised throughout the industry.
- Educational programs should be standardised to ensure confidence and consistency, which will facilitate the transfer of qualifications and skills.
- The industry needs to invest in developing its training capacity to ensure the necessary educational infrastructure is available. This includes investigating current training programs and the possibility of augmenting them to encapsulate the full skills set of the honeybee industry.
- AHBIC should lobby the government for more educational funding, and provide advice to current and potential trainers on how to address various state requirements for funding.
- Educating the government and public should address not only the perceived impacts beekeepers have on native flora and fauna but also the cost imposed on society by beekeepers using national forest. This will only be effective if the industry has a nationally recognised code of conduct relating to the use of national forests.

1

Introduction

In terms of the gross value of honey products and pollination services, beekeeping in Australia is a relatively small industry but through the economic value of pollination services it provides, the industry has an enormous impact on the rest of agriculture. It makes a real contribution to the economy, which is way in excess of the value added through honey and related products.

Apart from those in the industry not many people know much about the honeybee industry. Honey has appeared on supermarket shelves, largely unchanged, for decades but other honey products have a wide range of uses, including beneficial health and medicinal uses. Nearly a third of honey production is exported and there are growing export markets for package and queen bees and potentially for other honey-derived products.

On the supply side, beekeepers face diminishing access to native flora on which around 70 per cent of honey production depends. Queensland, for example, is moving to ban beekeeping in national parks in the long term and access roads in many public lands are not being maintained. Land clearing on private land and control of weeds like Paterson's curse, a useful source of pollen for honey production, also mean diminishing access to resources for honey production.

There are, however, opportunities for the industry to pursue. For example, there is a growing demand for pollination services especially from almond growers. And the beneficial medicinal properties of honey and honey products have yet to be fully exploited. There are growing export markets for good quality Australian branded honey and other related products especially live queen bees and package bees. The people in the industry are enthusiastic and hard working and the industry has a reasonable organisational structure.

The challenge for the industry is to set its sights on a more prosperous, sustainable and dynamic industry, work out what needs to be done to achieve specific and realistic goals, and decide how key projects should be done by whom and who should take responsibility.

This report is a contribution towards industry-driven strategic planning. It is a stocktake of the industry and identifies future directions to address threats and opportunities. In brief it covers:

- a comprehensive stocktake of the industry and the key issues it faces;
- an assessment of the industry's strengths, weaknesses, opportunities and threats (SWOT); and
- future directions for the industry and its key components.

This study has been undertaken by the Centre for International Economics (CIE) and funded through the Industry Partnerships Programme (IPP) of the Australian Department of Agriculture, Fisheries and Forestry (DAFF). This new programme offers benefits to industries and government through such things as understanding the opportunities and challenges facing industries and working together, in a strategic way, to overcome or capitalise on the key issues.

Our approach

The authors of this report contacted a wide range of people in the industry and collected a mass of material and reports on the main issues facing the honeybee industry. Four SWOT workshops were held in Orange, New South Wales, in May covering the four main components of the industry – marketing, queen bees, pollination and honey production. The authors are grateful to the many people in the industry who provided advice and reports on the key issues and challenges.

In addition, more in-depth research was carried out on the following issues:

- marketing
- supply constraints
- disease control
- contamination issues
- education and leadership
- environmental management and codes of conduct.

These issues form the basis of later chapters in the report. In addition, a strategic risk assessment was undertaken, assessing the impact of key issues against associated risks. This provides guidance on priority setting.

A draft of this report was presented to the industry at its annual conference in Hahndorf, South Australia, in July 2005. Further consultations were undertaken and feedback from industry incorporated into this final draft.

A framework

Previous work associated with the IPP (CIE 2005) established a generic framework for assessing the 'success' of an industry and actions that can be taken to move industries to improve overall performance (chart 1.1).

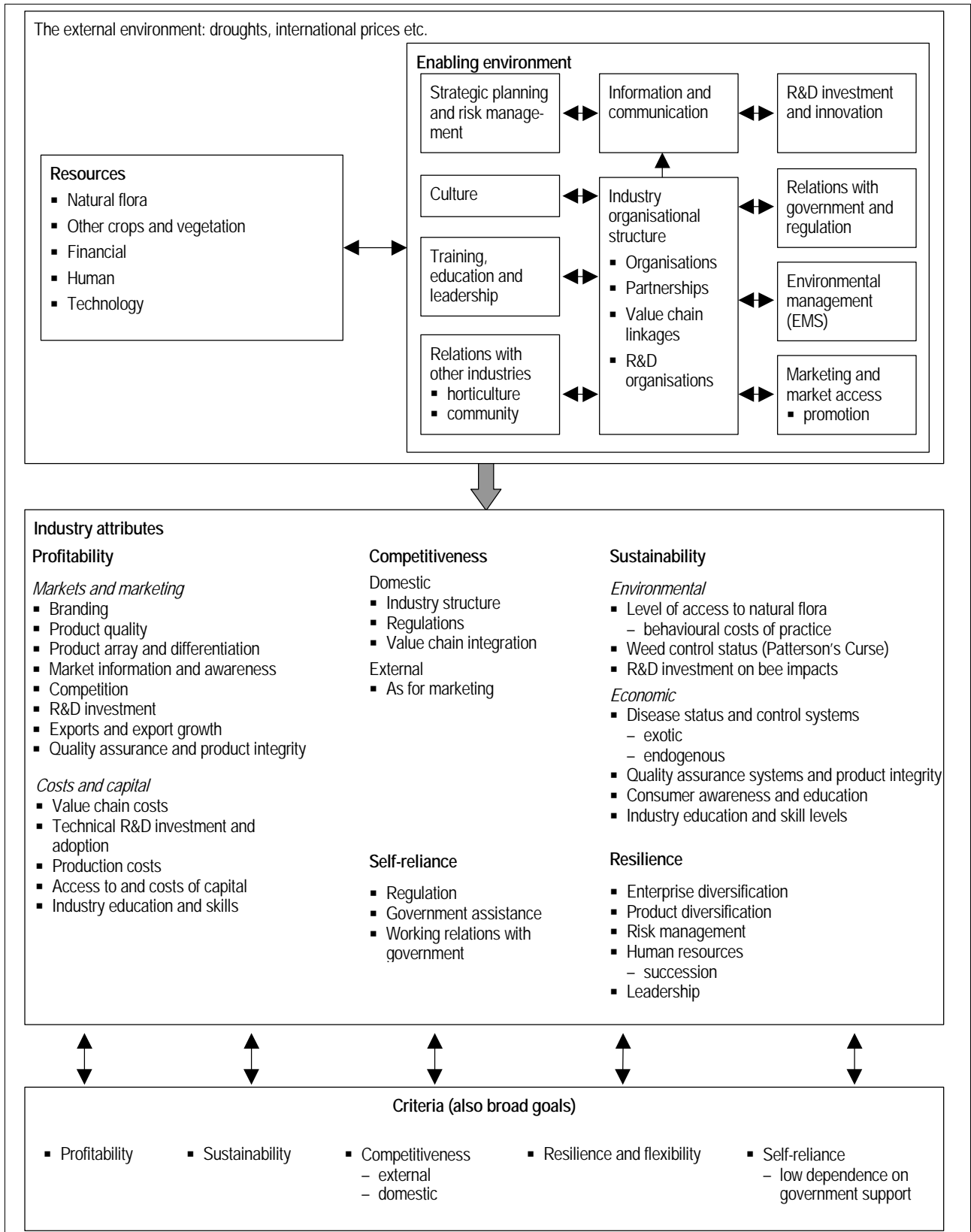
Desirable outcomes for an industry or the criteria on which an industry can be judged were identified as the following.

- *Profitability*: do participants in the industry make reasonable profits or is there a general low-income problem?
- *Sustainability*: is the industry sustainable in the long term in terms of economic long term viability as well as environmental sustainability?
- *Competitiveness*: the extent to which the industry can compete in the global market place but also, the degree of competition within the industry itself. Vibrant competition generally is associated with better-performing industries.
- *Resilience and flexibility*: refers to the ability of an industry to bounce back from adverse shocks and how flexible it is to deal with shocks, either physical (such as drought) or economic (such as severe market downturns).
- *Self-reliance or low dependence on government support*: better-performing industries seldom approach governments for structural adjustment or other financial support.

These criteria can also be viewed as broad goals for an industry. Thus industries should strive to achieve much more than merely increased profits in the short term.

Associated with each of the above are a number of attributes that contribute in a complex interlinked way to the criteria. They are the drivers or determinants of the performance categories. For example, the components of profitability are, at the highest level, simply revenues and costs. Revenues are obviously made up of prices and quantities. Similarly, costs can be broken down into fixed, operating and labour costs. Key attributes then drive each of these components. For example, branding, product differentiation, degree of competition, marketing skills and market information as well as the external factors of international price trends over which the industry has little control can all drive prices.

1.1 The framework for the honeybee industry



The many attributes that make up the criteria are in turn driven or influenced by the industry's enabling environment. This refers to how the industry is organised, what its culture is, what education programs it has, what quality assurance programs it has, the degree of regulation and relationship it has with government and so on.

Characteristics of the honeybee industry, which make up its enabling environment, include the following.

- A peak industry body, the Australian Honey Bee Industry Council (AHBIC), and numerous other bodies covering all facets of the industry.
- A marketing structure dominated by one player with a number of smaller packers.
- A quality assurance program (B-Qual) that needs more beekeepers to be actively involved.
- Generally good relations with government but a key issue for the industry is the increasing restriction on beekeeper access to native floral resources. The industry will need to lobby hard against the 'purist' views within environmental and national parks departments that conservation reserves cannot accommodate beekeeping and other multiple uses.
- The industry lacks a sound environmental management system but is slowly heading down an industry-led EMS pathway.
- Through the Rural Industries Research and Development Corporation (RIRDC) and the associated industry research levy the industry has a reasonably well-functioning R&D system.
- Industry information and communication systems are fair – an issue is that AHBIC is probably under-resourced.
- The industry has, periodically, undertaken strategic planning exercises and recognises the value of such plans.
- The honeybee industry has a unique culture, at least among commercial beekeepers. That culture is one of intense interest in beekeeping. There are some divisions, however, in the marketing sector.
- There is a reasonably well-established system of training and education but there is room for improvement.
- Overall, the industry could improve its enabling environment by 'selling' itself more to the rest of agriculture, governments and the economy. There are few rural industries in Australia which, on balance, leave such a small environmental imprint and yet provide as much

value to other industries – through unpaid pollination – as the honeybee industry.

This enabling environment interacts with the resources which the industry has access to. Some of these resources can be influenced by the enabling environment to some extent while others cannot. For example, the amount of natural flora is a key resource on which the beekeeping industry depends. Access to the resource is mostly beyond the control of the honeybee industry but, to some degree, access can be influenced by the industry's lobbying efforts with government.

Finally, the interaction of resources and the enabling environment takes place and is influenced by the truly external environment over which the industry has no control.

PART I

*The honeybee industry –
profile and perceptions*

2

Industry profile

Introduction

Each year the Australian honeybee industry produces between 20 000 and 30 000 tonnes of honey. The estimated gross value of production is around \$65 million, although this is highly variable depending on the volume of honey produced and the price of honey. Approximately one third of production is exported and Australia is currently the world's tenth largest exporter of honey.

In recent years, honey production has been reduced due to the combination of drought and bushfires. Despite reductions in output, the value of the industry has remained relatively stable due to increases in the price of honey, although prices have fallen more recently.

In addition to honey, the honeybee industry generates value from the production of beeswax, queen and package bees, pollen, royal jelly, propolis and bee venom, and from the provision of paid pollination services. The GVP, accounting for all these products, is in the order of \$65 million. In addition, the value of paid pollination services has been estimated to be between \$100 million and \$1.7 billion per year (RIRDC 2004), although pollinators receive payment for only about \$3.3 million a year.

Structure of the industry

Information regarding the number of beekeepers, the volume of production, and the size of apiaries varies between publications. Although much of the data presented in this chapter comes from a comprehensive survey of the honeybee industry (Rodriguez et al. 2003), the survey was undertaken over a one year period (2000-01) and therefore is highly susceptible to abnormalities within this year of production. Indeed, industry sources suggest this year was one of the worst honey-producing years on record due to severe weather conditions.

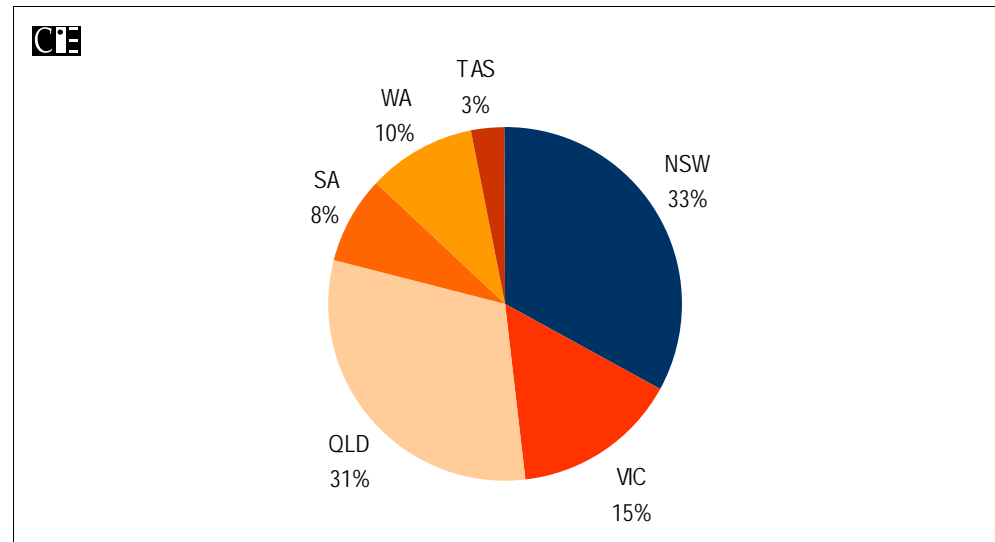
According to Rodriguez et al. (2003) in 2002 there were approximately 9600 registered beekeepers and 490 853 hives in Australia. Some 8015 registered beekeepers each had less than 50 hives and as a group accounted for 76 026 hives in total. New South Wales had the largest number of beekeepers (a total of 3153), accounting for about 33 per cent of the national total. This was followed closely by Queensland, where there were 3027 apiarists. The distribution of apiarists is demonstrated in chart 2.1. However this chart does not give a complete picture. Industry sources suggest there is a significant number of beekeepers moving between states, especially along the eastern coast. New South Wales requires that all beekeepers working in New South Wales be registered in New South Wales, regardless of the state they live in. This is not a requirement for Queensland. Therefore the figure for New South Wales may be slightly inflated.

Amongst the 9600 apiarists in Australia, operation of hives is highly concentrated. Rodriguez et al. (2003) note that only 17 per cent of apiarists have 50 hives or more but this small group operates 85 per cent of the total number of hives. Only 16 per cent of Australian honey is produced by businesses with 250 hives or less whereas 62 per cent of total honey production is estimated to have come from around 250 businesses (Rodriguez et al. 2003).

This is consistent with data on beekeeping registrations in New South Wales contained in a report on commercial beekeeping, commissioned by RIRDC (Benecke 2003). This report noted that in New South Wales amateur beekeepers accounted for 77 per cent of registrations and that 2125 beekeepers (from a total of 2725) had fewer than 11 hives. Table 2.2 shows the distribution of registrations.

There is also some concentration at the packaging level. Most commercial honey producers are contracted to supply an annual volume of honey to a major packer. The largest packer is Capilano Honey Limited, with its brand attracting a 46 per cent share of the national grocery honey market. In terms of total honey sold on the retail market, Capilano's share of the total domestic market is estimated to be approximately 67 per cent as it supplies most generic brands with honey. A greater breakdown of the marketing and packing market is provided in chapter four.

2.1 Distribution of apiarists by state, 2002



Data source: Rodriguez et al. (2003).

2.2 New South Wales beekeeping registrations, 2001

Category	Beekeepers		Hives	
	No	%	No	%
Amateur (1-40 hives)	2 725	77.0	22 898	8.9
Part time (40-200 hives)	492	13.9	50 271	19.6
Commercial (more than 200 hives)	321	9.1	183 507	71.5
TOTAL	3 538	100.0	256 676	100.00

Source: Benecke (2003).

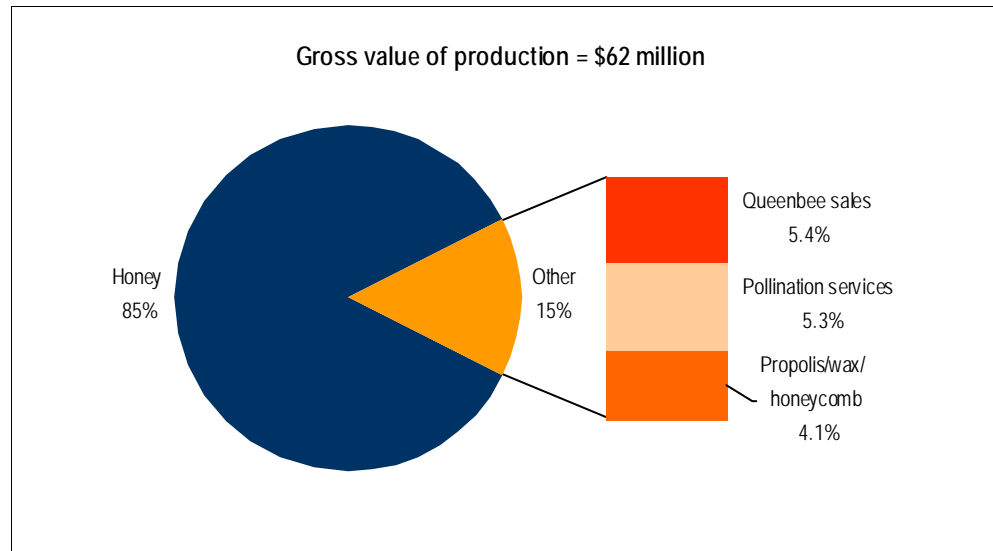
Industry economic value

Total industry economic value for honeybee products was estimated at around \$62 million for 2000-01 (Rodriguez et al. 2003). This was made up of:

- honey production of around \$53 million; and
- other honeybee products of around \$9 million.

However, industry sources suggest these estimates are relatively low. This may be due to the relatively small production levels experienced in 2000-01 due to adverse weather conditions, the subsequent increase in prices honey producers have received in the last five years (although recently honey prices have been falling) or both. The distribution of economic value between honeybee products is shown in chart 2.3.

2.3 Share of industry economic value, by product



Data source: Rodriguez et al. (2003).

Pollination

In addition to honeybee products, the Australian honeybee industry also generates economic value through pollination services. There have been various studies aimed at calculating the value of pollination, outside of paid pollination services. The original study by Gill (1989) valued pollination by honeybees at \$1.2 billion. In a later study, Gibbs and Muirhead (1998) came up with a similar figure. A more recent study by Gordon and Davis (2003) has revised the estimate upwards to \$1.8 billion. It should be noted that these estimates are based on the notion that without honeybee pollination services many horticultural crops and other crops would not occur (for example, two non-horticultural crops that are dependent on honeybees for any reasonable level of production are lucerne seed and hybrid sunflower seed).

A significant portion of honeybee pollination services in Australia is provided free to Australian agriculture through the location of honeybee sites near agricultural enterprises (feral bees also provide growers with pollination services). Pollination by honeybees is essential for some crops (for example almonds) and effective pollination for some crops (such as strawberries and some vegetables) is necessary to influence the size and proportions of the fruit to standard. It is estimated that over 65 per cent of horticultural and agricultural crops introduced into Australia require honeybees for pollination (Gordon and Davis 2003).

In addition to revenue earned from honey and other honeybee products, the apiculture industry also sells its pollination services to those horticultural

and agricultural industries that can benefit from increased pollination of crops. A typical charge for pollination services is about \$40 per hive. Stocking rates on almonds for example, average around six hives per hectare (Sommerville 2005).

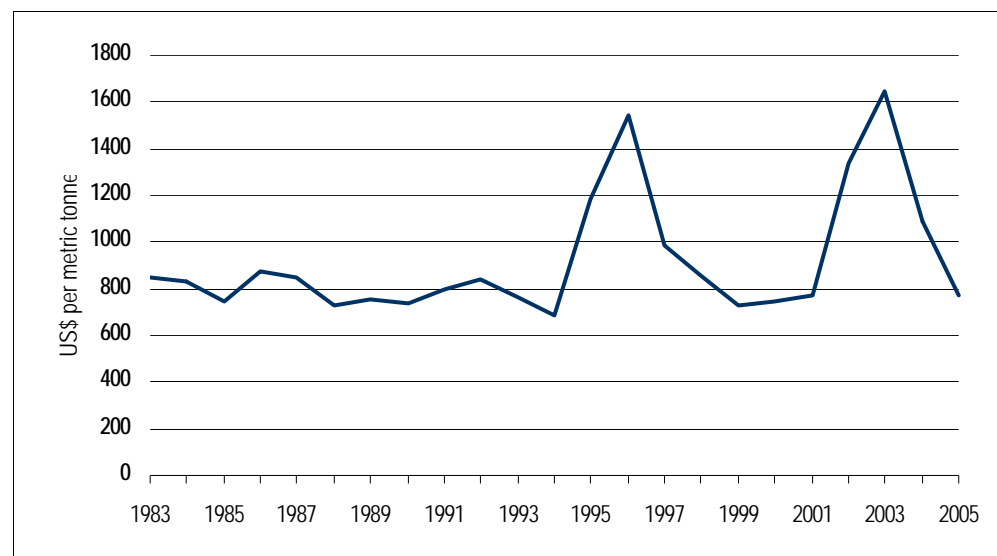
Industry production

Drivers of Australian honey production

Demand side

While recent data on world consumption of honey is difficult to find, it seems that the level of demand has been relatively constant over time. However, variable weather conditions, the presence of bee diseases and other health-related concerns may alter the composition of supply to the world market over time. In particular, changes in the ability of China (the largest honey-producing country) to supply the market will have implications for other honey-producing countries. Such an effect has been observed over the past few years, with high levels of antibiotics in Chinese honey leading to a ban on imports to the EU and restrictions in a number of other countries. The ban imposed in the EU began in early 2002 and has only just been lifted (Food Navigator 2005). For countries like Australia, a ban on honey produced in China manifests itself as an increase in demand for Australian honey and higher international prices for honey. Chart 2.4 shows the long term trend in international honey prices.

2.4 International bulk honey prices



Data source: Westcobe (2005).

On the domestic market, in the last four years the consumption of honey has been declining after a steady annual increase of around one per cent throughout the 1990s. This has been due to a number of factors, including the introduction of competing substitute products (especially chocolate/nut spreads), and the relatively high prices of honey within the retail market compared to other spreads (see section II for more details).

Supply side

The value of the Australian honeybee industry has remained relatively stable over recent years despite increased demand for exports of honey. This would suggest that key drivers of honey production in Australia lie on the supply side. One such driver, noted by RIRDC (2004) in discussing recent levels of production, is the prevailing weather conditions. The relatively low levels of production in both 2002-03 and 2003-04 have largely been attributed to weather conditions, including bushfire and drought.

Variations in production may also be a result of the status of the bee population (that is, whether they are subject to any bee diseases or nutritional deficiencies) and the status of the flora from which honey is produced. While Australia is free from varroa mite (*Varroa destructor*) and some other important exotic pests, most of the world's other serious bee diseases are present.

A key constraint on honey production is the gradually decreasing access of beekeepers to conservation areas (see chapter 6). The ability of beekeepers to access crown land came into question in the early 1980s. Varying arrangements for access have been determined by the states, but these access arrangements are subject to change. As an example, the Queensland government is planning to gazette a number of state forests as national parks. As a result the number of sites in these new parks will not be allowed to increase and existing operations and access will be phased out by 2024.

Concerns in relation to flora have also arisen due to dieback in a number of species of eucalypt. Dieback problems differ across states, with the main cause in the south eastern states being insects whereas in other states the cause is soil-borne fungi. There is, as yet, no solution to this problem. Continued land clearing especially on private land is also a concern for beekeepers.

However, there have been some ameliorating changes to the resource base. In particular, canola has emerged as an important crop in south eastern and south western Australia, providing beekeepers with a useful source of honey (Benecke 2003).

Supply resource aspects are considered in greater detail in chapter 5.

Honey production

Australia normally produces between 20 000 and 30 000 tonnes of honey a year, depending on weather conditions. Slightly lower estimates of total honey production are contained in a report by the National Forest Inventory (2003), which is based on data collected by the Australian Bureau of Statistics. As shown in table 2.5, annual production averaged around 21 000 tonnes per year between 1998 and 2000. On the basis of the survey results contained in Rodriguez et al. (2003), estimated total honey production from Australian commercial beekeepers in 2000-01 was approximately 27 800 tonnes.

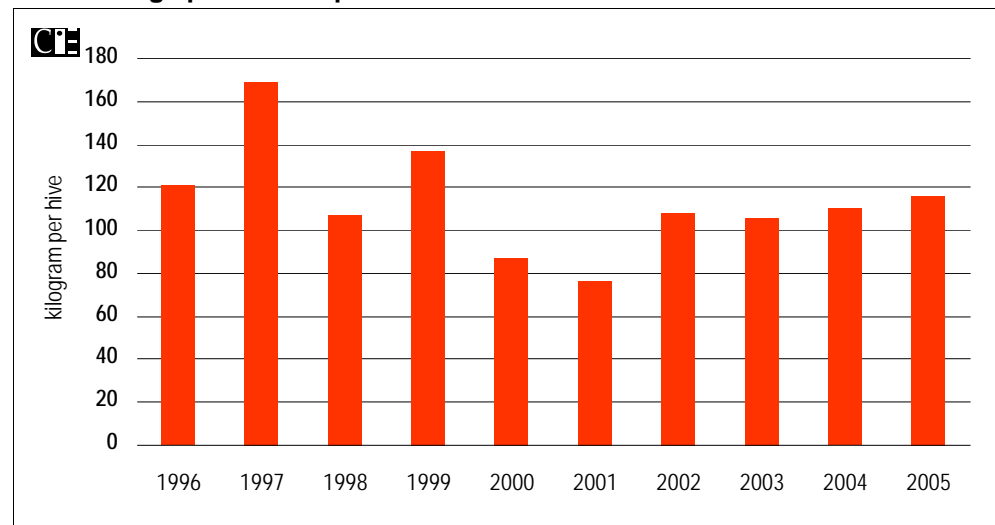
The variability of honey production and the impact of drought is highlighted in chart 2.6, which shows the average production per hive over a ten year period from suppliers to Capilano, Australia's largest honey packer. The lowest production levels were in 2000 and 2001, when the drought was at its peak. Since then, production per hive has been relatively stable, hovering between 106 and 116 kilograms per hive.

2.5 Honey production, 1998-2000

Jurisdiction	1998		1999		2000	
	<i>Quantity produced</i>	<i>Gross value</i>	<i>Quantity produced</i>	<i>Gross value</i>	<i>Quantity produced</i>	<i>Gross value</i>
	<i>t</i>	<i>\$m</i>	<i>t</i>	<i>\$m</i>	<i>t</i>	<i>\$m</i>
New South Wales	8232	13.7	8921	15.1	8775	14.5
Queensland	3721	6	3287	5.5	2069	3.4
South Australia	3274	5.7	1959	3.3	3008	5.1
Tasmania	741	1.4	686	1.4	944	2.0
Victoria	4266	7.3	2477	4.2	4971	8.3
Western Australia	1781	2.7	1508	2.5	1596	2.7
Australia	22015	36.8	18838	32.0	21363	36.0

Source: National Forest Inventory (2003).

2.6 Average production per hive^a



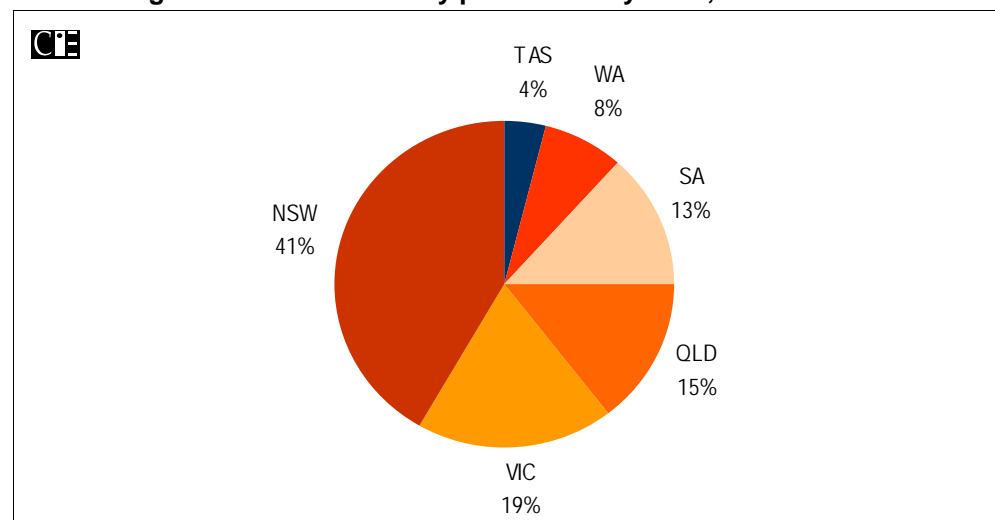
^a Capilano suppliers.

Data source: Australian Bureau of Statistics (1996-2002), Capilano Honey delivery records (2002-2005).

Production by state

According to the National Forest Inventory (2003), average production between the states was highest in New South Wales between 1998 and 2000, followed by Victoria and then Queensland (see chart 2.7). However it must be noted that these markets shares only serve as an approximate guide, as production levels within states may have changed significantly since 2000. Drought and bushfires have impacted production to varying degrees across Australia. In addition, commercial beekeepers are highly migratory, which adds to the difficulties of estimating state production. Some industry sources suggest that the New South Wales figures in chart 2.7 are inflated while the proportion of production in Queensland is underestimated.

2.7 Average distribution of honey production by state, 1998-2000



Data source: National Forest Inventory (2003).

Queen and packages bees

Queen bees are produced by dedicated breeders who sell them to apiarists and to export markets. Some apiarists also produce their own queen bees. The primary production of queen bees is located along the East Coast between Sydney and Southern Queensland. However, Western Australia has its own breeding programme as it is the only state that does not suffer from European foulbrood (EFB). The estimated portion of queen bees purchased by apiarists of each state is shown in table 2.8

During 2000-01 Australian beekeepers sold approximately \$3.3 million worth of queen bees (Rodriguez et al. 2003). There are three types of queens used by apiarists – the Italian, Caucasian, and Carniolan – although Italians are by far the most popular. Queen bees are required at various times of the year, but demand is highest between spring and autumn. Queen bee exports to Europe and North America (primarily Canada) are required in the Northern Hemisphere spring. They are shipped in both wooden and plastic mailing cages, which are packed into ventilated boxes, overnight express post bags, or small queen bee banks (called Riteway queen shippers). Australia Post is a common and effective way of transporting queen bees.

Australia has imported most of its breeding stock from the USA and most recently Europe, which has been driven by demand for exports of Australian queens by Canada and more recently USA. This adds an extra cost to queen breeding as the queen must stay in quarantine while being checked for disease by the Australian Quarantine and Inspection Service (AQIS). The costs to keep the bees in quarantine varies with the number of bees imported and whether the apiarist provides the nucleus hive. The queen bee is never actually released by AQIS as the apiarist only obtains access to the larvae.

2.8 Portion of queen bees purchased by apiarists

State	None	Less than half of their requirement	More than half of their requirement	All of their requirement
	%	%	%	%
New South Wales	48	21	18	13
Victoria	0	85	0	15
Queensland	50	45	0	5
Northern Territory	0	0	0	100
South Australia	3	4	29	64
Tasmania	unknown	unknown	unknown	unknown
Western Australia	unknown	unknown	unknown	unknown

Source: Benecke (2003).

There has been continual research undertaken by RIRDC and state agencies on the queen bee. These have primarily looked at improving queen bee production. Due to the concerns raised by some apiarists within the industry, the Australian Honeybee Industry Council (AHBIC) recently established a committee to examine the possibility of re-establishing an institutionalised programme to provide improved genetic material to satisfy both domestic and international demand. These are to be undertaken in New South Wales and Western Australia.

Although package bees have been exported in small quantities, the package bee industry primarily developed around 1990 to satisfy the Korean market. Since then, producers have also started exporting to Canada, the Middle East, and Europe as they are able to deliver in the northern hemisphere spring and are free from the varroa mite.

The production of package bees is highly labour intensive, requiring a crew of six plus personnel to undertake the shaking (Benecke 2003, p. 57). They are shipped in a package bee container that also contains bee feed during airfreight. The cargo is very fragile so a great deal of care is taken in making sure the packages are well ventilated.

At present there are three major exporters of package bees, all located in New South Wales. Exports are undertaken between February and April each year. The value of package bee exports has been estimated to be approximately \$2 million per year (Benecke 2003, p. 5).

Other honeybee products

Beeswax and honeycomb

The estimated value of beeswax, propolis and honeycomb is approximately \$2.5 million per year (Rodriguez et al. 2003).

Although beeswax faces strong competition from synthetic waxes that can often have superior characteristics for specific applications, it is still used in a number of applications, including:

- candle making – higher melting temperature than petroleum products such as paraffin;
- metal castings and modelling – its plasticity and low melting point makes it ideal;

- cosmetics – provides solidity to emulsified solutions and increases the water holding capacity of ointments and creams, although considered expensive compared with other waxes;
- food processing – used in packaging, processing and preservation;
- textiles and paper – used for waterproofing; and
- varnishes and polishes – for painting and art restoration, floor and furniture.

Beeswax is a by-product of honey production. Essentially, 1 kilogram of wax is created for every 60 kilograms of honey. Production of beeswax by state is therefore expected to be roughly the same as the production of honey by state.

Pollen

Like honey, pollen varies according to the plant species from which it is collected. It can be used in various ways including:

- medicine – for the treatment of various prostate problems;
- food supplement – pollen is very rich in nutrients and vitamins; and
- cosmetics – used in cosmetic preparations, although there is a considerable allergy risk for a large percentage of the population.

Commercial pollen production is an important diversification for many Western Australian beekeepers. Production has increased in recent years and some beekeepers are now able to collect 3 to 4 tonnes per year. This is primarily sold on the Asian markets, including Korea, Japan and Taiwan, although these markets are not as valuable as the markets for royal jelly and propolis.

Royal jelly

Royal jelly can be sold in its fresh state, cooled or frozen, mixed with other products, or freeze dried to be used in other preparations. It is primarily used in:

- dietary supplements – it is claimed that royal jelly can increase energy and boost the immune system, and can alleviate anxiety, asthma, moodiness, and sleeplessness;
- food products – mixed with honey, or in yogurt, fruit juices, and other beverages; and

- cosmetics – for skin refreshing and skin regeneration and rejuvenation.

There are no commercial royal jelly producers in Australia due to the high labour costs associated with its extraction. However the royal jelly market is significant both within Australia and in the Asian region, the largest markets being Korea, Japan and Taiwan. These markets are serviced primarily through Chinese royal jelly, which is either supplied directly through China or is imported to Australia and then rebadged as 'Made in Australia' to be shipped back into the Asian markets. This presents a significant risk to the Australian honeybee industry as Chinese royal jelly can often be contaminated with antibiotics. This issue is addressed further on in the report.

Propolis

Propolis is a substance made by bees from plant resin. It can be sold in a fresh state or reprocessed to be added into cosmetics, medicine, and food. The largest markets for propolis are in Japan, Korea and Taiwan, although there is also an Australian market made up of Asian tourists and Asian communities.

Although the production of propolis does not require a large capital investment there is very little production of propolis in Australia, primarily due to the cost of production compared to China.

Venom

Honeybee venom is a clear, odourless, watery liquid that contains a number of very volatile compounds that can be easily lost during collection. It is traditionally used in natural medicine for various kinds of rheumatism and other medical conditions, although Western countries are known to use it as an alternative to heavy drug use for some ailments.

Bee venom is either sold as a whole bee extract, pure liquid venom, an injectable solution, or in most cases in a dry crystalline form. This means the extraction method must be extremely clean as most venom preparations are likely to be used as injections into humans or animals.

Bee venom is a highly specialised field. There are only a few buyers of bee venom in the world and the market is relatively small compared to royal jelly, propolis or pollen. Currently there are no beekeepers in Australia who produce bee venom on a commercial basis.

Pollination services

The value of paid pollination services has been estimated to be around \$3.3 million per year (Rodriguez et al. 2003, p.vii). There has been an increase in demand for these services in the last few years due to the increased size of the horticulture industry and the reduction in feral bees from changing land management practices.

Large markets for pollination services exist in all states. Pome and stone fruit, and almond growers are the largest purchasers of pollination services, which are located in Victoria and South Australia. In the Burdekin area of Queensland, it has been estimated that apiarists derive 50 to 80 per cent of their gross cash flow pollinating cucurbits. This has led to an estimated increase of cucurbit production of between 30 to 40 per cent (Benecke 2003).

Another opportunity to provide pollination services is in almond production, which has its strength in South Australia but now with extensions into Victoria. Planned expansion is attributed to large publicly listed companies such as Timbercorp and Select Harvest. Industry consultations have revealed that almond production is predicted to increase dramatically within the next few years, requiring over 200 000 new hives if current trends continue. Some suggest that there are currently not enough hives to fill this demand. However, if pollination services are adequately rewarded, there should be adequate hives available to satisfy demand (Somerville 2005). Any fees paid for new hives by almond growers would also have to incorporate the preparation expenditure that is required for colony brood production during winter.

Although beekeepers can earn good returns from pollination services, it is considered risky work. Although the grower can promise not to spray pesticides while the bees are located in the area, the grower has no control over use of pesticides from neighbours. As some horticultural plots are located close to each other, the beekeeper runs the risk of his hive receiving unintended spray.

The long term value of paid pollination will be dependent on a number of factors. These include the:

- value of various agricultural crops that can benefit from honeybee pollination;
- risk associated with continual use of pesticides;
- dependence of agricultural crops on honeybee services;
- awareness of farmers as to the value honeybees can provide;

- ability of farmers to pass through the increased costs of honeybee pollination services onto the consumer;
- relative value of alternative crops that do not require honeybee pollination and the ability of farmers to switch to these alternative crops; and
- opportunity cost in terms of lost revenue from reduced honey production (which will depend on price of honey).

The world market for honeybee products

The world market for honeybee products is made up of trade in honey, beeswax, queen bees and package bees, pollen, royal jelly, propolis and venom. However the value of honey trade is by far the largest market.

World honey

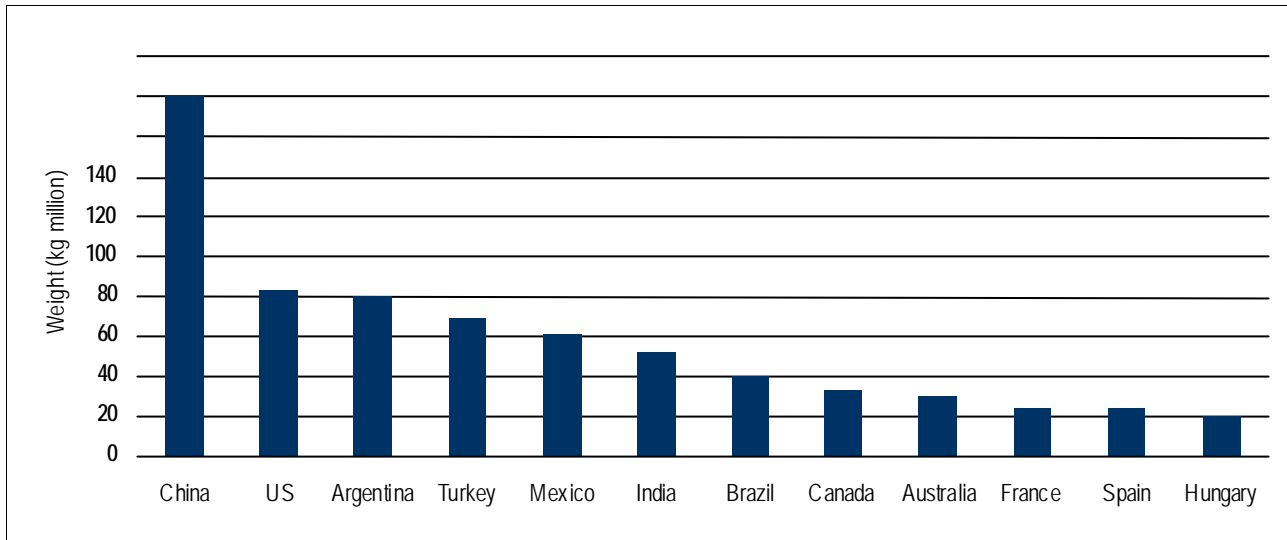
Honey is consumed right across the world. The largest annual consumers are the United States with around 153 000 tonnes, China with around 123 000 tonnes, and Germany which consumes approximately 90 000 tonnes a year (AAFRD 2005).

The three largest honey-producing countries in the world are China, the US, and Argentina. Chart 2.9 shows a broad estimate of average annual honey production for the major honey-producing countries.

China has traditionally been the world's largest honey producer. Although there are no official honey production figures, the United States Department of Agriculture estimates annual production in China to be between 170 000 and 180 000 tonnes (USDA 2001), although the Food and Agricultural Organisation of the United Nations has estimated production much higher at 306 000 tonnes (FAOSTAT 2005).

The US is the second largest honey producer. However, nearly all of its production is for the domestic market, and current supplies do not meet demand. Varroa mite has had a devastating effect on the US industry. Imports fill the gap.

2.9 Estimated annual production of honey for major producing countries, 2004



Data source: USDA (2005), FDL (2005), FAOSTAT (2005), IHEO (2005)

Argentina is the third largest producer of honey. In both 2000 and 2001 it produced approximately 100 000 tonnes of honey, although since then average annual production has been around 80 000 tonnes (FDL 2005). Due to relatively low consumption of honey in Argentina, most of its production is sold on the export market.

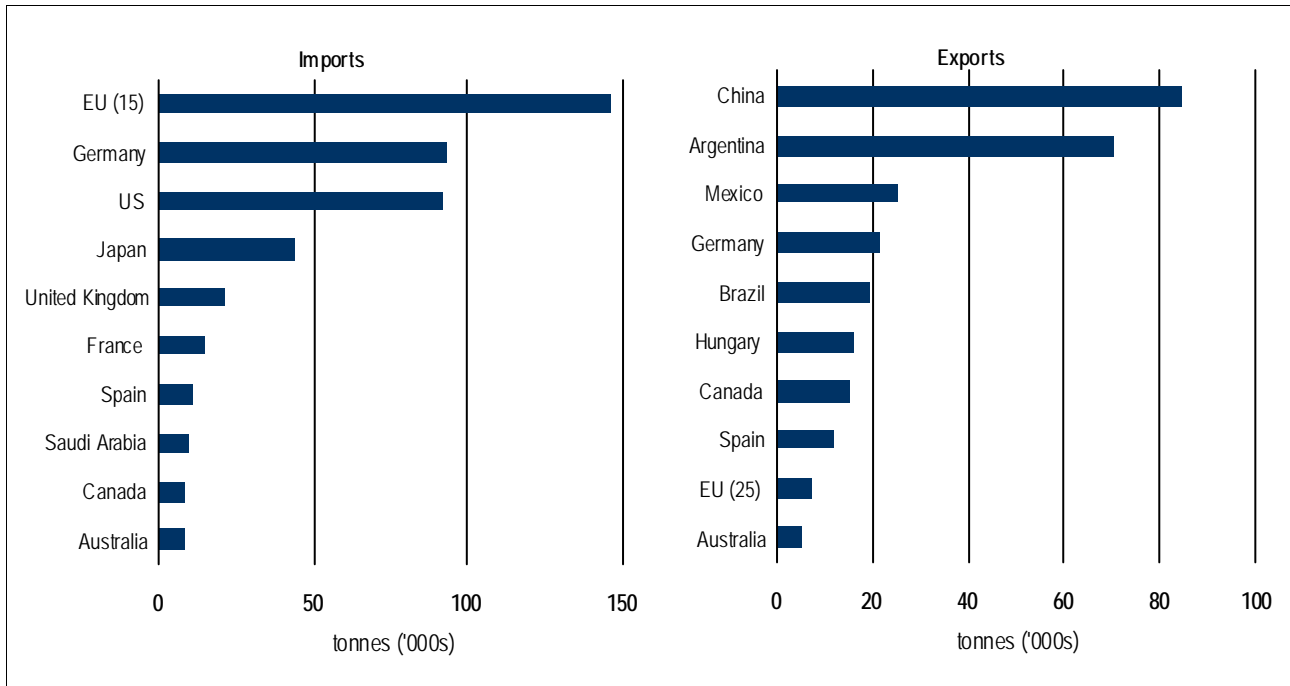
The primary importer of honey is the European Union. In 2003, the EU imported a total of approximately 146 000 tonnes of honey from around the world. The EU is both an importer and exporter of honey but on balance is a large net importer. Within the EU, Germany is the largest importer of honey, with estimated annual average imports of around 95 000 tonnes between 2000 and 2003 (FAOSTAT 2005). Although there is some local production within the EU (the largest producers being France, Spain, and Hungary), available supply falls well short of demand.

Outside the EU, the US is a significant importer of honey along with Japan and Saudi Arabia. Chart 2.10 shows the average volume of honey imported for the top ten countries in 2003.

The primary exporting countries are China and Argentina and the annual exports of these two countries have traditionally dominated the landscape of the world honey market (see chart 2.10).

Until 2001, China dominated the world honey market. However, China experienced problems exporting honey in recent years due to health safety concerns over the levels of the antibiotic chloramphenicol, which has been linked to aplastic anaemia, a serious disease with symptoms similar to

2.10 Major honey export and import countries, 2003



Data source: FAOSTAT (2005).

some cancers. As a result, Chinese honey exports were banned in EU in 2002 and 2003 (although the restriction was lifted in July 2004). Furthermore, the US applied anti dumping regulations on Chinese honey in 2001 to protect its domestic honey production from low Chinese honey prices.

However, recently, Chinese honey exports have started to pick up after the lifting of the EU ban and the introduction of a minimum price of US\$1300 per tonne for Chinese light amber honey set by the Chinese Chamber of Commerce. This was introduced to remove anti dumping restrictions. It is to be policed by the Chamber to ensure discounting does not continue.

With the ban on Chinese honey by the EU in 2001, Argentina flourished in the world market and became the largest exporter of raw honey in 2002 (FAOSTAT 2005). This was facilitated by Argentina's low cost of production, plentiful floral resources, and reasonably high quality honey. Most of these exports were sold to the European Union, as US anti dumping restrictions placed on Argentine honey in 2001 had restricted its competitiveness and drastically reduced the quantities being sold to the US.

In 2003 an unacceptable level of nitrofurans was found in some Argentina honey batches by UK authorities. As a consequence SENASA in Argentina introduced a stringent compliance testing regime on all export shipments. However it is believed that contaminated honey from Argentina is still being exported. It was estimated that 7 per cent of the 2004 crop suffered from nitrofurans contamination in excess of 1 part per billion (ppb), with a

further 20 per cent in the 0.5 ppb to 1.0 ppb range. Only 25 per cent of the crop either contained no nitrofurans, or suffered contamination below 0.25 ppb. This is a severe problem for destinations that have relatively strict testing limits such as the UK who commonly test down to 0.2 ppb (Fuerst Day Lawson 2005).

To take advantage of the recent reduction in honey exports from Argentina, Brazil has been increasing its production in the last three years. It is estimated that approximately 30 000 tonnes is produced annually, with around 80 per cent being exported on the world market, primarily to the EU (FDL 2005).

Key factors driving the world market

As consumption has been relatively stable in the last five years, the key factors driving the world market have been climate and quality. This is shown by the restrictions placed on China and Argentina by the US in recent years, and adverse weather conditions that have affected a number of large honey-producing countries, such as Mexico, Australia, and Canada.

There are emerging markets for honey, with the biggest opportunity being the large income growth in China. However, the US is also seen as a major growth opportunity as its domestic supply cannot meet expected demand due to incursion of the varroa mite devastating the industry.

Australian exports

Australia is known for exporting a premium quality product. Australian exports are relatively free of chemical residues, antibiotic residues and high microbial counts (Ward and Trueman 2001). As such, Australia is one of the largest and most diverse honey exporters in the world, exporting to over 38 countries.

The total value of honey exported to the rest of the world was \$30.7 million in 2004, the highest value that has been exported in the last five years. However, although the value of exports has been steadily increasing in the last five years, this has been primarily due to higher average prices received for exports. The volume of honey exported has actually decreased since 2000.

Chart 2.11 shows the exports of honey between 2000 and 2004 against average prices for a kilogram of exports. Although exports of honey were

2.11 Quantity of exports and average export price for honey



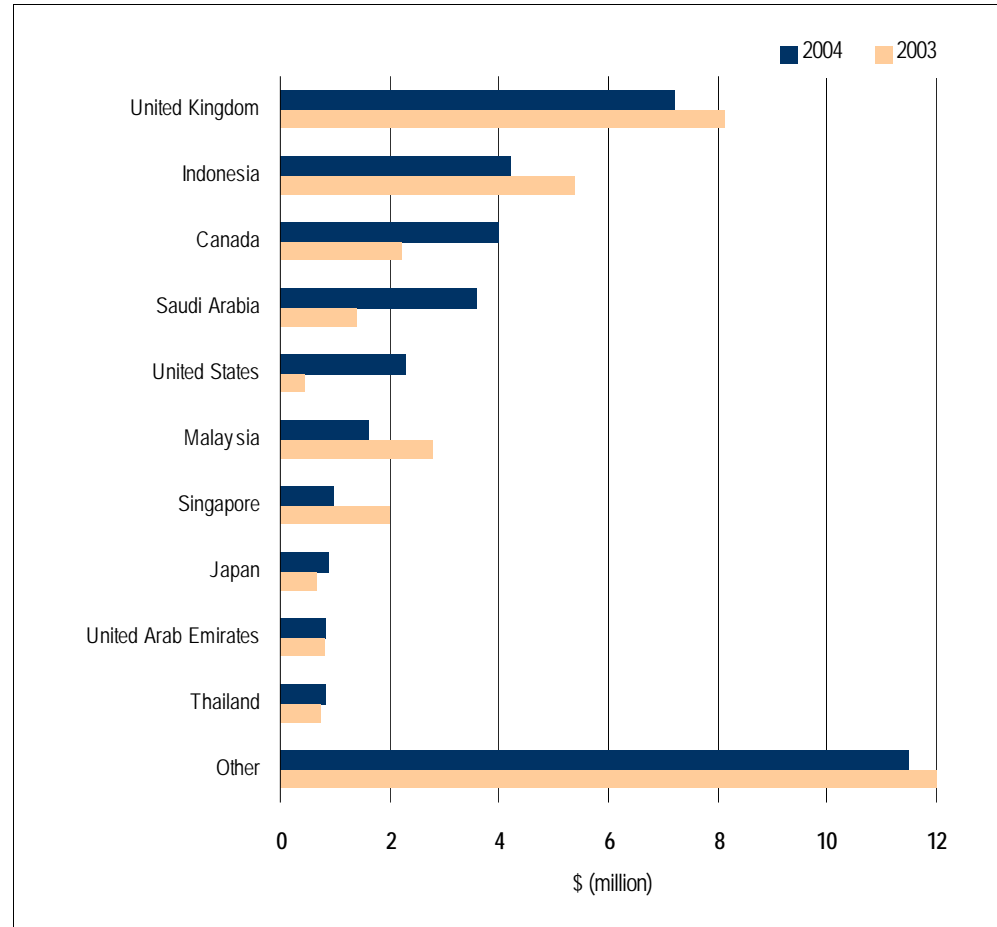
Data source: DFAT (2005).

relatively stable between 2000 and 2002, with an average 8.7 million kilograms, 2003 saw a large decline in exports of 3.3 million kilograms, or around 39 per cent. This was primarily due to low production from a widespread drought that affected Australia, especially along the eastern states. While 2004 saw an increase in honey exports, it did not reach the levels experienced in the three years prior to the large decline.

As chart 2.11 indicates, there is an inverse relationship between exports of honey and the average export price. For example, in 2003 export prices were at their highest. However, rather than taking advantage of these high prices, exports from Australia were at their lowest. This was primarily because honey producers and packers faced supply side constraints in exporting.

The destination of Australian honey exports has also changed in recent years. This is demonstrated in chart 2.12, which shows the value of exported honey to Australia's top ten destinations for 2003 and 2004. Although the UK received the most honey from Australia during this period, the destination of honey shifted from the Asian region (such as Indonesia, Malaysia, and Singapore), to the North American market and the middle east (Saudi Arabia), on the basis of strong demand from these areas.

2.12 Value of honey exports to top ten destinations



Data source: DFAT (2005)

Australian imports

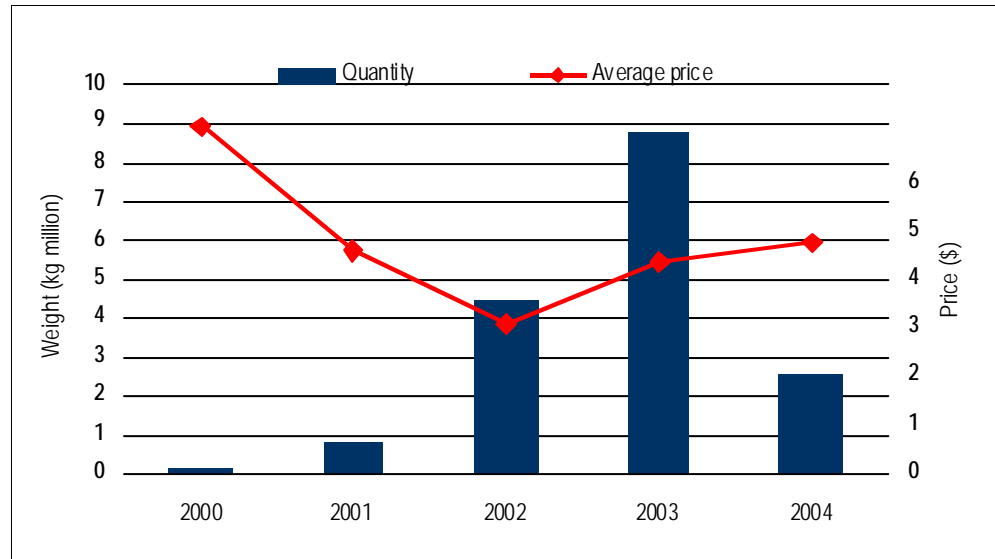
In 2004, Australia imported a total of \$12.2 million worth of honey, down from \$38.3 million in 2003 (DFAT 2005).

Australia normally imports a relatively small quantity of honey. However in 2002 and 2003, Australian imports increased dramatically due to low domestic production levels from drought and bushfires along the eastern states. Argentina was the major supplier, increasing its exports to Australia by 4.3 million kilograms between 2002 and 2003, or 240 per cent¹. In addition, imports were driven in part by Australia's obligations to fill export contracts over this period of time.

¹ This was subsequently reduced by 5.8 million kilograms in 2004 due to higher Australian production and problems with high nitrofurantoin content.

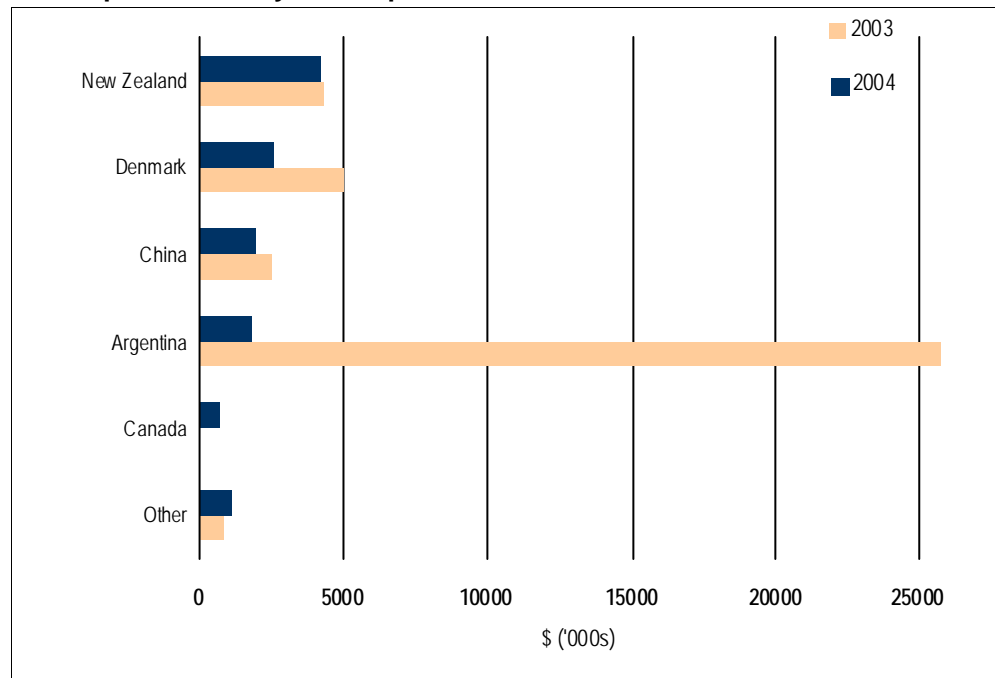
Chart 2.13 shows the quantity of imports and the average price paid for honey. The price of honey was driven down between 2000 and 2002 due to high production yields from China and Argentina, and the anti dumping rulings imposed by the US on Argentina and China in 2001. In 2004, the primary source of honey imports was from New Zealand. Chart 2.14 shows the value of honey imported from the top five source countries.

2.13 Quantity and average import price for honey



Data source: DFAT (2005)

2.14 Imports of honey from top five source countries



Data source: DFAT (2005)

Trade barriers faced by Australian honey suppliers

The primary trade barrier faced by Australian honey exporters at country borders is applied ad valorem tariffs. Although Australia applies a zero tariff rate on all honey imports, Australian honey exports face tariffs ranging from zero to 248.4 per cent. The average tariff applied to Australian honey is approximately 26.2 per cent. Table 2.15 shows the tariff rates for Australia's top 38 honey export destinations.

2.15 Ad valorem tariffs faced by Australia's honey exporters

<i>Country</i>	<i>Ad valorem tariffs</i>	<i>Country</i>	<i>Ad valorem tariffs</i>
	%		%
Republic of Korea ^a	248.4	Bangladesh	15.0
Mauritius	65.0	El Salvador	15.0
Morocco	50.0	Kenya	15.0
Slovenia	45.0	Indonesia	5.0
Sudan	45.0	Oman	5.0
India	35.0	Saudi Arabia	5.0
Lebanon	35.0	Qatar	4.0
Japan	25.5	Malaysia	2.0
Pakistan	25.0	United States ^b	1.3
Sri Lanka	25.0	Thailand	0
Djibouti	20.0	Brunei	0
Brazil	17.5	Canada	0
Belgium	17.3	Hong Kong	0
Finland	17.3	Kuwait	0
Germany	17.3	Singapore	0
Ireland	17.3	United Arab Emirates	0
Italy	17.3	Fiji	na
United Kingdom	17.3	New Caledonia	na
China	17.0	Papua New Guinea	na

^a Out of quota tariff ^b Ad valorem equivalent rate.

Source: Market Access Database (accessed 22 April, 2005).

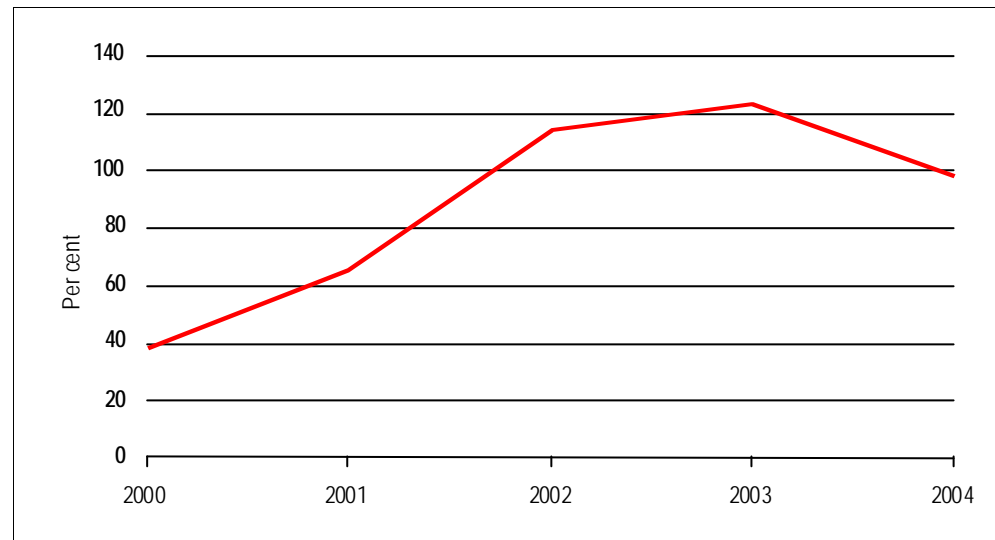
However there is also evidence of non-tariff barriers faced by Australian honey exporters. These include quotas place on the total amount of honey allowed to be exported into the country (for example Korea), and cumbersome quality testing measures that are not placed on domestic honey producers.

Terms of trade

Terms of trade have improved in the last five years, suggesting Australian honey exporters are getting a relatively larger price compared with the price paid for imports (chart 2.16). This is due to the increase in average price Australia has been receiving in the last five years and the somewhat stable import price after a large decline between 2000 and 2001 of \$2.55 per kilogram, or approximately 36 per cent.

The increase in terms of trade may be due to the high premium Australian honey commands on the world market stemming from its reputation for quality. This reputation would have been particularly valuable between 2000 and 2004 due to the relatively high risks that were evident in the world honey market associated with Chinese and Argentine honey. Furthermore it could be argued that the honey imported into Australia during this time was an inferior quality, thereby reducing its price, although some industry sources suggest the lower imported price was due to joint venture arrangements between Capilano (the major importer during this time) and its supplier in Argentina.

2.16 Terms of trade for Australian honey



Data source: DFAT (2005) and CIE calculations

Other honeybee products

Beeswax

Australia also exports and imports beeswax. In 2004, Australia exported around \$2.2 million and imported around \$0.5 million worth of beeswax. Chart 2.17 shows the volume and price of beeswax between 2000 and 2004, while chart 2.18 shows the total value of beeswax exported and imported from the top ten countries.

Queen bees and package bees

There are less than ten breeders and suppliers of queen bees in Australia who export queens. These are supplied primarily to the North American markets (primarily Canada and recently the USA) where the disease free

status of Australian queens is highly valued. Package bees are also exported to these locations, and the United States represents a potentially large market where the varroa mite has destroyed a large portion of their hives in the last ten years.

There are no official statistics on the value of queenbee and package bee exports.

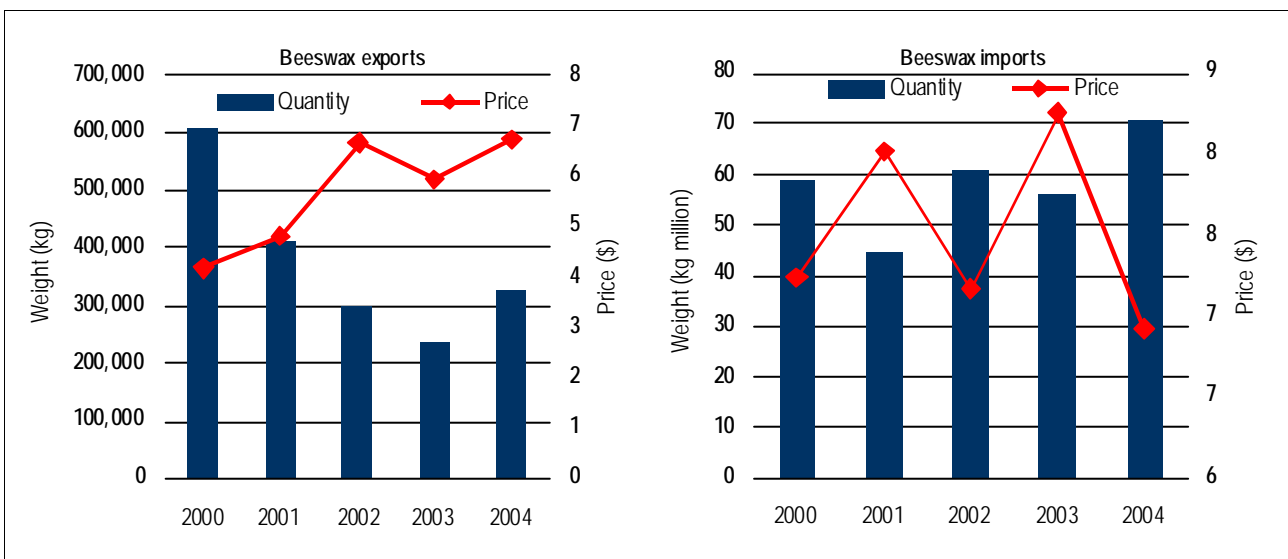
Pollen, royal jelly, propolis, and venom

There is a small pollen industry in Australia that exports to Asian markets, primarily Korea, Japan, and Taiwan. However there are no official statistics available on the value of exports.

There is no royal jelly, propolis or venom produced in Australia on a commercial basis so there have been no exports from Australian producers. This is primarily due to the high cost of producing these goods compared to China and the difficulty in differentiating the quality of the product, which limits Australia’s ability to generate a premium.

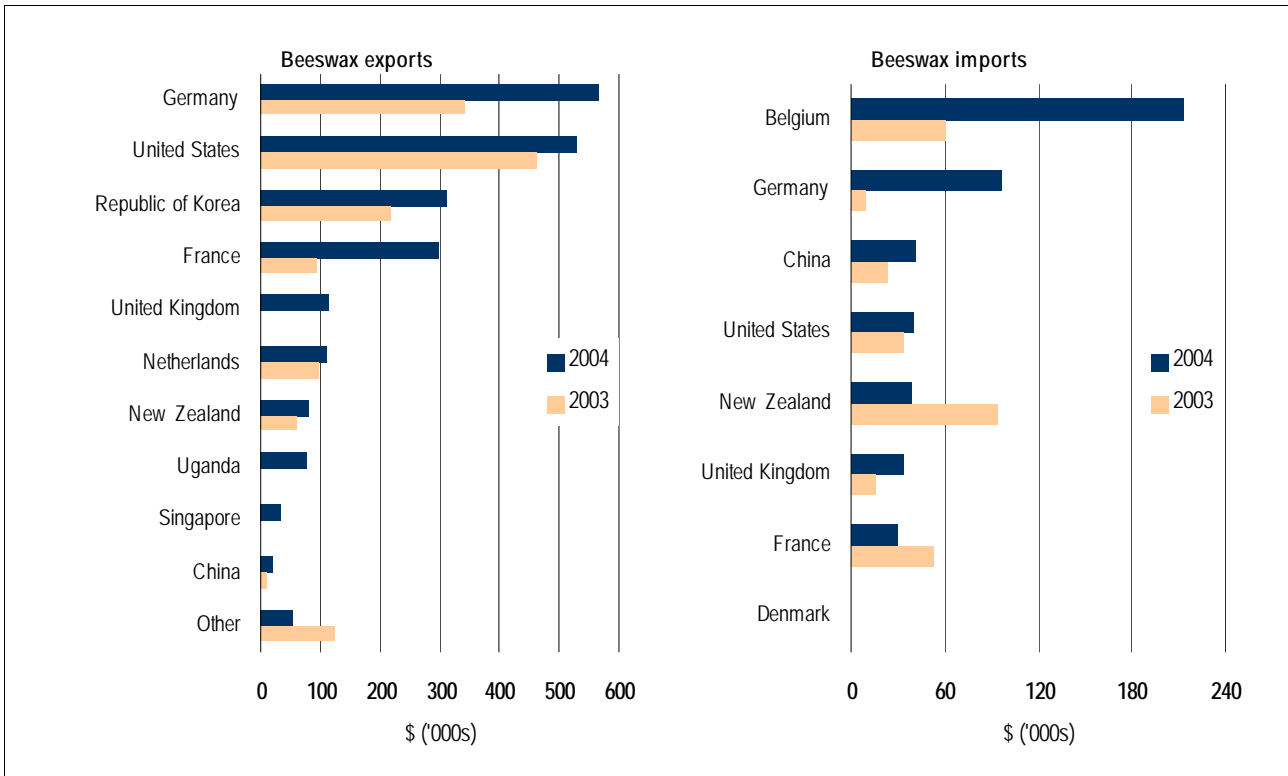
However, there are imports and exports of royal jelly and propolis from Australian distributors. Currently there are a number of health food suppliers who are importing royal jelly and propolis, making minimal product transformation (primarily packaging only), and then exporting these products relabelled as ‘Made in Australia’.

2.17 Volume and price of beeswax exports and imports, 2000 to 2004



Data source: DFAT Star database (2005)

2.18 Value of beeswax exports and imports, 2000 to 2004



Data source: DFAT Star database (2005).

3

The industry's perceptions: a SWOT analysis

Initial assessment of industry profile

It is useful to make an initial assessment of the industry profile on terms of the five key criteria outlined in chapter 1. What follows is an initial assessment by CIE. This is followed by a self assessment by beekeepers who attended workshops on SWOT analyses for the four main sectors of the industry – marketing and packing, queen bee and package bee production, pollination services and honey production.

Initial industry assessment by CIE

Profitability

The ABARE survey (Rodriguez et al. 2003) of beekeepers is the only information on the financial performance of the industry, although its limitations have already been noted. The results for 2000-01, before the price spike in 2003-04, clearly shows a pattern of low profitability for smaller beekeepers. Large commercial operators have positive returns but even here, they have generally low rates of return on capital.

Profitability may not have changed much in the subsequent years, as the high prices of 2003-04 coincided with low production because of the drought.

In short, it seems reasonable to assess that reasonable profits are made by large scale, full time commercial beekeepers owning more than 500 hives, but those with 500 hives or fewer would have to rely on other sources of income to be viable.

Sustainability

Threats to sustainability come mainly from loss of access to public lands, and the threat of an incursion of the exotic pests and diseases, especially varroa mite. There is a trend towards gradual erosion of access for beekeepers to native flora on public land through expansion of conservation reserves. In New South Wales there are currently relatively few apiary sites in national parks (see chart A.2), but the continued conversion of public lands into national parks and the trend towards banning or discouraging beekeeper access to national parks is cause for some concern for the long-term viability of the industry. This may be a slow long-term process but the trend needs to be counteracted by strategic actions by the industry.

An incursion of varroa mite would have a devastating impact on the industry by substantially adding to disease control costs and killing off many bee colonies.

On the other hand, there are good prospects for enhancing sustainability through increased demand for pollination services and for queen and package bees as well as exploiting the medicinal properties of honey and related products.

Another aspect of sustainability is the average age (54 years) and experience (25 years) of beekeepers. This makes training of younger beekeepers and succession in commercial businesses an important issue for the industry to address.

Competitiveness

The industry competes on the international market by virtue of the superior quality of Australian honey and resultant price premiums for an 'Australian' label on final product honey exports. Australian honey is not price competitive compared with Chinese and Argentinean honey on world markets. It is essential, therefore, for the industry to maintain a 'clean and green' image, maintain product quality and integrity and market branded product. This implies an increasing emphasis on sales of branded tin or jar honey rather than bulk honey.

On the domestic market, even though Capilano Honey Limited has 70 per cent of the market (including its sales as 'home brand' in supermarkets), there is ample contestability from other packers and marketers such as 'Leabrook Farms' and Westcobe in Western Australia and a host of smaller brands. Supermarket home brands sometimes use imported honey

in blends and also provide strong competition. Even though Australian honey receives a premium for quality, price trends in Australia and for Australian exports follow international price movements.

Resilience

Commercial beekeepers are generally family businesses that have in many cases existed for generations. They have a strong, even passionate commitment to beekeeping and, overall, show high resilience. With pollination services and queen bee production there is also a degree of diversification. Smaller beekeepers generally have other sources of income and can therefore show some reliance to drought or market downturns.

Self-reliance

This industry receives very little in the way of government support which is mostly confined to matching government contributions to R&D levies, and some access to government programs.

In summary, the key areas for attention are in improving profitability and industry sustainability – maintenance of access to resources, enhancement of market opportunities and prevention of exotic disease incursions, especially varroa mite.

Industry assessment of its performance

At the industry SWOT workshops, participants were asked to score out of 10 (1 being very poor and 10 being excellent) the performance of the overall honeybee industry and each segment against the five key criteria mentioned above. The results are discussed in more detail in the report on the workshops (CIE 2005) but are summarised in tables 3.1 and 3.2.

The results presented in these tables should be taken as rough guides only as numbers of participants at the workshops were quite small.

Participants had quite a wide range of views on the performance of their sector of the industry and of the honeybee industry overall. Queen bee breeders were generally quite positive about their general profitability level (say, over the past 5–10 years) and the other criteria, but were less positive about the honeybee industry overall. Their assessment of profitability for the overall industry coincided with that made by apiarists. Packers and marketers were the most pessimistic and thought that profitability in the industry overall was generally quite low.

3.1 Industry segment perceptions of the performance of their own segment

Criteria	Honey producers		Packers and marketers		Pollinators		Queen bees	
	Average	Range	Average	Range	Average	Range	Average	Range
Profitability	6.1	3–8	5.0	3–7	6.1	3-10	8.0	7-8
Sustainability	7.8	5–9	6.5	3–8	7.0	5-10	7.0	5-9
Competitiveness (domestic)	8.0	5–10	4.8	4–8	6.6	4-10	7.5	6-8
Competitiveness (export)	6.4	2–10	na	na	2.5	0-6	na	na
Resilience	8.5	6–10	6.1	4–8	6.6	1-10	8.0	5-9
Self-Reliance	8.3	3–10	6.7	5–9	6.6	2-9	9.0	8-9

3.2 Industry segment perceptions of the overall performance of the honeybee industry

Criteria	Honey producers		Packers and marketers		Pollinators		Queen bees	
	Average	Range	Average	Range	Average	Range	Average	Range
Profitability	6.8	2–8	4.0	1–7	4.0	2-6	6.0	2-8
Sustainability	7.7	5–10	4.2	1–8	5.3	1-10	6.5	5-9
Competitiveness (domestic)	7.8	2–10	4.8	1–7	4.4	2-8	6.0	1-9
Competitiveness (export)	6.7	2–10	na	na	4.0	0-10	na	Na
Resilience	8.4	5–10	5.0	4–7	6.5	1-10	7.0	7-9
Self-Reliance	8.2	3–10	5.4	4–8	6.8	5-9	8.5	8-10

Source: CIE run workshops with industry participants.

Perception of key issues facing the industry

Beekeepers attending each of the workshops had similar ideas on the key issues facing the industry. These are summarised below.

Erosion of access to public resources

This is constraining the industry, putting significant constraints on honey production and development of new apiaries. The situation is made worse by the industry's difficulty in influencing governments on natural resource issues.

Public relations between beekeepers and the general public and governments

The industry needs to educate the public and governments on the value of the industry to the overall economy, especially the horticultural, cropping and pasture-based-industries.

How industry profitability is leading to inability to attract young people

Many beekeeping businesses are suffering the effects of the recent decline in honey prices. Low industry profitability especially for smaller enterprises makes it difficult for the industry to attract young people. A skills shortage is developing in the industry.

Inability to influence prices

The packaging and marketing sector saw the main issue as their inability to influence the prices for their product and therefore industry profitability. This stems from the market power of supermarkets, imports of cheap honey from Argentina and China, growing honey exporters such as Brazil, lack of adoption of honey use in the bakery trade and consumers having little knowledge of honey. Honey is losing market share to imported products used in 'home' brands.

Lack of appreciation of paid pollination services

Some beekeepers provide pollination services on a part time basis at discounted rates. Many horticulturalists do not appreciate the true value of professional pollination services.

Quality control in pollination services

Some beekeepers provide these services through beehives at below strength. There is a need for some standards and codes to enhance the reputation of the pollination sector and the services it provides.

Risk of chemical sprays used by growers

Pollinators face these risks. Grower clients need to be better educated and labelling standards on chemicals need to be improved.

Perception of insufficient hives to meet pollination demand over next few years

Some said that if present trends continue especially in areas planted to almonds, there will be insufficient hives to meet demand. However, raising the price of pollination services would attract more beekeepers to take up this enterprise.

Risk of introduction of exotic pests and diseases

Queen bee producers especially were concerned at the perceived deterioration in quarantine services increasing the risks of exotic incursions.

Lack of quality breeding stock in Australia

This is limiting production of queen bees and their ability to capitalise on access to export markets especially in the United States. However, new genetic material can be imported into Australia.

SWOT analysis

Table 3.3 summarises the main points arising out of SWOT analyses undertaken at each of the four workshops.

Perceptions of what the industry can do

The following suggestions were made by participants at the workshops on what the industry can do to address threats and opportunities, capitalise on strengths and overcome weaknesses.

Promoting the industry to government and public

- The industry needs to promote the value of honeybees to the economy and society in order to generate positive public relations with the Australian community and government. This should be achieved through the promotion and marketing of the industry to government officials and the general public, and supporting other environmental issues within public policy debate to generate positive relationships with environmentalists.
- To inform customers that they are buying 100 per cent Australian honey that represents premium quality and taste, a logo should be developed (in addition to the B-Qual logo) that has the backing of the peak honey industry bodies. To accommodate this in the domestic market, an education program should be developed that informs the public on the difference between good and poor quality honey and the meaning of these logos. Furthermore, brand loyalty should be developed by targeting young school children. This could be done through school campaigns showing how healthy honey is compared to substitute products.

3.3 The honeybee industry: summary of SWOT analysis

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> ▪ High quality and reputation of Australian honey on international markets. Large variety of flavours. ▪ Low risk of contamination within the distribution process. ▪ Good research on production and pest and disease control. ▪ Australia's isolation in reducing risks of exotic incursions. ▪ Australia is well positioned to supply expanding Asian markets. ▪ Honey is recognised as a natural healthy product and some honey has medicinal properties. It has a range of other uses. ▪ Medical use of honey holds great potential for improving the honey industry's public image. ▪ High level of enthusiasm among beekeepers ▪ Strong organisational structure. ▪ Packers and marketers are innovative and adaptable to change. ▪ Capilano has some market power regarding Coles and Woolworths. 	<ul style="list-style-type: none"> ▪ High transport costs within domestic market and to export markets. Also high labour costs compared with competitors, and high fuel costs ▪ Reduced access to public land limits the ability of beekeepers to maximise honey production ▪ Consumer confusion over what actually is 'Australian honey' ▪ High retail price compared with substitute products ▪ Production is highly variable ▪ Cheap imports are used by retailers and some packers to cover excess demand. ▪ Australian climate is conducive to the spread of disease and pests ▪ Lack of young people training is creating a serious skills shortage — lack of management skills ▪ Lots of bee keepers not willing to change management practices, which limits their production capacity and makes it hard to reduce disease and pest risks ▪ Public relations between beekeepers and the general public is not positive. Public does not recognise the importance of beekeeping to the economy and society ▪ A large number of state legislation acts are adding an extra cost to the industry 	<ul style="list-style-type: none"> ▪ Promotion of honey, creating greater consumer loyalty, focussing on Australia's high quality in international markets, targeting Asian markets ▪ Educate the general public on quality differences in honey and between imported and Australian honey ▪ Develop niche markets based on unique tastes of Australian honey ▪ Target higher income segments of markets in Asia ▪ Promote the B-Qual label ▪ Enhance efforts to engage in environmental debate and influence outcomes based on research and well-reasoned argument ▪ Diversify sources of income through wider range of products especially those used in medicinal and cosmetic applications ▪ Lobby for reduction of trade barriers for example in Japan ▪ Promote the industry's worth to agriculture and the economy through a public education program ▪ Further develop rural training packages ▪ Develop alternative packaging to reduce leakage on supermarket shelves 	<ul style="list-style-type: none"> ▪ Supply shortages could lead to Australia developing a reputation for unreliable quantities and therefore limit contracts ▪ Increased competition from other honey-producing countries in domestic and international markets ▪ Continual reduction in access to flora will reduce the production capacity of the Australian honey industry ▪ Rising fuel prices could render producing honey unprofitable ▪ Incursions of exotic pests and diseases ▪ Beekeepers may start to adopt the use of chemicals for disease control which may destroy the clean and green reputation Australia currently enjoys ▪ An increase in pesticide and insecticide use by farmers will increase the risk to beekeepers ▪ Contaminated honey from misuse of vet medicines used to control pests and disease of bees ▪ Using Australia Post is the only way to cost efficiently distribute queen bees but risk that an adverse event may cause Australia Post to stop delivering ▪ The public may start to perceive that honey contains some genetically modified element if pollination of GM crops ▪ A number of small beekeepers do not understand the reason for quarantine restrictions

(Continued next page)

3.3 The honeybee industry: summary of SWOT analysis Continued

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> ▪ Horticultural industry depends on pollination services, creating strong demand for these services. ▪ There are good profits to be made in the industry. ▪ Pollination services provide a valuable service to agriculture beyond the value of the paid service. ▪ Pollination fits in with management of an apiary business. ▪ Industry is highly mobile so can service clients in many different areas. ▪ Industry has a large range of expertise in all areas of beekeeping. ▪ Good competition throughout the industry. ▪ Public has a fascination for honeybees which could be exploited in drawing attention to the value of pollination services and the bee industry ▪ Most professional horticulturalists do recognise the value of pollination services. ▪ Good quality assurance program (B-Qual) ▪ Australia has diverse flora 	<ul style="list-style-type: none"> ▪ Perceived inability within the industry to influence the government on natural resource issues ▪ Disease and hive pests can be transferred across large distances due to the high mobility ▪ Undercutting in pollination is taking place by beekeepers who do not fully cost their service and value of expertise ▪ Farmers are not able to readily recognise the quality and value of an experienced pollinator before purchasing the services ▪ Pollinators do not have a say on the types of chemicals used by horticulturalists ▪ Ongoing risk to hive strength from pesticide spray ▪ Lack of understanding by pollinators in stocking rates and colony size and strength for specific crops ▪ Inability to pass on knowledge to young people as accumulated human capital not written down ▪ Inability to test for resistances to varroa mite ▪ Labelling laws are very lax 	<ul style="list-style-type: none"> ▪ Develop a queen bee breeding program using imported genetic material ▪ Develop an industry-driven national strategy to gain increased access to native forests ▪ Achieve better cooperation in the industry ▪ Greater cooperation and communication between pollinators and horticulturalists ▪ Increase fees for pollination services ▪ Opportunities to import superior genetic resistant material ▪ Continue to research from good base to improve productivity ▪ Promotion of non-chemical disease control methods could improve industry image 	<ul style="list-style-type: none"> ▪ There is a high risk from other honey producers bringing pests and diseases into Australia ▪ There is a lack of understanding within government on the pest and disease risk associated with bees ▪ Increase in the industry 'cash economy'

Secure access to resources

- The industry needs to secure its resources to achieve sustainability. This includes:
 - creating lines of communication with state and federal governments and developing programs to address state legislation to work towards sustainable access to public natural resources;
 - developing a queen bee breeding program to increase the quality of queen bees;
 - increasing and promote the rural leadership program to attract young people into the industry and fill the skills gap; and
 - strengthening the exotic disease and pest surveillance system to respond to biosecurity risks.

Product differentiation, product integrity and promotion

- The industry needs to differentiate itself from cheap honey imported from China and Argentina in order to compete on the domestic market and earn a premium price. This includes undertaking a widespread marketing campaign to promote Australian honey, informing consumers of the unique and premium taste qualities of various types of Australian honey, and focusing on and exploring other uses of honey, such as, as its use a therapeutic agent. Furthermore, the industry needs to look at focusing on a consolidated industry-led expansion into other markets in China and other Asian markets especially, to take advantage of their expected increase in demand within the next decade.
- There should also be further promotion of honey in other market uses, such as in therapeutic or medicinal products. It was suggested that the industry needs to take on a more commercial focus and inform other industries that may potentially find value in the use of honey in their products.

Improving the provision of pollination services

- The industry needs to develop education programs for beekeepers and pollinators to ensure the pricing of paid pollination services represents the true cost of the service and value provided to the grower. This should be supported by continual research and development on the optimum hive strength and management for specific crops, the implementation of industry standards, and planning at the start of the season to co-ordinate pollination services within a district.

- There needs to be greater co-ordination between beekeepers and seed companies and growers. Joint research needs to be undertaken on the application of chemicals and the optimum number of hives and bee types to ensure value from paid pollination is maximised for the grower.

'Selling' the value of pollination services

- The value of paid pollination services needs to be recognised by growers through continual marketing of the benefits this service can provide. Advertisements and articles should be placed in agricultural journals, and the industry should heavily promote the use of any industry standards that may be developed. Furthermore, the industry needs to educate the government on the value of pollination services to the economy and society in order to gain more access to native vegetation located on public land.

Address skills shortage and attract young people

- Young people need to be encouraged to enter the queen bee breeding sector in order to fill the skills shortage and increase the total number of queen bee breeders within Australia. This should be achieved through an increase in funding for rural leadership programs and formalisation of training courses to increase the ability of queen bee breeders to pass on their extensive knowledge.

PART II

*Assessment of the key
issues*

4

Marketing opportunities

Throughout the workshops, it was noted by a number of participants that marketing and promotion of Australian honey within the domestic and international market was a key issue that needed addressing if low profitability within the Australian honeybee industry was to be improved. A number of suggestions to undertake promotion were offered by the participants, including:

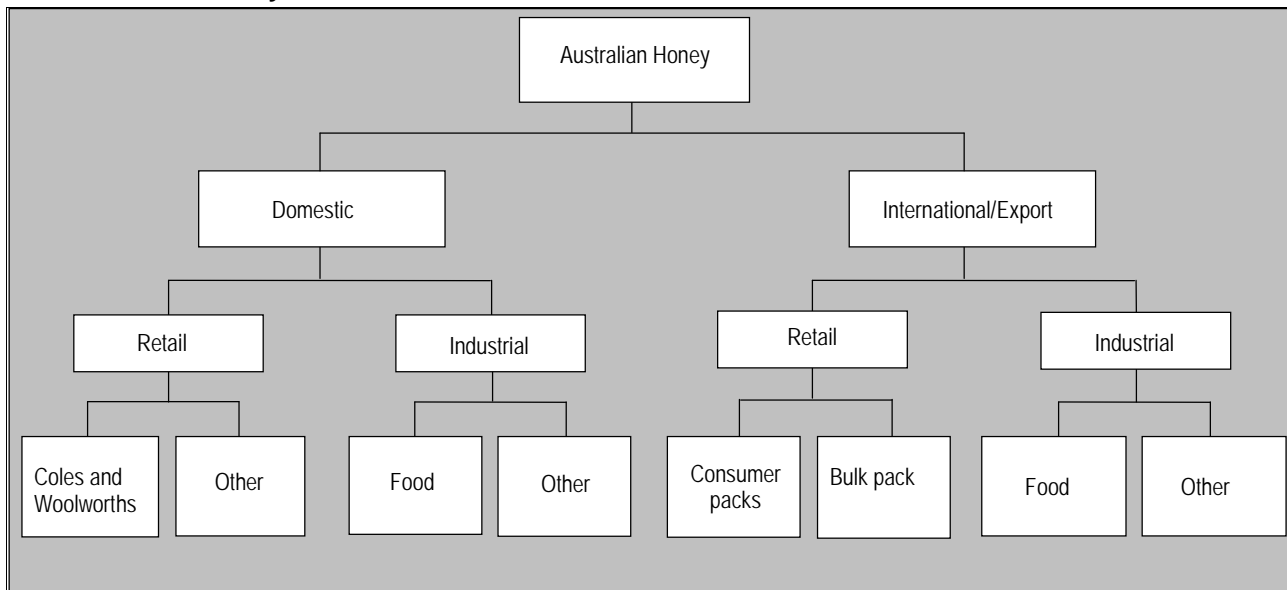
- focus should be placed on Australia's premium quality and taste in order to develop niche markets;
- education activities should inform consumers of the different tastes within Australia and their various uses; and
- further promotion of honey should be undertaken in other market uses, such as therapeutic or medicinal uses.

This chapter provides an overview of the market for Australian honey, and analysis of the various methods the honey industry could undertake to generate growth. This includes gaining a greater share of the spread market, promoting honey in alternative uses, expanding the international market, and selling honey in the industrial market.

What is the 'honey market'?

The honey market can be broadly classified into two categories - domestic and international. These can be further categorised into retail and industrial, and within these sectors further broken down into sub-categories such as food or medicinal/therapeutic. Chart 4.1 outlines the market for Australian honey.

4.1 Australian honey market



Honey is both a consumer good and an industrial good. Consumer goods are those bought by final consumers for personal consumption, and in the case of honey, buyers purchase the product with a minimum of comparison and buying effort (when compared to other products such as clothing). Industrial goods are those bought by individuals and organisations for further processing. Honey is used in both the production of food (for example, cereals) and non-food products (for example, shampoo).

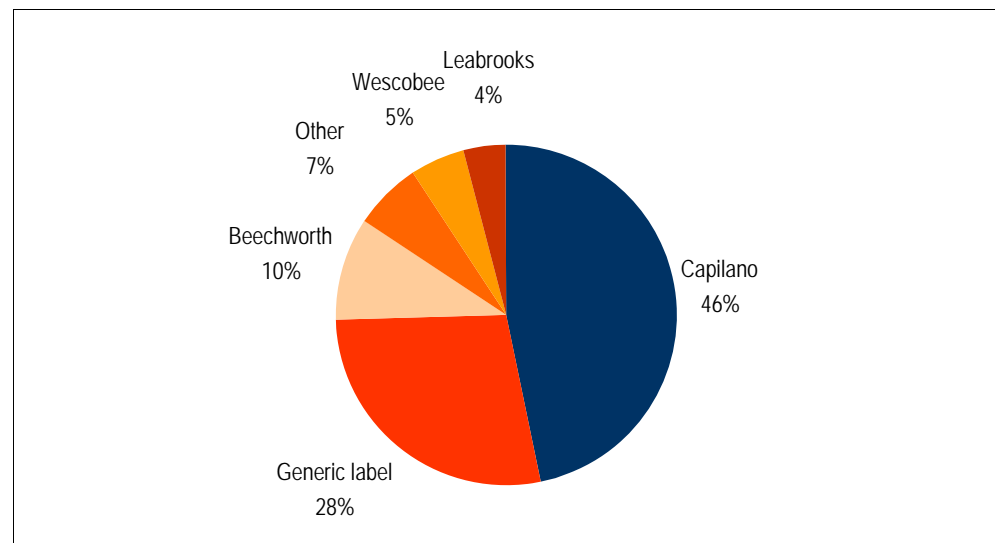
Consumer market

Honey is consumed through retail outlets, through more informal channels (for example agricultural shows and local fairs) and as a gifts (for example hobby farmers providing excess supply to friends and family). This section concentrates on honey sold through retail outlets only. However industry consultations suggest honey sourced through other means makes up a significant portion of honey consumption within Australia and some industry sources have suggested this might be as high as 20 per cent of total honey sales.

Domestic consumer market

The domestic consumer market is serviced by four primary packers and marketers (Capilano, Beechworth, Leabrooks, and Westcobe), a large number of small honey producers selling direct to the public, and generic brands sold by Coles and Woolworths. There is a small amount of imported honey sold on the shelf through the Woolworths generic 'home' brand. Chart 4.2 shows the market share for each marketer and packer.

4.2 Market share for marketers and packers in Australia, 2004^a



^a As at June 2004.

Data source: Capilano Honey Ltd.

The biggest marketer and packer in Australia is Capilano, which makes up approximately 70 per cent of all honey sales through their various branded products and also through the supply of honey to the generic labels.

The primary distribution channel for branded products is through Coles and Woolworths, which make up around 80 per cent of the retail market. According to retailers, the amount of space allocated to a branded honey product on the supermarket shelves is determined by the:

- historical or projected volume of honey
- size of the range
- profitability opportunities
- marketing support program
- other strategic reasons.

Although it is not absolutely necessary for a honey producer to undertake promotional activities, according to retailers it is very much the normal practice for most products on the shelf. This is because the supermarket environment is brand competitive and most brands competing against honey pro-actively develop promotional programs in conjunction with retailers to drive additional sales volumes.

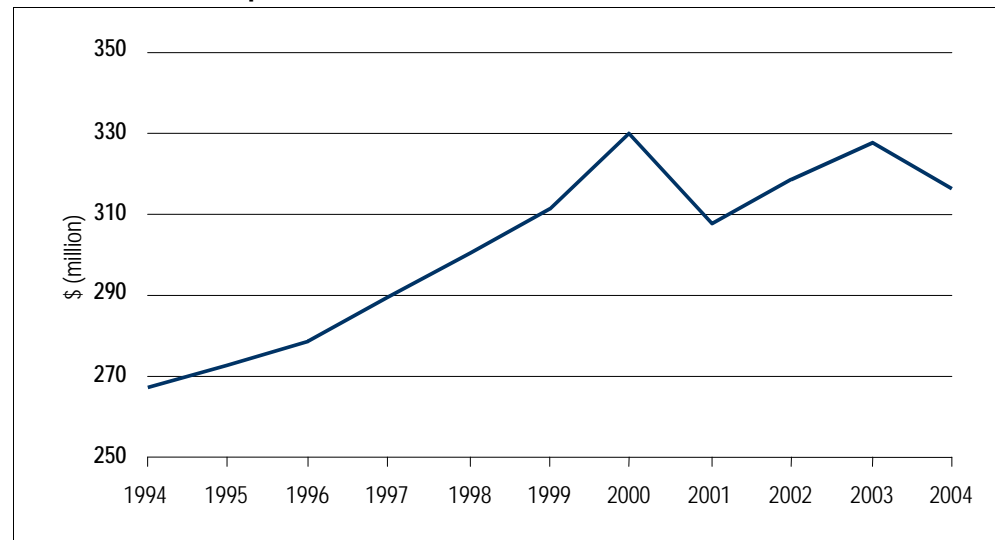
The spreads market

The value of honey is determined in part by the value of the spreads market. The total value of the spreads market has been increasing over the

last ten years. Between 1994 and 2000 the amount of money spent on spreads by retailers increased by about 22 per cent (adjusted for inflation) (see chart 4.3). Since 2000 the market has become relatively volatile, shifting between \$310 and \$330 million.

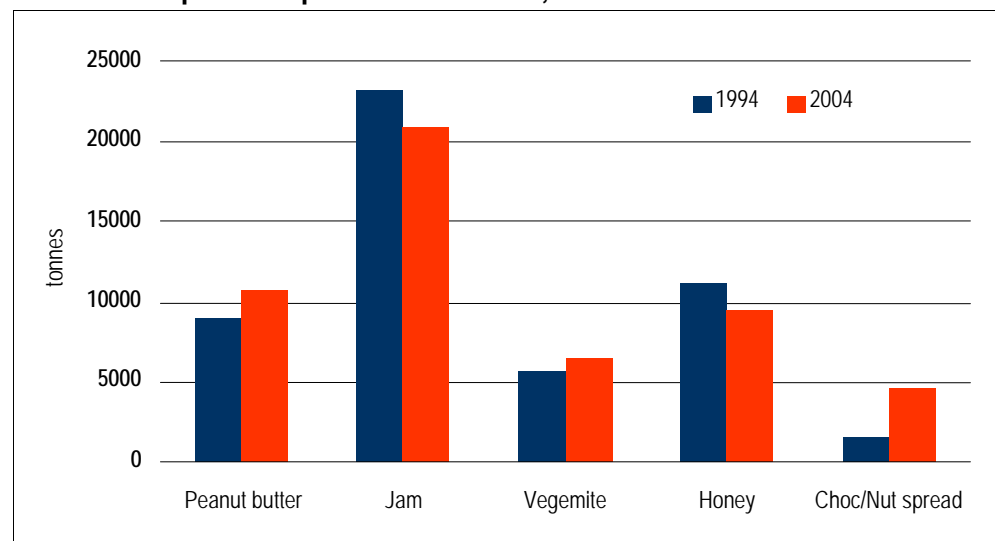
Although the total value of spreads has increased, the total consumption of spreads between 1994 and 2004 has only increased by around 3 per cent, from 50.5 million kilograms to approximately 52.1 million kilograms. This was comprised of a slight increase in consumption of peanut butter and Vegemite™, relatively large increases in chocolate/nut spreads, and declines in jam and honey (see chart 4.4).

4.3 Value of the spreads market in Australia^a



^a Adjusted for inflation (at 1994 prices).
Data source: Capilano Honey Ltd, RBA.

4.4 Consumption of spreads in Australia, 1994 and 2004



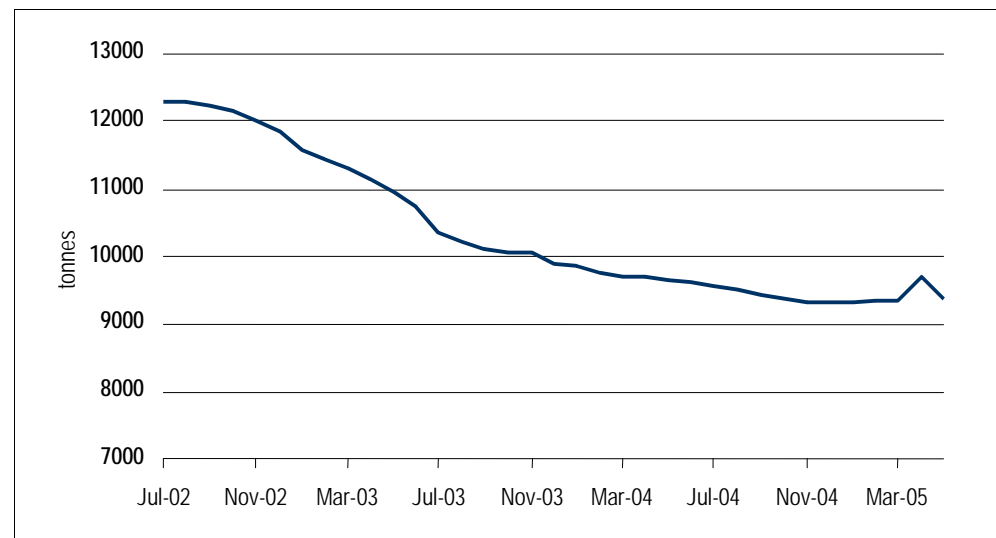
Data source: Capilano Honey Ltd.

However, the consumption and value of honey has followed a different path to the total spreads market. Although the consumption of honey was relatively stable between 1994 and 2001 with an average annual increase of approximately 1.3 per cent, it has declined by approximately 24 per cent within the last three years (chart 4.5). Industry consultations suggest some of this may be due to the increase in the consumption of chocolate/nut spreads.

Even though consumption of honey has declined, it has still managed to grow in terms of value, averaging an annual growth rate of around 5.6 per cent since 1994 (adjusted for inflation) (see chart 4.6). As a result, its market share in terms of total value has increased from 16 per cent in 1994 to around 22 per cent in 2004 (chart 4.7). This has been at the expense of peanut butter and jams, whose market shares decreased by approximately 3 and 10 per cent respectively.

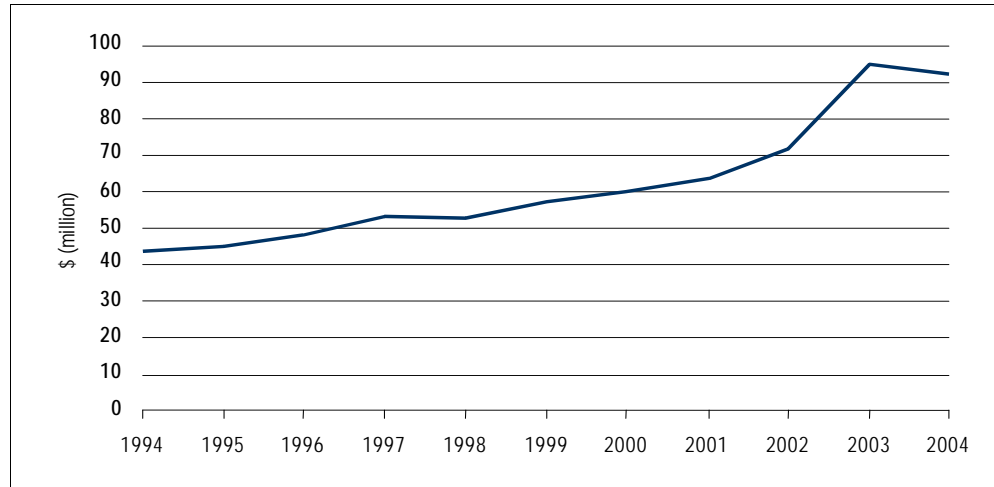
The combination of increased value and reduced consumption was generated by the relatively large increases in retail honey prices. Honey has experienced the highest average annual price change since 1994 at around 10.6 per cent compared to all other spreads which range between 1 per cent for chocolate/nut spreads and 3.1 per cent for Vegemite™ (chart 4.8). The majority of the price rise has occurred in the last four years, increasing by around 74 per cent due to a combination of short supply from Australian producers and high prices on the export market.

4.5 Total retail consumption of honey in Australia, 2002 to 2005^a



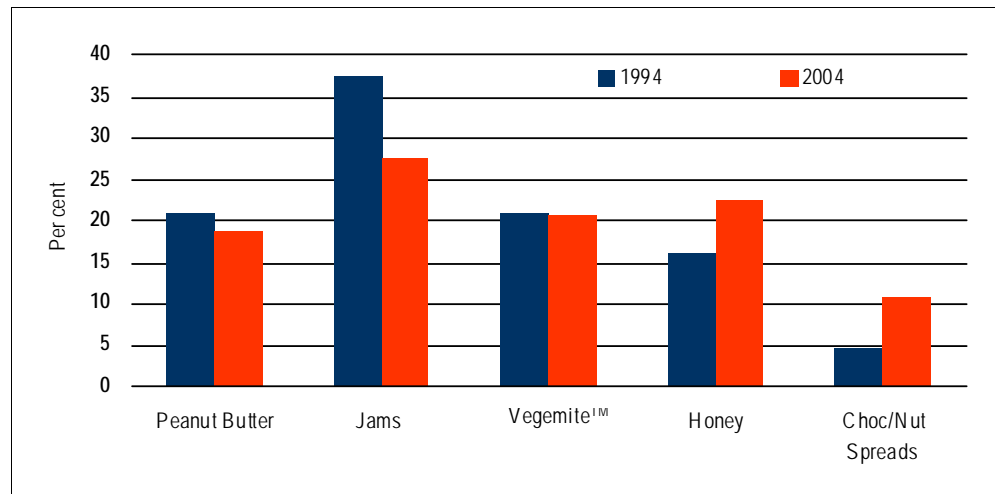
^a July 2002 to May 2005.

Data source: Capilano Honey Ltd.

4.6 Value of honey consumed in Australia^a

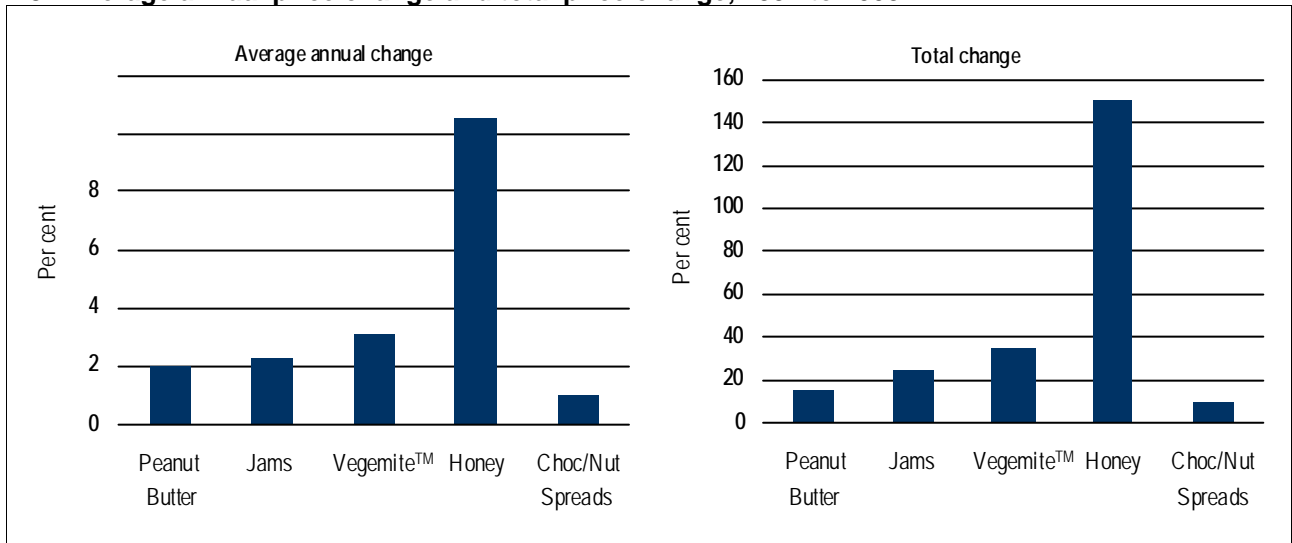
^a Excludes industrial use
Data source: Capilano Honey Ltd.

4.7 Market share of spreads, 1994 and 2004



^a In terms of value
Data source: Capilano Honey Ltd.

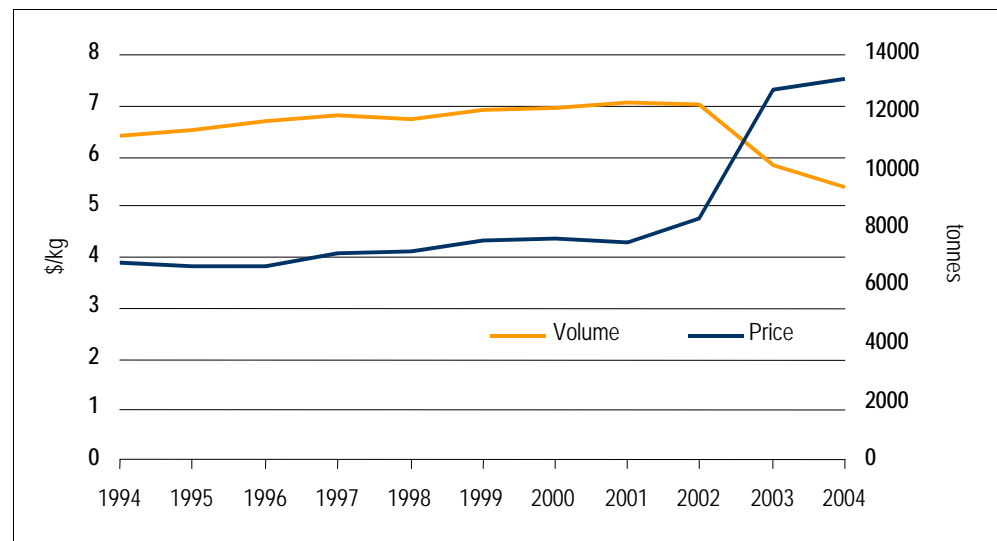
4.8 Average annual price change and total price change, 1994 to 2005^a



^a July 1994 to June 2005.
Data source: Capilano Honey Ltd.

The combination of a large increase in price and a subsequent reduction in the consumption of honey in Australia suggests honey is relatively elastic at these high prices, which means an increase in price will cause a proportional decrease in honey consumed (chart 4.9). This is because spreads represent a close substitute and a relatively large increase in the price of honey induces consumers to switch to those products. This is in contrast to the period between 1994 and 2001 where both volume and price were rising, suggesting honey was inelastic and a small change in price would not have had a significant effect on levels of consumption.

4.9 Average retail price and consumption of honey^a



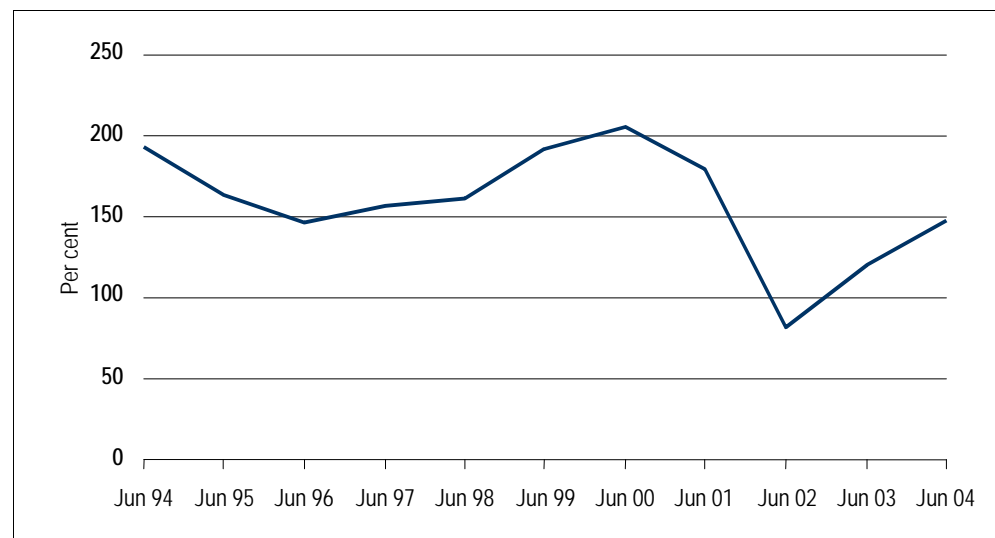
^a Adjusted for inflation (at 1994 prices).
Data source: Capilano Honey Ltd.

However caution must be exercised when drawing associations between the price of honey and the reduction in consumption as other factors may also have impacted on the total consumption of honey. For example in 2003 there was a distinct taste change in some brands due to the use of Argentina honey in the domestic market. Industry consultations suggest the taste of Argentina honey was disliked by Australian consumers, which may have either caused consumers to switch to honey brands where 100 per cent Australian honey was still being used, or switch to alternative spreads which would have reduced the total consumption of honey.

Throughout the workshops a number of honey producers noted that they were not receiving a good domestic price compared to the price sold on the retail shelf. It was said this was due to downward price pressure being exerted by retailers on packers and marketers, the import of cheap honey into the Australian market, and the subsequent downward price pressure placed on producers by some packers and marketers within the industry.

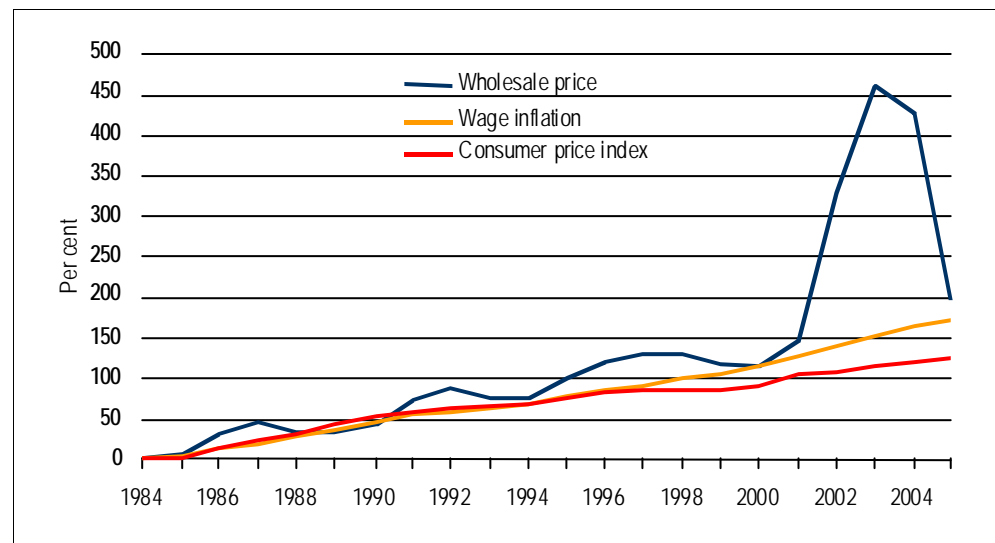
Although the last ten years have seen a highly volatile price differential between the retail price and wholesale price, in 2000 the price differential dropped dramatically from a peak of around 206 per cent to its lowest level of around 83 per cent in 2002 (chart 4.10). This was primarily due to the relatively large increase in the wholesale price of honey during this period (chart 4.11).

4.10 Difference between average retail price and wholesale price



Data source: Capilano Honey Ltd.

4.11 Cumulative change in wholesale price compared to inflation^a



^a Consumer Price Index (CPI) and Average Weekly Ordinary Time Earnings (AWOTE)

Data source: Capilano Honey Ltd.

A decrease in the price differential suggests that in the last five years honey producers have been receiving a greater proportion of the retail price compared to what they received throughout the 1990s. The primary reason for this has been the ability of producers to sell into the international market at relatively high prices, which has provided them with greater market power. Furthermore, short supply of Australian honey in the domestic market pushed up wholesale prices and packers and marketers were unable to pass the entire increase in cost on to the retail shelf as honey still had to compete with spreads.

However, this trend may not continue as the difference between the retail and wholesale price is starting to increase. This is due to a combination of sticky retail prices and low international and domestic wholesale prices. Industry consultations suggest low domestic prices are the result of an oversupply of Australian honey as some producers are switching supply from exports back into the domestic market where brand loyalty and consumer preferences traditionally provide Australian producers with a premium over world prices. Whether the trend continues will depend on the extent retail prices come down in line with the reduced wholesale price.

How can the industry increase its domestic retail market share?

To increase growth in the value of honey within the consumer market and ensure any market share is not threatened by cheap imports entering Australia in the future, the honey industry needs to:

- gain a greater share of the spreads market;
- differentiate Australian honey from cheap imports; and
- create demand for honey through other uses.

However this is a challenging task. To plan an effective strategy the industry first needs to investigate its market and its competitors by investing money into data collection. Furthermore, the industry must continue to invest in this information to constantly compare its products, prices, channels of distribution and promotion with those of other spreads. This will ensure the honey industry knows its competitors' strategies and what their reaction may be to certain marketing activities.

Any marketing plan developed by the honey industry must incorporate all aspects of the relationship between the honeybee industry and the public. This includes the following.

- Advertising, which is any paid form of non-personal presentation that is used to inform consumers about honey or persuade consumers that honey offers the best value for money. It can also be used to compare Australian honey directly with substitute products (either imported honey or spreads) and ensure honey is at the forefront of consumers' minds.
- Sales promotion, which consists of short term incentives to encourage consumers to purchase Australian honey (for example taste testing, price discounts, displays, and contests).
- Good public relations, which involves building good relations with the industry's various public contacts by obtaining favourable publicity with the media, building up an industry image, and dealing with unfavourable rumours, stories or events. Major public relation tools include press relations, product publicity, industry communications, lobbying, and counselling.

Gaining a greater share of the spread market

Gaining a greater share of the spread market may be achieved through competing with alternative spreads on two fronts. This includes:

- price, where the honey industry offers lower prices in order to take market share from the spreads market; and
- quality, where the honey industry generates a consumer perception that honey is 'better for you'.

The capacity for the industry to reduce prices is limited. This is because the pricing structure used by retailers takes away some of the ability for honey packers and marketers to set prices, which means the retailers are responsible for determining the selling price of all the products they sell. The price is calculated based on a profit margin added to the cost of goods and a price that will deliver a projected profit.

Although discounting is allowed, it is tightly controlled by the retailers. If a supplier wants to change the sell price temporarily, they have the option to do so through a promotional program. However, any difference in the normal retailer price and the discount price is usually made up by the supplier. If a supplier wants to change the price permanently, they have to reduce the retailer's cost of goods sold.

Price discounting may not lead to a greater market share or an increase in the value of honey sold. This is because a price reduction may induce a reaction from the other spread producers, leading to a price war that may only succeed in reducing prices and total market value.

The only plausible avenue for the honey industry to compete with other spreads is through the health qualities of honey. Therefore the industry must focus on the natural aspects of the product and educate the consumer that honey is the healthy alternative. This could be done through nutritional comparisons (which is currently being done by Capilano), which would provide the consumer with the justification for buying honey even though it is relatively more expensive than other spreads.

However, the domestic market for Australian honey is a mature market and Australians are already very high consumers of honey per head relative to other countries. This means it will require a lot of investment to squeeze any additional demand out of customers beyond a slight increase in consumption back to pre 2001 levels.

Furthermore, the industry must take into consideration that the value from gaining greater market share of the spreads market will ultimately be determined by the size of the spreads market. Although the total size of the spread market is dependent on a number of factors, the primary influence is the demand for complement products (for example, bread). This means the total size and value of the spreads market is beyond the control of the honey industry and therefore limits its ability to generate additional growth.

Differentiating Australian honey from cheap imports

The amount of imported honey normally sold on Australian shelves has been relatively small compared to the total sales of Australian honey. Consultation with retailers suggest this is because Australian consumers prefer Australian food products. Australian consumers have already developed a taste for Australian honey.

However, consumers are always willing to try new products and retailers are always willing to sell products that provide greater margins. Therefore the Australian honey industry is under constant threat from cheap imports. As the Australian honey industry cannot compete with China and Argentina on price (due to their relatively low labour costs), it must differentiate Australian honey in a way that these countries would find hard to copy.

Therefore the industry needs to focus on developing brand recognition for Australian honey in terms of quality. Consumers assess quality of honey in terms of:

- taste of the product compared to their expectations (consistency); and
- capacity of the consumer to transfer and store the product (packaging).

Other considerations in a purchase decision may be, at least for some:

- immediate and long term risk associated with contamination of honey; and
- impact on the environment when producing the product.

The success of the Australian honey industry will depend on the industry recognising what is important to the consumer and then ensuring that it is the superior provider of these benefits. Each of the above quality characteristics needs to be addressed and communicated to the consumer in order to generate a recognised and trusted product that will command a price premium and establish entry barriers for cheap imported honey.

Although the B-Qual label is currently being used as an independently developed and audited food safety program, it does not go far enough in differentiating the quality of Australian honey compared to imports. The only way this will be successful in the long term is through the development of industry recognised standards that are independently assessed and audited across the entire supply chain. These need to be tied in with other programs the industry is developing such as education and environmental management systems (EMS). The industry needs to invest

and develop quality procedures that are world's best practice right across the honey supply chain.

If suppliers meet these industry standards, then they should be granted the right to place a label on their packaging that states they have met the requirements. The industry can then promote the quality of Australian honey as consumers will have confidence that the product being promoted will be better quality than imported honey.

Creating demand for honey through other uses

Creating demand for honey through the promotion of other final consumer uses for honey around the home (rather than just as a spread) provides the industry with a large array of markets. It also has the advantage of diversifying risk associated with a decrease in demand for spreads.

There are two alternative primary uses that are currently being promoted within the industry. These are:

- food product other than just a breakfast spread; and
- medicinal product to be used for its antibacterial and anti-inflammatory purposes.

Wider consumer uses

In order for the industry to change the use of honey, it needs to educate the public on what types of foods honey is best suited to, and how to maximise the different flavours of honey. This can be done through recipe ideas, face to face promotional activities (such as taste tests in supermarkets and in busy public areas), promotion from signature chefs on the use of honey within their restaurants, or by running competitions that generate public interest. For example, to promote the use of honey in cooking and the many different flavours that can be used, the National Honey Board in the United States has just started running a competition called 'Show me the honey'. This has been designed to showcase the many different flavours honey can offer and the versatility of honey in culinary applications, with celebrity chefs competing against one another by developing a three course honey-enhanced menu using different honey varieties.

Currently Capilano is promoting other uses for its honey. This includes its use as a substitute for sugar in cooking, and as a separate flavour base for stirfrys, sauces and marinades. This has been achieved through joint promotional campaigns with Coles Supermarkets, where Coles meal ideas

are used to advertise the Capilano honey brand by suggesting its use in free recipes.

Medicinal uses

As a medicinal product, honey is currently being used orally and as a treatment for wounds, burns and ulcers. Currently there are a number of alternatives on the consumer market for medicinal honey. These range from Medihoney (produced by Capilano and registered in 1999), to smaller independent suppliers. There is no competition from major importers (except from New Zealand) as other countries have yet to find suitable flora that has the same type of properties.

Four aspects of honey's composition provide its antibacterial activity. These include the low water content which inhibits microbial growth, low pH, hydrogen peroxide forming when honey is diluted with water by the action of the enzyme glucose oxidase, and a number of other uncharacterised compounds that contribute to anti-microbial activity.

Although most raw honeys have anti-microbial properties due to the production of hydrogen peroxide, jelly bush honey is favoured for its medicinal purposes as it has some as yet undiscovered property that provides extra anti-microbial activity. In 1997 jelly bush honey became the first and only honey registered as a therapeutic agent, which was made possible through research undertaken primarily by RIRDC and Capilano. It comes from *Leptospermum* species, a native plant with small waxy flowers. However of 85 *Leptospermum* species in Australia, only one has so far been found to give the honey the extra anti-microbial activity.

According to Shona Blair of the University of Sydney, the advantages of high activity jelly bush honey is that it not only stops the microbial process, but it stimulates the healing process, which is in contrast to conventional topical anti-microbial agents. Furthermore there has been no evidence to show that organisms will develop a resistance to honey, which is also in contrast to some antibiotics.

However, Shona Blair noted that even though the honey might come from jelly bush, it is still not guaranteed that it has a high level of activity, as the process of extraction can affect the level of anti-microbial activity. Consequently there may be a number of products currently on the Australian market which claim to have the healing qualities provided by jelly bush but are actually low in anti-microbial activity. Furthermore, some honeys may be contaminated as they are not required to be independently tested before being sold on the market.

Another issue with the use of honey as a therapeutic product is the perception of health carers (such as doctors and nurses) that honey does not provide the benefits claimed. This may be due to a number of factors including the overall belief that natural products do not work, fear of litigation if the health carer tries an alternative therapy, and lack of education on the healing properties of medicinal honey.

The opportunity for the honey industry to further expand the use of honey as a therapeutic good will depend on:

- the ability of the industry to generate trust for medicinal honey within the health care market and public;
- overcoming negative perceptions in the medical industry;
- educating the public and health care sector about the superior healing properties;
- appropriate labelling and testing to ensure the quality of the product is consistent across the industry; and
- the ability of the industry to source suitable flora on a large scale basis.

Industry consultations suggest raw jelly bush honey commands a very high premium compared to the price of normal honey. However there are special processes that need to be undertaken within the supply chain that drive up costs. For instance, no antibiotics can be used in hives, and the honey must be extracted and processed at low temperatures (less than 45°C). Furthermore, special quality systems must be implemented to ensure the product is clean and contains a high level of activity. Despite this, there is a good possibility for producers to expand into this area. Jelly bush grows in a number of places across Australia and grows quickly, maturing at between two and three years old. This may provide the industry with the capacity to expand production if promotional efforts currently being undertaken on the domestic market and internationally induce a greater demand. Further investigation into the properties that create active honey should be undertaken as not all jelly bush trees will be appropriate for generating this type of honey.

The ageing population and the increased amount spent on health care, with over a billion dollars spent on wounds alone in Australia, provides a large opportunity for the industry to promote the use of honey as a therapeutic product. Due to its unique properties and the inability of large scale honey producers in other countries to produce this type of honey, Australian producers will be able to command a high price premium. Continual promotion of the product's healing capabilities compared to conventional medicines within large, high income markets such as Europe and North

America provides the industry with the opportunity to diversify its farm income and tap into a potentially huge health care market.

International consumer market

The overall demand for honey around the world is fairly stable, as most markets are relatively mature. Anecdotal evidence suggests there are some countries increasing their demand for honey (including China), mainly due to rising income levels. This represents an opportunity for Australian companies to compete in established and growing markets (based on the unique qualities of Australian honey), and provides a consumer base that is a lot bigger than the domestic market.

The largest consumer of honey is the United States, and even though they are the second biggest producer of honey, they are the third largest importer. This is primarily due to their decreasing supply of honey over the last ten years, driven by the incursion of the varroa mite destroying nearly two thirds of their colonies. Therefore this market may represent the most profitable over the short to medium term. However, the strength of the honey market already established within the US may mean an initial investment to gain a foothold in the market could be expensive and risky to the small to medium packer and marketer. Furthermore, although the market share for retail consumption has increased from 40 to 44 per cent between 2001 and 2004, the volume of honey sold in grocery stores has fallen by approximately 21 per cent (NHB 2005). Although the National Honey Board notes that this may be a statistical anomaly due to changing buying patterns away from grocery stores, evidence suggests honey sales in grocery stores have been dropping and shelf space is shrinking.

Alternatively, China was mentioned in the workshops as a potential large growth market in the medium to long term due to its rapid increase in income and the large number of middle to high income people within the country. Consumption of honey in China has been steadily rising since 1997, increasing from approximately 34 000 tonnes to around 53 000 in 2003, or an average annual increase of around 10 per cent (Access Asia 2005). However, this high growth rate is expected to decrease, with consumption forecast to be around 68 000 tonnes by 2008, or an average annual growth rate of around five per cent (Access Asia 2005).

Any increase in demand due to an increase in income in China will depend on honey's income elasticity, which is defined as the proportional change in quantity demanded resulting from a proportional change in consumer income. Although an increase in income may increase demand for honey,

the strength of the relationship between income and honey may not be strong. This is because demand for Australian honey will also depend on China's acceptance of honey derived from eucalypts, which may be problematic considering the taste of Chinese honey is very different from that of Australian honey.

Furthermore, China is currently the world's largest net exporter of honey which provides the country with the capacity to sell cheap honey within its own market and utilise established distribution networks. Although the Chinese have been tainted by contamination issues in the last five years, government legislation and demand from international markets have forced Chinese honey producers to start cleaning up their product in order to retain their competitiveness against foreign products. This will provide local producers with an ability to compete against the traditionally clean honey.

Deciding on which international market a producer should invest in is a challenging task. The demand for Australian honey in the export market is strongly influenced by cultural, socio-economic, personal, and psychological characteristics. Determining the right export market must take these environmental and personal characteristics into account. For example, it was noted by Capilano that Australian honey in France does not represent a large growth potential because the French do not like eucalypt tasting honey nor the PET bottles that are used.

Gaining access to new markets

There are two ways a marketer and packer can obtain access to a new international market. These include developing:

- relationships with an offshore representative
- an on the ground presence within the country.

There are a number of options available to the honey packer and marketer when exporting, and choice should be based on the representation that best suits the needs of the individual. Offshore representation can be achieved through four broad channels, including the following.

- Agent, which seeks out potential customers for the product but does not take ownership of the goods. An agent can be paid a salary, retainer, a commission, or a combination of all three.
- Distributor, which directly receives prepacked goods from the packer and marketer by taking ownership and then directly distributing the product throughout their established network.

- Importer, which takes ownership of the good for resale to other companies within the distribution chain.
- Joint venture arrangement, which could be informal or formal and is usually established with like minded firms who can best serve the packers' and marketers' interests in the local market.

Developing relationships with offshore representatives and establishing a product within a new country requires a large investment. The packer and marketer needs a product plan, brand plan, and marketing plan, along with a large amount of research to determine consumer tastes. Furthermore, if the packer and marketer use a distributor, they need to pay listing fees and undertake continual promotion in order to compete with the established honey packers and marketers. Even if a distributor is found, the product might only last approximately three months on the shelf if it does not sell. These represent significant sunk costs to a small packer and marketer, and therefore could be considered a high risk venture.

Creating an 'on the ground' presence is the second alternative. There are three broad strategies that a packer and marketer can use, each with different levels of risk, legal obligation, advantages and disadvantages. These include:

- joint venture, where an Australian packer and marketer joins a domestic company in the target market to form a new incorporated company which shares in the management and net profits;
- merger/acquisition. A merger occurs when an Australian company merges with an existing company in the target market and creates a new entity, whereas an acquisition involves the exporting company taking over a domestic company in the target market; and
- greenfields site, where the packer and marketer establishes a new packing operation within the target market.

The advantages and disadvantages of each of these options are presented in table 4.12.

4.12 Advantages and disadvantages of alternative 'on the ground' export strategies

	Advantages	Disadvantages
Joint venture	<ul style="list-style-type: none"> ▪ Acquire competencies or skills not available in-house ▪ When market needs to be penetrated quickly, for example. When competitive entry is imminent or technological change is very rapid ▪ Spread the risk of a large project over more than one firm ▪ Enable faster entry and payback ▪ Often forced into JV by government regulation or pressure ▪ Avoid tariff barriers and satisfy local content requirements 	<ul style="list-style-type: none"> ▪ Partners do not have full control of management ▪ May be impossible to recover capital invested ▪ Disagreement on new export markets ▪ Partners may have different views on expected benefits
Merger and acquisition	<ul style="list-style-type: none"> ▪ Decreased time to access and penetrate target market as the existing company already has a product line to be exploited and a distribution network ▪ Prevents an increase in the number of competitors in the market ▪ Overcome entry barriers including restrictions on skills, technology, materials supply and patents. 	<ul style="list-style-type: none"> ▪ Increased risk — may be a large financial commitment but faces political and market risks ▪ Poor or slow post-merger integration ▪ Target too large or too small ▪ Overly optimistic appraisal of synergies ▪ Overestimation of market potential ▪ Inadequate due diligence ▪ Incompatible corporate cultures
Greenfields site	<ul style="list-style-type: none"> ▪ Reduce or eliminate price escalation caused by transport costs, customs, duties, etc ▪ Guarantee availability of goods to resellers, minimising potential conflicts over allocation decisions and eliminating delays ▪ Ensure more uniform quality ▪ Adapt products for local requirements 	<ul style="list-style-type: none"> ▪ Slower entry mode ▪ Increased risk exposure with the resource commitment on the scale usually required ▪ Political risks — repatriation of profits etc. ▪ Potential problem if there are country of origin issues — negative impact if manufactured in a low wage country

Source: Austrade (2005).

Consultation with industry suggests it is very difficult for a new packer and marketer to establish themselves within an international market, either through a representative or on the ground presence. This is because distribution channels are very hard to acquire, requiring many trips overseas to establish relationships and develop trust. Furthermore, the packer and marketer needs to demonstrate that it can guarantee a consistent product for the full 12 months, year on year. This may be difficult for a small to medium size packer, especially considering the restrictions currently in place on access to native forests.

To mitigate some of this risk and to help packers and marketers develop an export capacity, the Australian government provides support through

Austrade and export grants. Austrade can help the packer and marketer by providing information on prices and market structure, in-market support such as making appointments, obtaining documents, attracting publicity through media channels, referrals to local experts, and introductions to networks and established contacts within the country. Through the New Exporter Development Program (NEDP) Austrade and TradeStart offer a package of free export services designed to assist small and medium sized enterprises to make their first export sale.

In terms of direct financial support, the Export Market Development Grant (EMDG) is the Australian Government's principal financial assistance program for new and current exporters. The purpose of this grant is to encourage small and medium sized Australian businesses to develop export markets through the reimbursement of up to 50 per cent of expenses incurred on eligible export promotional activities (less the first \$15 000). Furthermore the Export Finance and Insurance Corporation (EFIC) assists Australian companies exporting and investing overseas by providing medium to long term finance and insurance services.

Although the risks in exporting are high, so too are the rewards. Instead of trying to squeeze out additional demand from a mature and saturated domestic market, AHBIC should seriously consider investing in market information to investigate the potential for supplying high growth markets that can utilise the unique tastes and quality aspects of Australian honey. This could then be shared amongst industry members who are considering exporting their product, thereby reducing costs that would have otherwise have been incurred by suppliers individually gathering this information.

Industrial market

Honey use in the industrial market represents all those products that have used honey as an input into production. This includes food processors, baking and snack operations, confectionery, dairy, alcoholic and non-alcoholic beverages, meat, poultry, and seafood applications, and non-food items such as health and beauty care products.

Although industrial honey consumption accounted for approximately 25 per cent of total demand in Australia, industry consultations suggest this demand may be decreasing. This is also supported by a recent survey from the US National Honey Board which shows between 2001 and 2004, market share for honey in the industrial sector decreased from 46 per cent to 41 per cent (NHB 2005a).

Rather than trading in individual packages for honey, the industrial market trades in bulk. This is usually achieved through moving honey in large 200 litre drums. A number of industry participants have noted that the future of the honey market is not in the industrial bulk market but in the pre-package retail market due to the relatively low price for international bulk honey compared to pre-package retail prices.

There may be two primary reasons for this. Firstly, although honey used in the production of food items still needs to meet quality assurance requirements, the taste may be less important as it is often masked by other flavours within the product. Therefore it is much harder to compete in terms of taste. This provides an avenue for large-scale honey producers such as China and Argentina to sell lower quality honey (in terms of taste) on the bulk market. Secondly, the use of honey in non-food items does not require strict quality assurance procedures, and therefore low cost honey producers who do not meet international standards for consumable honey are able to sell their honey into the bulk market.

The Australian honey industry should focus on honey markets that pay a premium for taste and quality, rather than selling into bulk markets where competition is primarily based on price. This will ensure any investment into marketing and promotion will be used in its most efficient and effective manner. There has been a gradual trend away from bulk honey exports towards final product export sales and this needs to continue and accelerate.

Promotion

It was noted in the packers and marketers workshop that generic advertising should be used to promote honey. Generic promotion by any industry should be addressed with extreme caution. To fund this, AHBIC has proposed a mandatory levy on domestic and imported honey to encourage consumers to buy honey in favour of other competing spreads and condiments (AHBIC 2004, p. 16). The levy is meant to correct for market failure in the honey industry, where some small to medium sized packers and marketers and new entrants are not paying the current voluntary levy but are still reaping the benefits promotion provides.

Although a statutory levy might reduce this type of free rider problem, it also presents other problems. If a packer and marketer can generate greater sales by promoting its branded product but is required to contribute to a statutory levy, then it does not maximise its return on investment. This means the packer and marketer does not have an incentive to contribute,

and imposing a statutory levy is actually imposing restrictions on the business operations and its capacity to maximise returns to its owners.

The reason why the free rider problem currently exists with the voluntary levy is because consumers cannot differentiate between honey producers who have contributed and those who have not. Therefore, there is not a strong incentive for producers to contribute because they know they will receive the same benefits regardless.

It is understood that the industry has now dropped the idea of a mandatory levy and generic honey promotion.

Pooled pricing

During consultations with beekeepers some concerns were raised about the pricing policies adopted by some packers and marketers and in particular a concern that some honey was being sold on the export bulk market 'at a loss'.

Packers and marketers use slightly different pricing systems but most often, prices paid to beekeeper suppliers are based on an average or pooled price for a particular grade where the pooled price is based on returns from the different market segments. Any honey produced under the pooled pricing system that is surplus to retail and industrial market segments in domestic and international markets, will be sold on commodity bulk markets. Honey sold through this channel will be subject to international influences with little control over the price return. International demand and exchange rate movements will affect the price received through this market segment.

Some packers base the price to suppliers on their forecasts of returns from different market segments where the forecasts are updated usually on a monthly basis. Other packers may pay suppliers on the basis of sales returns.

For high quality honey, such as yellow box, where supplies are limited, and the honey is sold in retail packs on the domestic market at high prices, there is generally little pooling involved. General light honey as a high grade honey, may be sold in retail packs on the domestic market and on certain export markets, and may also have other uses. Here, prices paid to producers are based on an average price, or on the pooled returns across all sales for this grade of honey in the various end uses. Where supplies are surplus to retail and industrial market segments in domestic and

international markets, the surplus may have to be sold on commodity bulk export markets.

Similarly for the lower grade dark honey. Here the price paid to suppliers is an average price from pooled returns across all market segments including retail and industrial uses. Some low grade honey has an undesirable taste and needs to be blended with other honey. This type of honey receives a much lower price.

Packers frequently refer to an 'oversupply' problem in the industry where the available supply of honey exceeds retail and industrial market segments in domestic and international markets. Individual quotas are applied by some packers to limit the liability to suppliers from whom they are contracted to buy. There is no two price payment system with lower prices for honey surplus to retail and industrial market segments requirements in domestic and international markets.

The more the supply of honey exceeds the requirements for retail and industrial market segments in domestic and international markets, the more the supplies must be sold on lower-paying commodity bulk export markets and the lower the average or pooled price paid to honey suppliers. Since the price paid to suppliers is a forecast average across sales to the various markets, it stands to reason that honey shipped into low priced commodity bulk export markets may be sold at less than the average price paid to suppliers (after adjustments for processing and handling) depending upon the prevailing commodity price.

However, the problem with pooling price systems is that there is an oversupply incentive built in. This is because honey suppliers receive an average price and respond to that price, whereas they should be responding to the marginal price, which is the price received on bulk export markets. It is true that the average or pooled price will gradually decline the greater the volume of honey sold on low priced commodity bulk export markets. But the average price is a very blunt signal.

The solution to this dilemma is not simple. A two price scheme is not really practical unless there is a single desk marketing authority which can price discriminate between markets and behave like a monopolist. If an individual packer attempts to operate a two price scheme, other packers and marketers will have an incentive to move in to secure honey supplies at just above the low price, and sell at just under the high price.

In practice, there are many pooled pricing arrangements operating in agriculture, including in the vegetable, cotton and grains industries and others. Honey is no exception. However, it needs to be recognised that a

pooling system has an in-built mechanism to somewhat 'oversupply'. And some sales to commodity bulk export market segments may be at a 'loss' or less than the average or pooled price paid to suppliers.

Key conclusions

- The industry should consider investing more in market research, both on the domestic front and internationally. This will provide industry participants with the ability to formulate efficient and effective marketing strategies and production schedules based on up to date information on trends forming both at home and abroad. Such research could be funded through RIRDC.
- The recent reduction in honey consumption has been due to the relatively large increase in retail prices compared to other spreads. This has been primarily driven by a short supply of honey on the domestic market due to the drought and producers switching to exports to capture recent price increases. However, the international price of honey has fallen dramatically over the last year, thereby forcing down prices in the domestic wholesale market and creating a surplus of honey.
- Gaining a greater share of the spread market may best be achieved by promoting Australian honey's health attributes. However, the domestic market for Australian honey is a mature market so inducing a large increase in demand will require a lot of investment.
- The industry cannot compete with imported honey on price due to its relatively large operating costs. Therefore Australian honey needs to differentiate itself from imported honey in order to compete. This should be done through developing a high quality product that is backed up by world's best practice quality procedures applied right across the honey supply chain, and labelling honey as 100 per cent Australian honey.
- The industry should promote the use of honey in other areas of cooking.
- The industry should investigate the possibility of increasing supply of jelly bush honey (for example through farming these types of trees) and develop promotional programs to drive the demand for medicinal honey in Australia and across the world. These activities should also be aligned with raising the public image of the industry.
- The industry needs to focus on the international pre-package retail market, especially in large markets such as the US, which is finding it hard to meet demand requirements. Small marketers should apply to

the government for direct financial support in order to mitigate some of the high risks associated with exporting.

- Selling to the industrial market is not an area that can provide net benefits from promotion because Australia's competitive advantages (such as unique taste and high quality) are not as highly valued in this market.
- Generic promotion through a mandatory levy is not recommended.

5

Diversification

Throughout the workshops, industry participants noted that the honey industry relies too heavily on the production of honey and should investigate the possibility of diversifying income. This would reduce the exposure of the industry to declines in world honey prices and thereby reduce the risk to profitability.

There are three avenues honey producers can take if they want to diversify their income. These are:

- pollination services
- queen bees and package bees
- other honeybee products.

This chapter outlines these avenues and investigates the viability of the industry undertaking these types of diversifications. It also offers strategies for the honeybee industry to develop and capture greater value in these markets.

Pollination

The Australian honeybee industry has a great story to tell as it provides enormous value to the production of crops. Estimates suggest honeybee pollination provides value within the economy of around \$1.7 billion per year. If honeybee pollination were suddenly to stop (as might be the case with a disease outbreak), growers of honeybee dependent crops and pastures would suffer and the Australian consumer would find themselves without access to many of the major fruits, vegetables and some crops and pastures (Gordon and Davis 2003).

Pollination represents a big opportunity for beekeepers to diversify their income. This is because of the large value honeybees provides to growers, the increase in demand for horticultural goods in Australia, and the reduction in available natural pollination services due to large scale monoculture.

However, workshop participants suggested the industry is finding it difficult to capture most of this value for a number of reasons. These include inadequate:

- pricing – some part-time pollinators are not properly costing their pollination services and are therefore discounting their prices;
- quality - some pollinators do not have the skills required to maximise the benefits of pollination to growers, and growers cannot differentiate between those beekeepers who do have the skills and those who do not; and
- education - growers do not recognise the value pollination can provide to the quality and volume of their crop.

Issues and strategies to correct them are presented below. Furthermore, this section investigates the issues associated with meeting the large expected demand for pollination from the almond industry.

Pricing

Pollinators, whether part-time or full-time, have the capacity to charge any price they think is reasonable. The problem is, what is a reasonable price? Every pollination service is different depending on the type and location of crop, and the pollinator will be required to take into consideration factors such as the risk of contamination from pesticides and insecticides being used in the local area. These are difficult concepts to measure and even more difficult to price. Therefore, it is expected that some pollination services will exhibit a range of prices from different service providers.

Ultimately, the price a pollinator can receive for services provided will depend on a number of factors, including:

- cost to provide the service
- quality of the service and value provided to the grower
- competition within the market.

Just because pollinators can correctly price the true cost of service does not mean they can command a profit. If there are other pollinators in the area who are also willing to provide the service, then competition may drive down prices. The only way a pollinator can command a higher price over their competitors is if he or she can demonstrate their service is better quality and will provide greater value to the grower.

However, the industry can make pricing decisions more uniform by educating beekeepers on the risks involved in pollinating, the benefits

provided to the grower, and techniques to calculate a price that provides a return commensurate with the expected risks of pollination. This should be done through formal educational programs established by the industry and should tie in with the industry's push for the development of a standardised nationally recognised educational program.

Quality

The difference in quality of pollination services is the biggest issue facing the industry. Without the ability of growers to differentiate between good and bad pollinators, those who have invested time and effort increasing their hive strength and developing their knowledge of pollination will not be able to signal to the grower their service is superior, other than by a long period of association with the grower. Therefore they will have difficulty in commanding a premium.

To help improve quality, the New South Wales Department of Primary Industries (DPI) has already developed best practice guidelines for honeybee pollination services and a number of pollination guidelines that relate to specific crops. Although these guidelines may help the beekeeper, they do not allow the grower to differentiate between quality because there is no formal recognition that the beekeeper has actually read the guidelines.

Therefore the industry needs to develop pollination competency standards and education programs that will enable beekeepers to meet these standards. If there is a large difference in pollinating specific crops, the educational programs should be developed to specifically target those areas that require specialised skills (for example almond pollination). Beekeepers then have the option of reaching these standards so they can show growers they have been independently assessed on their capabilities in providing a quality pollination service. This will introduce transparency within the pollination market and enable growers to choose pollinators based on quality and price.

The industry needs to move towards making the pollination sector a professional service. Developing competency standards and ensuring pollinators meet these standards before a pollination service backed by the industry can be offered will increase consistency within the market and reduce the risk faced by growers when employing new pollinators. Furthermore, pollinators who have obtained the standards should be subjected to independent audits to ensure the quality attached to the competency standards is not eroded by individual pollinators who do not provide a high quality service.

Education

Currently the perceived value of good pollination services to growers is diminished due to the inconsistency of quality. This is because some pollinators have a lack of understanding in stocking for specific crops and in hive strength, which introduces a risk to the grower. Consequently, growers are not prepared to pay for a service that cannot be directly measured.

Introducing pollination competency standards and education programs will go some way to reducing this risk. However, to maximise value to the grower and pollinator, the industry needs to educate the grower on the benefits pollination services provide, especially for those crops where honeybee pollination is not essential for crop development. This should be undertaken through continual research into the benefits at an individual crop level, and promoted through advertisements and articles placed in agricultural journals.

The almond industry

Australia is the largest commercial producer of almonds in the Southern Hemisphere with a farm gate value of around \$85 million per year (PIRSA 2005). Annual growth is expected to continue at around 13 per cent (ANIC 2005). However, Australian almond production only makes up around 5 per cent of the world's almond production, with around 70 per cent of production concentrated in California.

The primary area that produces almonds in Australia is in South Australia (60 per cent) and the Riverina area in Northern Victoria. This is due to the favourable climatic and topographical conditions.

The production of almonds is 100 per cent dependent on honeybees, and stocking rates are dependent on the maturity of the orchard and the strength of the honeybee colonies used. The demand for honeybee hives is expected to increase by at least as much as the annual growth in the industry.

However, although there will be sufficient numbers of hives to service this market, some of these hives will have to be sourced from New South Wales which will require beekeepers travelling long distances. Therefore beekeepers have the capability to provide an adequate pollination service (Somerville 2005) or may not be interested in supplying this market.

According to Somerville (2005), there are three major impediments facing the industry in capitalising on the expected demand for pollination services from the almond industry. These include:

- management modifications by the beekeeper during autumn and winter;
- profitability of providing the service; and
- conditions imposed on cross border movements and inspection of hives.

The industry needs to address these impediments in order to maximise its capabilities and command a premium on its services. The industry should immediately develop and implement recognised and standardised education programs on pollinating almonds with a certification that can be used by the pollinator to indicate they have undertaken the necessary skills training. This will reduce the risk to the grower of receiving a sub-standard service and therefore enable the pollinator to generate a premium.

Furthermore, the industry needs to ensure that costs from border crossings are minimised. It needs to work with state governments to remove unnecessary conditions on cross border movements and hive inspection. This could be done by demonstrating the minimal risks for accredited pollinators and highlighting the value free movement of honeybee hives will provide to the almond industry and state economies.

Queen bees and package bees

Diversification into commercial queen bee and package bee production for the domestic and international market represents a viable alternative to honey production and could provide the industry with huge opportunities in the long term. However, there are some areas the industry needs to concentrate on to ensure these opportunities are not lost to international competitors.

Queen bees

The queen bee sector is essential for the Australian honeybee industry. However a number of workshop participants noted that the total supply of queen bees within Australia is limited and some queen bee producers are not capable of filling demand at specified times of the year. This puts a severe limitation on the supply of honey as producers cannot maximise their yield, and may restrict the expected increase in supply of hives for pollination services.

Currently there are around 10 major commercial queen bee breeders supplying the Australian market. The small number of commercial queen bee breeders is surprising as the workshops suggested the queen bee breeders were making relatively good profits compared to the rest of the industry. Furthermore, Australia's recent access into the North American markets will provide the industry with a huge opportunity to supply one of the biggest markets in the world. This is because Australia is able to supply the Northern Hemisphere markets with a large number of strong queens at the start of their spring due to our geographical location and relatively long breeding cycle.

Consequently, it is surprising that more beekeepers have not moved into queen bee breeding in order to capitalise on expected high profits and mitigate some of the risks faced by the reduction in world honey prices. Industry consultations suggest there may be three primary reasons why there is a relatively small number of queen bee breeders. These include:

- profits relative to costs and lifestyle may not be attractive
- there are high initial investment costs
- there are no readily accessible education programs.

Although queen bee breeders may earn a greater profit relative to honey producers, the time consuming nature and the inflexible work hours associated with breeding queens suggest profit per unit of cost (for example direct labour cost and the cost of not having enough recreational time) could be low. Although honey producers may not receive a high profit, they are not required to manage the business seven days a week and have some flexibility in work hours. Furthermore, honey's relatively high or prices have, in the last five years, kept beekeepers in the honey producing sector.

Furthermore, becoming a queen bee breeder requires specialist equipment and skills. This means investment in learning how to manage a commercial queen bee breeding enterprise (which has an opportunity cost in the income lost from not producing honey while training), and investment in buying the appropriate equipment and breeding stock. These represent a significant constraint on supply. Although the New South Wales DPI has undertaken a specialist three-day skill-based queen-rearing course, and there are some private courses available, these need to be extended to increase access across Australia and to reduce the cost (both monetary and personal) of individuals undertaking training.

In order to capitalise on the opportunities provided by the recent access to the US market, induce demand for Australian queens, and reduce supply side constraints, the industry needs to:

- invest in improving efficiency in production of queen bees;
- increase access to queen bee breeding educational programs and formalise the recognition of skills within the industry;
- assist potential queen bee breeders in undertaking market research and establishing distribution channels or direct contacts within the United States;
- promote and market the use of Australian queens in the US market and educate the industry on the assistance Austrade provides in establishing new export markets and the direct funding available to small to medium size enterprises under the EMDG;
- continue to develop better breeds of queens through continual support of the Western Australian breeding program and the establishment of an industry owned breeding program and where appropriate importing superior genetic material;
- ensure research findings are disseminated throughout the entire industry; and
- minimise the risk of the introduction of exotic disease into Australia.

Industry consultations suggest there is a general lack of breeding stock within Australia, which limits their ability to capitalise on US access. Although there seems to be a large demand for Australian queens from the US since access was granted, improving and increasing the breeding stock will ensure Australian queen bee breeders can compete with alternative suppliers in the future. In the long term, the success of the queen bee-breeding sector will depend on the quality of Australian queens relative to the rest of the world. This means Australian queens should continue to be bred for their honey-gathering potential, good temperament, high disease resistance, low swarming tendency, and high daily egg-laying rate. However, it also means the industry should continue to invest in minimising any disease risks, as a lapse in quarantine could severely hurt the industry very quickly.

Package bees

The package bee industry developed around the late 1980s primarily to satisfy the Korean market. However, since then the market has expanded to include Canada, the Middle East, Western Europe and most recently the

US. This has been primarily driven by the varroa free status Australian bees enjoy and the capacity for Australian producers to deliver strong colonies at the start of the Northern Hemisphere spring.

Therefore the industry should capitalise on these qualities by assisting beekeepers in establishing export markets and develop distribution channels and direct contacts in the United States. Furthermore the industry should continue to actively promote itself within the United States market through advertisements in National Honey Board journals and other relevant honey industry publications.

Other honeybee products

Royal jelly

Royal jelly is secreted by the hypopharyngeal gland of young worker bees as it is fed to young larvae and the adult queen bee. As royal jelly is not stored by the hive, extraction of royal jelly occurs during queen rearing, when the larvae that are destined to become queens are supplied with royal jelly.

It is mainly the spectacular fertility and long life span of the queen, which is exclusively fed on royal jelly, that suggests royal jelly may produce similar effects in humans (Krell 1996). Although royal jelly contains all of the B vitamins, including high concentrations of vitamin B5 and B6, scientific investigation into the health-promoting properties of royal jelly in humans has been limited to its ability to lower blood cholesterol levels. Test tube studies suggest royal jelly may have some cancer-preventive properties while animal studies have found that royal jelly has some cholesterol lowering, immune stimulating, anti-inflammatory, and wound healing properties. Despite the number of positive publications, these studies have not been able to determine the mechanisms of royal jelly's activity and there is still no serious scientific evidence on the clinical effects of royal jelly.

Royal jelly can be sold in its fresh state, unprocessed (frozen or cooled), mixed with other products, or freeze dried for use in other preparations. However, for large scale industrial use, royal jelly is usually freeze dried as it is easier to handle and store.

Although there are no official statistics, industry sources suggest the largest market for royal jelly is in Asia, specifically Korea, Japan and Taiwan. Australia also has a relatively large royal jelly market, which mainly supplies Asian tourists or Asian communities within Australia.

Royal jelly is often sold and consumed in its unprocessed, natural state because it does not require any special technology and it appeals to consumers as an unaltered, natural product. However it has many other uses, including as:

- a dietary supplement;
- an ingredient in food products, such as honey or yoghurt;
- an ingredient in medicine like products, for either stimulatory effects or specific health problems; and
- an ingredient in cosmetics, mainly for skin refreshing and rejuvenation.

The Asian and Australia markets are supplied by a large number of distributors, including many from Australia who utilise the quality reputation the Australian honey industry has built over the years. However, although labelled 'Made in Australia', industry sources have suggested that all of the royal jelly used in these products use Chinese royal jelly because it is much cheaper, selling at around US\$40 per kilogram rather than US\$1000 per kilogram (as required from Australian producers). Furthermore, it has been noted that the largest Asian markets (Korea, Japan, and Taiwan) do not trust product that comes from China, so changing the label to 'Australian Made' gets around this problem. However, those distributors who undertake this practice suggest the 'Made in Australia' refers to the quality testing that is undergone before it is shipped back to Asia, and not the actual royal jelly used in the product.

The labelling of royal jelly as 'Made in Australia' when in fact the jelly came from China presents a serious risk to the Australian honeybee industry as contamination of these products may destroy the international reputation of the industry. This issue is further discussed in chapter nine.

Australia's capacity for royal jelly production

The production of royal jelly is highly labour intensive compared to the production of other honey products. Therefore a comparative advantage lies with those countries who have relatively low labour costs and can therefore produce the product at a relatively low cost. This is the primary reason why China is the biggest producer of royal jelly in the world. This stops Australian producers from competing on a cost/price basis unless the process can be mechanised to deliver similar production levels at the same costs as the Chinese product.

The fact that the properties of royal jelly have not yet been scientifically proven, and the lax labelling laws that are currently in place regarding the

'Made in Australia' label, limits Australia's capacity to compete on a quality basis. Although Australian honey is able to compete on the world market through its unique taste, royal jelly's taste is not very pleasant, which could actually enhance its image as a 'medicine'.

Furthermore, there is a high risk that Argentina may move into the royal jelly market, thereby further driving down prices and limiting Australia's capacity to compete. Although Argentina is a large producer of honey, the amount of royal jelly sold on the international market is minimal. This too may be due to non-competitive costs in production compared to China.

However, if therapeutic and other beneficial properties of royal jelly can be established scientifically, and Australian producers can differentiate their product from Chinese royal jelly in terms of positive benefits, then the potential for Australian royal jelly production would be enormous. Furthermore, it would provide an enormous opportunity for the product to be expanded in the North American and European markets, where high incomes may enable the purchase of this product even with the high labour costs associated with its production.

Propolis

Propolis is a resinous material collected by the honeybee from plants. It is used by worker bees to line the inside of nest cavities and all brood combs, repair combs, seal small cracks in the hive, and reduce the size of hive entrances. It also reduces the chance of infection due to its antibacterial and antifungal effects. The colour, odour and medicinal characteristics of propolis depend on the types of plants accessed by the worker bees.

The antibacterial, antiviral, and antifungal properties of propolis have had positive scientific evidence to substantiate claims made by the promoters of propolis, although the effects are dependent on the correct concentrations. Nevertheless, propolis is used in a wide variety of applications, including:

- cosmetics – for its effects on tissue regeneration and rejuvenation;
- medicine – for treatment of cardiovascular and respiratory infections, dental care, dermatology (including wound healing), cancer treatment, immune system support, digestive infections, liver protection and others; and
- as a preservative in food, although there is evidence that some compounds found in propolis can be damaging to human health.

The largest market for propolis is in Japan, followed by Korea and then Taiwan. Industry sources suggest the market for propolis is around a

quarter of the size of the royal jelly market in Asia. These markets are supplied by a number of Asian and Australian companies who distribute cheap Chinese propolis.

The market for raw material and secondary products containing propolis may continue to grow as medical and cosmetic manufacturers find alternative uses for the product. However, there are no standard quality control mechanisms in place, which may present a barrier for further development of the market (Krell 1996).

Australia's capacity for propolis production

There are very few, if any, producers of propolis in Australia. The basic requirements for extraction by hand do not require a large investment in capital, although choice of solvent used for extraction is very important if the propolis is intended to be used for human consumption and proper storage requires refrigeration. However it still does not represent a commercial opportunity when compared to the low cost producers of China. Industry consultation suggests that propolis production could be well suited to the Australian honey producer if moves to mechanise and automate the process of extraction are successful.

Any exports of propolis from Australia would be best suited to the Asian market as producers could leverage off the high quality image to access a large, well established market. This is where propolis has already gained wide spread acceptance. However, there have been a number of cases where people have had allergic reactions to propolis, mainly in the form of contact dermatitis. This may limit the ability of propolis to gain further acceptance across Asia and therefore limit potential growth in the demand for propolis unless it can be assured that it does not present a significant risk to consumers.

Conducting further research to find differences in the antibacterial, antiviral, and antifungal properties of Australian propolis when compared to cheap Chinese propolis may provide an opportunity for Australian producers to charge a premium. This may justify the relatively high costs associated with propolis production. However, it is essential that labelling laws are able to ensure imported propolis is not permitted to be re-exported as an Australian product in order to retain any premium.

Pollen

Pollen is primarily used by consumers for its nutritional value, either as a supplementary food or as medicine. While comparable in protein and mineral content with beef and beans, pollen averages more than ten times the thiamine and riboflavin or several times the niacin content (Krell 1996).

However, pollen from each plant species is different with different health benefits. Also it is usually mixed with nectar or regurgitated honey from the hind legs of the honeybee. Therefore the variation of compounds within pollen can be large.

Quality control of pollen is difficult as there are no reliable tests that have been developed to test contamination within pollen. The major risk is the contamination of pollen by pesticide use. Therefore to ensure the quality of the product is fit for consumption the buyer must be confident that the producer has taken all the necessary precautions.

Industry consultations suggest the largest markets for pollen are in Korea, Japan, and Taiwan, although these represent a relatively small market compared to royal jelly and propolis.

Australia's capacity for pollen production

Australia already produces pollen in a number of states. The collection of pollen does not require large investments in capital so the opportunity for the honey producer to diversify into this line of production is available. However industry consultations suggest the largest barrier to expanding pollen production is processing as most companies require it to be cleaned and dried before it is purchased. Another barrier recognised by the industry was developing reliable distribution channels.

Bee venom

Bee venom is a very specialised area of the honeybee industry and it requires specialised equipment and very clean extraction facilities. Currently there are no commercial producers of bee venom in Australia. Industry sources suggest that due to the small size of the international bee venom market, the high initial investment costs and the high labour costs compared to the larger honey-producing countries such as China, make the possibility of diversifying into this section of the industry very unattractive.

Key conclusions

- The industry should focus on developing a professional pollination service that provides consistent quality across all types of crops. This should be done through:
 - educating beekeepers on the risks involved with pollination, the benefits provided to the grower, and techniques that can be used to properly price their service to generate a return commensurate with the risks;
 - ensuring that quality is standardised across the industry and that growers can recognise those pollinators who can meet industry endorsed competency standards; and
 - continuing to invest in research on the benefits pollination provides to the grower, and advertise and promote these benefits across horticultural and agricultural industries.
- Remove supply side constraints to the queen bee sector by continuing to undertake research into improving productivity, increasing access to research outcomes, and by encouraging more beekeepers to take up queen bee production.
- Expand current research into improving the genetic stock of queen bees within Australia.
- Promote and market Australian queen bee and package bees in the US market to capitalise on recent access arrangements, the varroa free status of the bees and Australia's ability to supply at the start of the Northern Hemisphere spring.
- Educate the industry on the support Austrade provides in setting up new export markets and the direct funding available to small to medium size enterprises under the EMDG program.
- Assuming China continues to produce royal jelly, propolis, or bee venom at a lower cost than Australia, beekeepers should not invest in producing these products until they can differentiate their product in terms of the benefits these products can provide over cheap Chinese imports.

6

The industry resource base

This chapter² and the next on environmental issues are closely linked. This chapter examines resource supply issues, highlights the gradual erosion of access to native flora on public lands and develops the possible responses the industry could adopt. Issues relating to the adoption of a systematic approach to key environmental issues through an EMS-like framework are considered in the next chapter.

Honey production in Australia is migratory, with some hives being moved up to 10 times per year. This is due to the high variability of budding, flowering, pollen and nectar yields associated with most plants accessed by apiarists. Therefore, most beekeepers will search for the most amiable areas in order to maximise production.

Recently, increased concerns about vehicular access to hives and the equivocal empirical data about the impact of introduced honeybees on ecological processes have led various state governments to place restrictions on access to public land. For example, Queensland and Northern Territory have a policy of denying beekeepers access to national parks. As the commercial beekeeping industry is migratory, beekeepers require access to a number of areas within the year. Restricting the ability to source flowering plants will result in limited production and reduced viability of the industry. This is one of the most important issues facing the commercial beekeeping industry.

However, there are other threats to the floral resources accessed by beekeepers:

- land clearing for agriculture;
- forestry activities that remove flowering trees;
- replacement of felled trees with pine and low pollen yielding eucalypt plantations;
- fire, including back burning and natural bushfires;

² The substantial contribution of Doug Somerville, Apiary Officer, New South Wales Agriculture is gratefully acknowledged.

- reduction in vehicle access to potentially high yielding apiary sites;
- salinity affecting the health of the available flora;
- droughts which reduce flowering and interrupt growth cycles;
- control of weed species that provide pollen and nectar for honeybees;
- urban sprawl, which reduces mature vegetation and limits the size of apiary sites due to safety concerns; and
- access to native flora on private lands because of a perception by some landholders that honeybees are harmful to the ecosystem.

Flora resources

The future success of the honeybee industry hinges on the continued access to areas which contain flora that produce nectar and pollen. This includes both private and public land. However, at least 50 per cent of beekeeping activities are undertaken on public land that is controlled by state governments. This exposes the honeybee industry to risks associated with changing land management policies and practices, and outright exclusion from some national parks in some cases.

Each state has its own set of floral species that essentially supports honey production (box 6.1).

The dominant group of floral species of major importance to the Australian beekeeping industry is the eucalypts. This genus does not, as a rule, flower annually in Australia. Flowering events can be two to four years apart and, in some cases, up to 10 years. The stimulus for flowering regularity is thought to be rainfall, stimulating growth and bud initiation. Some species initiate buds 24 months prior to flowering, whereas other species may initiate buds and flower within three months. Soil fertility, tree maturity and the general health of the tree will contribute to the flowering behaviour of this genus.

Agricultural crops and weeds tend to have an annual flowering cycle, but their reliability is also not guaranteed. The germination of weeds or area grown to canola is very much dependent on rainfall at critical periods of the year to initiate germination and growth. Suitable weather at the time of flowering for all species will influence nectar secretion and the flight activity of honeybees. Leatherwood in Tasmania flowers every year, from Christmas through to the end of autumn. Yields are not consistent, but the major constraint is considered to be weather related.

6.1 Floral species supporting honey production by state

New South Wales: Paterson's curse (*Echium plantagineum*) is the dominant species, providing on average 20 per cent of that state's honey crop. The Eucalyptus genus is the most important group of plants, combined with closely related species, contributes 67 per cent of the total honey crop of New South Wales. The box and ironbark eucalypt bark types account for 55 per cent of the total eucalypt and related species group.

The next single most important species after Paterson's curse is Yellow box (*Eucalyptus melliodora*). The genus *Corymbia*, originally part of the eucalyptus genus, is a significant group of plants of importance, providing both nectar and pollen. Of the top 51 identified most important species in New South Wales, 33 were eucalypts, 3 corymbias, 5 other native shrubs and trees including Angophora, Banksia, Dillwynia, Lophostemon, and Melaleuca.

Introduced 'weeds' include *Arctotheca calendula* (Capeweed), *Centaurea solstitialis* (St Barnaby's thistle), *Echium plantagineum* and *Echium vulgare* (Paterson's curse and Viper's bugloss), *Hypochoeris radicata* (Flatweed), *Onopordum acanthium* (Scotch thistle), and *Rapistrum rugosum* (turnip weed). Agricultural crops of importance for honey and pollen include *Brassica napus* (Canola), *Medicago sativa* (Lucerne), and *Trifolium repens* (White clover). There are many hundreds of other species of local importance.

Victoria: At least 75 per cent of the Victorian honey crop is derived from Eucalyptus species. There is also a significant use of floral resources within the Riverina region of New South Wales by Victoria-based beekeepers.

Of the 20 most important nectar species, 13 are eucalypts, 3 are agricultural species (clover, canola, white clover), 2 are shrubs (banksia and tea tree), and 2 are agricultural weeds (Paterson's curse and Wild turnip). Of the 20 most important pollen producing species, Capeweed is listed as the most important, with 9 eucalypt species, 3 agricultural species (clover, canola, white clover), 5 shrubs or small trees (banksia, wattle, shrubs, tea tree, desert banksia), and 3 agricultural weeds (capeweed, wild turnip, Paterson's curse). Other weed species mentioned of significant importance, but not in the top 20, were Flatweed and Onion weed.

Queensland: Large areas of Yapunyah (Napunyah in New South Wales) throughout the channel country of south west QLD attract many large scale commercial beekeepers from New South Wales. This tree was stated by New South Wales beekeepers as being one of the most important species for honey production, yet only 10 per cent of its distribution is in New South Wales.

Many plants have been identified as being important for bees. Of the top 20 nectar plants, 13 were eucalypts, 2 corymbia's, 2 native trees (brush box, paperbark tea tree), 2 agricultural species (clover, sunflowers), and 1 agricultural weed (carpet weed). Of the eucalypt species 9 (70 per cent) were ironbark or box bark types, which traditionally are poor sources of pollen. In these circumstances, bees must have access to a reliable source of pollen.

The top 20 pollen plants included 8 eucalypts, 2 corymbia's, 5 shrubs or small trees, 2 agricultural species (clover, sunflower), and 3 weed species (flatweed, blue heliotrope, turnip weed).

South Australia: The Eucalypt genus continues to be the dominant genus within SA, as it does for all mainland states. Of the top 32 species, 20 were native species, 4 agricultural species, and 8 introduced weeds. Of the native species 15 were eucalypts, 2 tea trees (Melaleucas), desert banksia (*Banksia ornata*), desert styphelia (*Styphelia exarrhena*) and *Leucopogon parviflorus*. Of the 4 agricultural species only lucerne is a major producer of honey, with canola, clover and citrus producing about 20 per cent of the lucerne honey crop equivalent. Salvation Jane (*Echium plantagineum*) is one of the major sources of honey in SA, with the majority of the remaining weeds providing a major contribution through pollen used by a honeybee colony to stimulate colony population expansion prior to an anticipated major nectar flow on another species.

Western Australia: The dominant species of major importance to beekeeping include 12 species of eucalypts, numerous coastal heath species which tend to flower at similar times, including banksias, 2 weed species including Capeweed and Paterson's curse, plus the agricultural crop, Canola. Of the eucalypt species, Jarrah, Marri, Karri, and the gold fields mallees are considered of most importance.

Tasmania: Tasmania is unique within the Australian beekeeping industry, not relying on Eucalypts or *Echium* species for the basis of their industry, but rather leatherwood (*Eucryphia lucida* and *Eucryphia milliganii*) which provides approximately 70 per cent of that state's honey production. The other 30 per cent is derived from clover (*Trifolium repens*), blue gum (*Eucalyptus globulus*), historically, blackberry (*Rubus fruticosus*) and other minor species.

Source: Doug Somerville, pers.comm. 27 June 2005.

Overview of flora trends on public lands

All states have experienced increasing areas of public lands transferred into various state conservation reserves, such as national parks or nature reserves or wilderness areas. Conservation reserves have been progressively increasing and now take up a little over 5 per cent of Australia's land area. Public lands accessible for harvesting of native timber have declined as increased areas have been reserved for nature conservation, the most recent decline arising from the Australian Government-State Governments' Regional Forest Agreements (RFA). The current 4.8 per cent of land for harvesting of native timbers is increasingly based on private plantation and farm forestry production systems (NLWRA 2002). Within this increasing protectionist framework, managed honeybees are seen by some to be a land management activity which is no longer appropriate without a thorough understanding of the interactions between introduced honeybees and ecological processes. Some ecologists and conservationists have taken the position that as managed honeybees are exotic insects they have no place in any conservation reserve at any time. In 2001 the Scientific Committee of New South Wales made a preliminary determination to support a proposal to list competition from feral honeybees as a key threatening process under the New South Wales *Threatened Species Conservation Act 1996*. The New South Wales National Parks and Wildlife Service supported this proposal and is in the process of preparing a threat abatement plan (Benecke 2003).

In all states there are various levels of pressure for the removal of managed honeybees from conservation reserves, with various levels of success. In many cases, beekeepers at local levels have not objected, or their objections at local management levels have not been agreed to. In some circumstances beekeepers have been able to place apiaries on other alternate sites, but often these are not as reliable as the nectar and pollen source lost. In recent years, Tasmanian beekeepers were able to negotiate continued access to leatherwood sites, even though they were now within 'Wilderness' classified land management. New South Wales Apiarists Association has negotiated no further loss of sites within national parks in New South Wales.

Similar outcomes were achieved in Victoria and South Australia. An example is the desert banksia country in the Little and Big Desert National Parks.

Queensland Parks and Wildlife Service (QPWS) believes the introduction and keeping of introduced fauna in conservation reserves is contrary to the management principles of all categories of conservation reserves. Hence,

beekeeping activities are not permitted in national parks other than as part of a phase-out process after declaration of the national park (Queensland Department of Primary Industries and Fisheries 2005). A recent government decision is to exclude bees from the long term traditional apiary sites in south-east Queensland's newly created national parks by 2024. This will reduce access by an estimated 3000 sites.

Of all the floral species considered of importance to commercial beekeeping interests within Australia, many are primarily only found in conserved areas, for example, desert banksia, leatherwood. Thus, the continued pressure by the beekeeping industry to maintain access to such sites is understandable and justifiable for the survival of the industry.

State managed forests for timber harvesting have been traditionally major floral resources in most states. The relationship between timber harvesting and the honeybee industry has been a sweet and sour one. Invariably, access to many floral resources would not be possible without an all-weather road access provided for log removal. Old log dumps on the side of access roads offer excellent locations for the placement of commercial apiaries. Many areas of state forests have been transferred to various conservation reserve systems such as national parks in the last 15 years. Generally, state forest management and policy is sympathetic to commercial beekeeping activities.

The RFA process was very protracted and followed comprehensive regional assessments. The final RFAs have not all been to the benefit of beekeepers even though the aims of beekeeping and government in wanting to preserve forest areas of national significance have been in the same direction. In the east Gippsland region for example, the areas of forest reserved under the RFA were generally remote and inaccessible while other forest areas mostly used by beekeepers were subject to clear felling (Benecke 2003).

As a floral resource, river red gum forests along the major inland river systems have lost favour in recent decades. This species remains one of the most important in Australia, but its decline as a floral resource has been noticeable. The possible reasons for this may include rising salinity, lack of flooding, artificial flooding out of season and insect attack.

Other public lands include Crown Land, Water Board, Rural Lands Protection Board (travelling stock reserves), Crown leases, and road reserves. These lands can be valuable to individual beekeeping businesses, although decisions affecting commercial beekeeping access are frequently conducted at local management level. This has noticeably been influenced

in the last 10 years by the public discussions on beekeeping access to national parks.

Pressures from development affecting water and air quality have been suggested as influencing the reliability of mangrove trees to yield nectar in some coastal regions.

Overview of trends on private lands

Beekeeping on private land has been most significant in all mainland states, Tasmania being the exception. For instance, in New South Wales, of the 23 479 sites used by beekeepers over a five year period, 13 981 or 60 per cent were on private property (Somerville 1999).

There is a recurring theme over many years of a concern about land clearing and loss of access to flora. During the first half of the 1990s, the annual rate of land clearing of native vegetation in Australia was nearly 400 000 hectares a year, mostly on private land (CIE 1999). Although wholesale land clearing has slowed due to both government legislation and public pressure, it still continues at a level that impacts negatively on available floral species for honeybees.

During the 1970s there was considerable clearing of prime yellow box trees in rural areas within the eastern states. Yellow box is possibly the most important eucalypt to commercial beekeeping interests in Australia. This clearing was driven by tax incentives, which have since been eliminated. Many areas of box, ironbark and mallee have been removed. This continues to some extent in most states. These floral species are slow to regenerate and, if allowed to do so, may significantly contribute to honey production.

The general landscape across temperate rural Australia is that of ageing and dying mature eucalypt trees. There are comparatively small areas of active regeneration. There continues to be a gradual reduction in the resources available to beekeepers. Many woodlands on private property have been abandoned by beekeepers due to the demise in the health of the vegetation. The reasons are speculative but most include issues such as dieback, influence of stock camps, fertiliser use, rising water tables and salinity.

Firewood gathering places major pressure on the fallen and then standing timber under private ownership around major population centres. In the eastern states where the box and ironbark eucalypts are regarded as the most valuable eucalypt bark type groups for honey production, they are also the species favoured as a firewood source of choice. Approximately a

third of the houses in Canberra have been estimated to be heated by firewood. This places an enormous burden on a floral resource that is not readily regenerating and is generally a slow growing group of species, as compared to softwoods and gums, those species most favoured in plantation forestry.

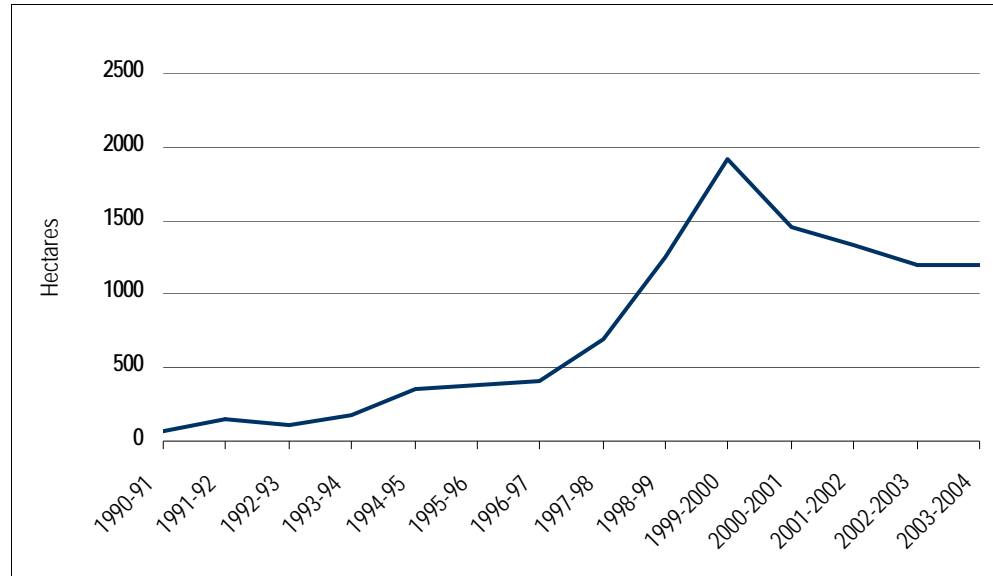
Weed management continues to become more sophisticated with ever increasing use of herbicides and minimum tillage practices. Biological control has had a major impact on the availability and reliability of at least two honey plants – blackberry in Tasmania and nodding thistle in New South Wales. There is a concerted effort to release further biological control agents targeting Paterson’s curse, arguably Australia’s most important single floral species for beekeepers. Biological control agents have also been released for a number of thistle species that are useful nectar and pollen sources.

Land management issues, particularly relating to agriculture, have meant increasing pressure on floral resource availability. Crop headlands are often sprayed out with a broad-spectrum herbicide. These areas would normally harbour useful flowering weed species of value to honeybees. With increasing financial pressures on farmers, pasture grazing rotations are tighter. This increased grazing pressure frequently means the reduction in flowering of pasture species such as clover. Lucerne and clover are major floral resources for honeybees. Traditionally, paddocks of these species were left to flower and eventually cut for hay. With mounting pressure to maximise productivity, most farmers tend to cut pasture at 10 per cent flowering for fodder conservation. Thus, there is limited scope to regard these fields as a significant beekeeping resource.

Changing crop areas

A number of agricultural species have changed their status in relation to their value to commercial honeybee interests over the last four decades. Canola has increased its importance as an early spring flowering resource providing useful breeding conditions, due to the abundance of pollen and nectar. Honeybee colonies are usually expanding, so have not reached their population peaks at the time of flowering. Also, the weather in September when flowering occurs is often unreliable, restricting the flight of field bees. Even so, canola has become a major rotation crop throughout the wheat growing regions, proving to be a valuable floral resource in early spring (chart 6.2).

6.2 Canola areas in Australia have increased



Data source: ABARE 2005.

White clover has been identified as a useful bee plant worldwide. It has a wide distribution across temperate Australia, yet it is only a reliable producer of nectar under limited conditions. These are usually found on the tablelands or coastal areas in summer whenever suitable conditions prevail. The increased grazing pressure in many circumstances, and the influence of drought, have seen a decline in the value of this plant to honeybees.

Balansa clover, grown in some higher rainfall cropping areas, has proven to be a prolific yielder of nectar. Unfortunately, it has not become a mainstream fodder species.

The recent expansion in the Australian almond industry has provided a valuable addition to beekeeper cash flow in August. This expansion is set to continue with an increasing demand for hives to pollinate this crop. The tree does not substantially provide any nectar to honeybees but the pollen collected is regarded as nutritious and useful to honeybee colonies.

The areas grown to cotton in Australia have traditionally been no go zones for commercial beekeepers due to the regular use of pesticides. With the possibility of chemical use diminishing due to GMO cotton crops, honeybees may in future derive some benefit from this crop in the form of nectar/honey. This will also benefit the cotton crop by an increase in yield of 16 per cent to 20 per cent. However, there is a risk of consumer concerns over honey derived from GMO cotton crops.

Horticultural areas have generally not been regarded as a major floral resource. Most fruit trees flower in early to mid spring when colonies are in the process of population expansion. Risks of being sprayed are often too great, causing many larger beekeeping operators to steer clear of such areas. The horticultural industry is increasingly becoming more professional and understanding of the need for honeybees, yet the small size of orchards and flight behaviour of bees still puts them at risk. The floral rewards from most horticultural species are not greater than those obtained from other floral species flowering at the same time.

Analysis of factors affecting resource supply

Changing policies on access to public lands

As noted earlier there has been a marked trend in the transfer of lands between public land management agencies, primarily from unallocated crown lands and areas previously used for native forest operations, into agencies with a conservation management goal. In this transfer, land management agencies have generally had a negative view on the perceived impact of honeybees on the ecosystem.

Numerous synopses of the 'relevant' research have covered the subject of honeybees in the Australian environment. Generally the amount of research reviewed is limited, and the conclusions remain equivocal and open-ended. A recent AHBIC paper on managed honeybees in conserved forests has reviewed both sides of the arguments (Moncur 2005). The overall conclusion reached is that the findings of the limited scientific investigations into competition between honeybees and native flora and fauna have been inconclusive. In some instances honeybees have a negative effect while in others they have a neutral or positive effect. But while the research has been equivocal, conservation agencies have used the precautionary principle and desire for only native ecosystems in conservation reserves to justify an exclusion policy. The precautionary principle, in effect, excludes activities for which the empirical evidence is equivocal.

As a result, access to conservation reserves, has been a political compromise between the wishes of conservation reserve managers and beekeepers. This maintains a very tenuous hold by the beekeeping industry on the use of large areas of public lands, creating significant uncertainty within the beekeeping industry as policy detail changes from year to year and between states.

Changing management in conservation reserves

In some states within conservation reserves, a reduction in access and apiary sites is occurring due to the change in management by land agencies. Sites to place apiaries may have arisen due to road diversion, realignment, or old log dumps. But unless maintained they revegetate, restricting access to vehicles. Some sites will be utilised for public amenity as picnic sites. Minor access roads used in forestry operations are being allowed to regenerate, removing access. There is also a requirement to adhere to a greater number of stipulations when using conserved areas, such as holding public liability insurance or placing hives further away from the road or public access sites.

Policies affecting access to private lands

Access to forest resources on private land primarily depends on the availability of sites in or next to suitable floral species, and the resident attitude of the private landowners. Both these have changed in recent decades. Land clearing, dieback, salinity, etc., have reduced the number of suitable locations where the vegetation may be deemed reliable as a source of honey and pollen. Combined with this is the ever-increasing encroachment of rural and urban subdivisions.

The public does not, as a general rule, look favourably on a large mass of bee hives as a comfortable activity with which to be in close proximity. Increasing complaints are received whenever this scenario occurs, most often leading to the removal of the apiary even if the site has been utilised for beekeeping activity in past years.

There have also been cases in recent years whereby the property owner has concerns about the impact of honeybees on the ecological processes of their farm, largely driven by unsubstantiated argument appearing in the literature to which they have access. This view totally undervalues the pollination role honeybees have in the maintenance of clover based pastures, horticulture and some broad acre crops. Some beekeepers are also being asked for a 'green card' for occupational health and safety purposes to protect the farmer against potential litigation.

Land clearing has slowed considerably at a national level, yet it still continues with some floral types such as mallees. This continues to be a concern to beekeepers as this group of plants takes many decades to recover to its full potential, if ever.

Recent policies encouraging the retention of native vegetation on private lands, often under covenant agreements with government agencies, are encouraging, but thus far the areas involved are still relatively minor in size. The replanting of degenerated areas, windbreaks and shelter belts on private property has the potential to be of benefit to beekeepers, but to be significant, the species selected need to be reliable producers of nectar and pollen, which is not the case in most planting projects at this present time. Continued low or nil tolerance by landowners for certain weed species significantly reduces the population of beneficial beekeeping weed species.

Changes in NRM: longer term

Current changes in rural activity and thinking, plus policy changes by government, may provide some opportunities for increasing or conserving the remnant floral resources, primarily eucalypts, on private lands. Revegetation of salinity-affected lands, riparian areas and eroded sites all hold the possibility of adding to the floral resources for the beekeeping industry in the future. This is dependent on the species selection foremost, and the success of the revegetation strategy.

Plantation forestry by and large offers little opportunity for honeybees, as pines are of very little value, and eucalypts are frequently planted in very high densities and harvested before they mature.

Forest plantations with a longer rotation, planted for conservation or land restoration purposes, hold the potential of being a useful resource for the beekeeping industry, as does the continued development of the carbon credits influence on large scale long term tree establishment. But few plantation species are commercial producers of pollen and nectar.

Climate change

The temperate climatic patterns of the world have generally favoured *Apis mellifera* (European honeybees). Beekeeping in tropical and sub-tropical climates is practised, but without the same success as in the temperate zones. Beekeeping in arid areas is also possible, with various management modifications, but becomes extremely dependent on rainfall events with long periods of lean production.

The dominant native flora of Australia is programmed to survive for lengthy periods of minimal water supply, but in so doing during such periods, flowering activity is virtually non-existent. Long term climate change that may have the impact of increasing drought durations and

frequency, will equate to reduced reliability of the floral resources within Australia to regularly and reliably flower. These long term dry periods may also equate to an escalation in fire events, which potentially remove a floral resource for many years until regrowth is mature enough to return to a regular flowering pattern.

Prolonged droughts followed by periodic 'normal seasons' will also see dramatic differences in the total honey crop obtained by the industry from year to year, which will affect the marketability of such a commodity and the regularity of income.

Future industry focus

Identify and target the important native flora

There have been a number of studies conducted across Australia, principally funded by the research levy on honey currently managed by RIRDC. These studies are mainly focussed on the distribution and land tenure of bee sites plus what flora is of primary importance on those sites. In many cases these studies do not quantify the honey production per species, prioritise the species, or differentiate between flora of high value for honey or pollen and nectar. These questions need to be addressed to determine what native floral resources should be targeted when lobbying for continued access to public lands or retention on private lands.

The analysis of bulk honey delivery data to the major honey packing businesses could be one such method of obtaining quantitative data on the value of species for honey production. Once the key floral species are established, the industry should direct its efforts to promoting either the regeneration or the replanting of the desirable species across the rural landscape, promoting the benefits to nomadic nectavores and honeybees.

The beekeeping industry could take a more active role in government regeneration programs such as through the Natural Heritage Trust.

Alternate floral species that have a proven record as producers of quality pollen or nectar should be considered for farm tree plantings. One species that demonstrates potential is South Australian sugar gum.

Engage in the debate on the ecological effects of honeybees

The debate on the impact of honeybees (*Apis mellifera*) on the Australian ecology will not be resolved or suppressed by any single event. Honeybees have been in Australia for approaching 200 years, with questions asked only recently as to their environmental imprint. The beekeeping industry cannot afford to take this ongoing debate lightly. There must be a continuing review of the science for and against. AHBIC has recently made a good start in this area (AHBIC 2005).

In many circumstances, the reviews or published discussions are those of a single author which invariably begs the question, what slant do they have on the subject? A more equitable and defensible position for the beekeeping industry would be to encourage a panel of three to five scientists to review the literature and produce a combined review, updating as required. This document may well outline certain circumstances where the placement of honeybees could cause concern for given high value of sensitive conservation areas.

In providing this equitable document and outlining possible situations or ecologies that require special attention, the beekeeping industry would be well served to take an EMS like approach, whereby commercial beekeepers work methodically and sustainably towards a longer-term goal to become third party accredited (such as the internationally recognised EMS ISO 14000 standard), demonstrating their environmental stewardship, actions and performance (see chapter 7).

This demonstrable approach to improved natural resource outcomes and audited environmental performance evaluation would provide an efficacious platform on which to challenge the current notions of honeybees having a deleterious impact on the Australian environment.

Industry to publicise its worth to the economy

As the access to supply is dependent on the beekeeping industry's image in the greater community, a concerted effort should be undertaken to produce generic information on the value of honeybees to the greater community via their role as pollinators. This public awareness strategy should be national and information should be readily available from any beekeeping association, amateur or professional, through web sites and colour brochures. Further promotion of the attributes of honey for its medical properties should also be considered to lift the perception of the importance of honeybees to human health as a practical and acceptable alternate medicine. These documents, including some on providing basic

statistics about the Australian beekeeping industry, should be reviewed as required and maintained as a high priority in the public arena. This awareness, although not contributing directly to access to floral resources, will significantly provide a sympathetic ear to any issues that might 'unreasonably' impact on the viability of the Australian beekeeping industry.

All these strategies need to be national in focus and overcome local or regional preferences or bias in documentation and delivery.

Given the small size of the industry and limited funds, the most sensible approach is to develop a national strategy, coordinated and managed through AHBIC.

Industry to stay politically engaged

The industry needs to stay politically engaged, ensuring new and existing ministers at state and federal level continue to be provided with information on the beekeeping industry. This should include any review documentation on the impact (or lack of any effects) of honeybees on the Australian environment. Representations should also emphasise the responsible steps the industry has taken and is taking to eliminate or seriously reduce any ecological impact of managing honeybees.

Forming alliances

With limited resources, the honeybee industry needs to 'leverage' what funds it has to the best advantage. It can do this by forming alliances with other groups that have similar overall objectives. The industry has a clear objective of preserving native flora. Its footprint in forests is extremely small, if any. Organisations such as the Australian Conservation foundation also have a clear objective of conserving Australia's native forests and flora. Forming alliances with such bodies could be a way to leverage the influence of the industry. The prospect for such alliances should at least be explored. In this regard the industry's environmental credentials would be enhanced if it adopted a pathway towards a sound Environmental Management System.

Key conclusions

The honeybee industry is heavily dependent on native floral resources both on public and private lands. A key threat to the industry is the gradual decline in availability of important floral resources for honeybees, through increasing limitations on access to public lands and through declining trends in the quality of these resources.

Increasing areas of state forestland are being converted into conservation reserves and state conservation agencies are, in many cases, taking a 'purist' approach to the management of conservation reserves by banning all exotic species, including honeybees, from these reserves. In some but not all cases, these 'purist' views have been balanced against the needs of beekeepers in the political process. Overall, however, the honeybee industry's position is tenuous and it will need to take a strong proactive stance to counter the 'purist' view.

Increasing areas affected by dryland salinity, land clearing, declining quality of river red gums and several other factors are also eroding access by beekeepers to quality native flora. These trends are not being fully compensated for by access to expanding areas of crops such as canola, almonds and others.

The industry needs to become actively engaged in the debate on the ecological effects of honeybees on native flora and fauna. It has made a good start with the recent publication of a position paper on this issue (Moncur 2005). This needs to be followed up substantially by other strategies. For example, the industry could encourage a panel of scientists to independently review the literature and encourage other scientists to engage in this work. There is considerable scope for the industry to better publicise its worth to the economy – through the pollination services it provides and, increasingly, the production of honey with beneficial medicinal properties. The industry also needs to be actively engaged in the political process and ensure that politicians receive an industry perspective on the key issues. A further strategy that should at least be seriously considered is to form alliances with other organisations that have common interests. The honeybee industry has perhaps one of the best environmental records of any rural industry in Australia and has much in common, for example, with organisations such as the ACF.

7

Apiarists, the environment and EMS

This chapter³ scopes out a pathway for the honeybee industry to consider in its management of environmental issues and challenges. As already noted, about 60–70 per cent of honey production in Australia is dependent on native flora. This means that apiarists and conservationists both have a common interest in preserving our native forests and ecosystems. Some conservationists claim, however, that beekeeping is detrimental to the environment and that beekeepers should be denied access to conservation reserves.

The main threat that the honeybee industry faces is that access to public lands may continue to diminish – to the severe detriment of the industry. Challenges for the industry to address this threat take several forms (chart 7.1).

- Should the industry embrace EMS of some kind – see chart 7.2 – as a demonstration of its environmental commitment and performance to use in arguing for continued access to public lands?
 - What are the impacts on the industry and on the industry’s case for continued access?
- As one step in the pathway towards an EMS, should the industry strive for a national code of conduct?
 - What impact would a standard national code have on operating costs within the industry – in short, would the benefits outweigh the costs?
- Would an EMS provide benefits in the market place along with quality assurance systems and best management practice (BMP) in general?
- What pathway should the industry take to introduce a national code of practice and EMS for the industry, and what form should an EMS take?

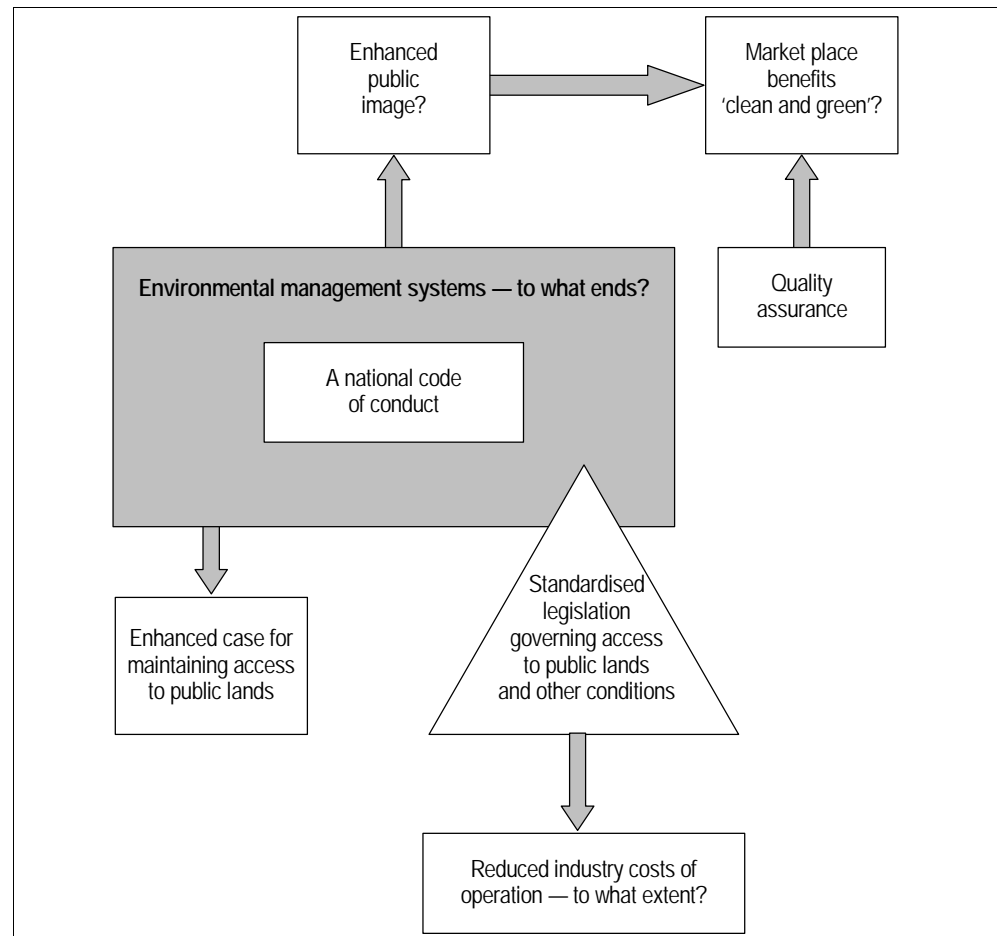
³ The contribution of Michael Williams of Michael Williams and Associates Pty Limited, Environmental Consultancy Specialists is gratefully acknowledged.

This chapter examines these issues but first scopes out the regulatory framework of public land access for beekeepers in Australia and assesses the impacts on the industry.

Regulatory framework of public land access in Australia

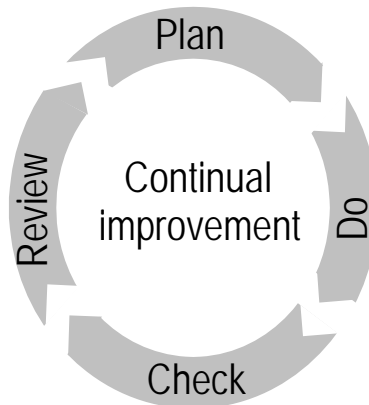
Each state and territory has different requirements and regulations in relation to apiary management on public lands and, as can be seen in appendix B, the range of differences is extremely broad. For example, some states have a centrally managed Register with varying fee structures attached, while other states set out highly specific requirements for hive identification. Furthermore, states have different and highly specific requirements for apiary site management, with differences ranging from fire prevention strategies to the number and placement of hives on sites.

7.1 Environment challenges for the honeybee industry



7.2 Environmental Management Systems

An EMS defines the approach an industry or organisation can adopt to protect the environment from the harmful impacts of its operations. Generally, the EMS approach involves cycling through four stages to ensure continuous improvement. The first stage is planning — what steps and actions need to be taken in order to reduce environmental damage — followed by the actual implementation of the planned activities. Thirdly, the results from the planned activity are analysed, leading to the final step of making any required adjustments arising from the evaluation of the activities, with the four steps continuously repeated. The process is often summarised as ‘Plan, Do, Check, Review’.



An EMS can help an enterprise or industry to better comply with relevant environmental laws, reduce pollution and waste, improve management of resources, demonstrate improved environmental outcomes, and importantly, reduce costs of correcting large environmental problems in the future.

An EMS can be audited voluntarily by the enterprise using it, or it can be externally audited for certification to an existing standard. For example, the ISO 14001 EMS approach, based on the premise that ‘better environmental management will lead to better environmental performance, increased efficiency and a greater return on investment’, requires a planned comprehensive periodic audit of an EMS to ensure that it is effective in operation, is meeting specified goals, and that the system continues to perform in accordance with relevant regulations and standards, through a process of rigorous external audits. Two examples of industry EMS adoption are outlined below. The cotton industry EMS is perhaps the most advanced. That for the chicken meat industry is in the early stages.

The Australian cotton industry has had an EMS in place since 1995 with over 60 per cent of the Australian cotton crop produced by growers certified under the program. The EMS system developed by Cotton Australia covers such issues as downwind arial spraying, pesticide and chemical applications, as well external auditing on procedures. Further activities by the industry include expanding the EMS to include all stages of the post farm-gate supply chain including classing, processing, warehousing and shipment. The industry link between the quality of the product and the EMS was fundamental to the commercial marketing opportunities of cotton fibre, and it is currently examining the feasibility of establishing an ‘eco-labelled’ product as a rewards system, thereby encouraging increased participation in the EMS program. Several growers have either adopted or are advancing towards full ISO 14001 accreditation.

The Australian Chicken Growers Council (ACGC) has developed a project to raise environmental awareness and increase skills and understanding among chicken growers, with the aim of encouraging greater use of EMS on farms. In achieving this, ACGC have developed and are rolling out industry specific EMS training packages for growers covering EMS guidelines as well as on-farm certification and auditing systems, tailored to specific states. Further work planned is to pursue links with catchment bodies, community groups and research and development organisations to further enhance the EMS program.

In addition to variations at the state level, there are different management and site application requirements and procedures for different public land tenures within states. Within the broad spectrum of public land, there exists a range of conservation reserve classifications such as national parks and wilderness areas; state forests; defence estates; world heritage areas, other crown and reserved crown lands and privately managed public (leasehold) lands, with each type of public land in each state generally having different management processes. Examining two examples from New South Wales, the day to day management of apiary sites within national parks is done by the relevant park authority and within the relevant National Park Management Plan. The number and allocation of apiary permits, however, is centrally coordinated, with the number of apiary sites capped, and with all sites either currently allocated or in the process of being allocated. New South Wales state forests, on the other hand, have a large number of unallocated sites, with site permits and site management all coordinated out of the relevant regional forestry office.

Impacts of public land restrictions and inconsistencies on beekeepers

Apiarists face direct and indirect costs as a result of the regulatory inconsistencies both within states and across the country, particularly for apiarists that operate along the eastern seaboard. These costs can primarily be broken down into the costs associated with accessing multiple land types within states and the costs associated with accessing land across state borders.

For apiarists operating within a state, there are considerable costs associated with managing access to a range of public land types. With site permits issued through either a central office for some land types or through regional officers for others, apiarists face significant direct costs managing the application, renewal, transfers and payment of site fees. Additionally, access can be dependent on local scale management plans of particular parks, which leads to the tyranny of small decisions and cost to the industry of dealing with local level decision-makers. These costs are compounded with apiarists often facing differing cost structures for different land types.

Along with increases in site access and management costs, apiarists face a range of indirect compliance costs resulting from the different regulations and management practices associated with different land types, and in certain cases, different regulations and management practices at different sites within certain land types, particularly national parks.

Additionally, as access to sites is increasingly becoming restricted, with a number of states capping the number of national park apiary sites, and in the case of Queensland, reducing the number of available sites, apiarists face increasing costs and more importantly, loss of access to the native flora resource. These restrictions and reductions in turn force apiarists to look further afield for sites, increasing their indirect management and transportation costs.

In conjunction with managing further afield sites, apiarists face significant management costs associated with maintaining access to specific sites in terms of gate access, road blockages and maintenance. In the face of poor quality access, the availability of sites is effectively reduced if not excluded. This not only increases the costs and inconvenience of accessing those sites but also increases the costs associated with finding sites to replace those that are unavailable. Suitable new sites are becoming increasingly restricted or hard to find.

For apiarists working across states, particularly along the eastern seaboard, the varying degrees of regulation and requirements for each state add to the costs faced by the industry. The requirement by most jurisdictions for apiarists to be registered adds to the direct costs of apiary management. Furthermore, apiarists face large indirect costs complying with a range of overarching state based legislation.

The situation along the eastern seaboard contrasts with that in Western Australia, where operators are able to move along the coast while still operating under one set of state based legislation. While still having a range of within state costs associated with different land types, the ability to operate along the coast in line with seasonal variations in pollination spawning reduces industry costs.

The key question is, is it worth the industry arguing and lobbying for a more uniform legislative framework to fix the 'inconsistent rail gauge problem'? The industry will need to prepare a strong case.

An industry national code of practice?

While the various states have imposed on beekeepers various codes of practice consistent with existing legislation, the industry itself is in the process of considering self determined codes of practice – but mostly on a state basis. A code of practice has been proposed for New South Wales beekeepers by the New South Wales Apiarists Association, and the Queensland Beekeeping Association, in consultation with the QPWS, is

developing a code of environmental practice for beekeeping on the QPWS estate. Other states have gone down similar paths. More recently AHBIC has prepared a policy document on honeybees in conserved forests (Moncur 2005).

In many ways, these state codes are being forced on the industry. The question is, should the industry take a proactive approach and not only develop a national code of practice for beekeeping in Australia but also embed this in an EMS, leading to the industry's continual improvement of its environmental performance?

Many beekeepers are keen for the industry to embark on an EMS pathway but others are less keen. The industry will need to consider carefully the benefits and cost of an EMS journey.

The main argument in favour of a national code of conduct and EMS is that the industry would then have better environmental credentials and be able to demonstrate that it has a serious understanding of its environmental impacts both positive and negative, can manage these impacts thus improving environmental outcomes and, within the system, can demonstrate its environmental performance through an assessment or auditing process. This could be a powerful weapon in arguing the case for better access to native flora on public lands. In the absence of an EMS, the industry could face the prospect of continuing, if not accelerating, deterioration in public land access.

Another benefit of a national code and EMS is that it could be used as a marketing tool. However, this would need to be demonstrated over time as Australia already has a high reputation for good quality honey, mostly from native flora and has a good 'clean and green' image. An EMS can assist in demonstrating the green component of the image.

Market access arrangements such as EUROPGAP are increasing and demonstration of environmental performance is a key ingredient for the maintenance of market access for many foods into Europe.

On the downside an EMS will impose additional costs of compliance on beekeepers who 'sign up' to any accreditation scheme, depending on how stringent the adopted EMS is.

A pathway to EMS

The honeybee industry is starting from a position of uncertainty about the benefits and costs of an EMS and what type of EMS should be adopted for the industry. But a good start has already been made in the form of a draft codes of conduct for beekeepers in several states, especially in New South Wales. Chart 7.3 outlines a process that the industry could adopt to develop an industry EMS. The steps are discussed in more detail below.

Step 1: a national EMS workshop

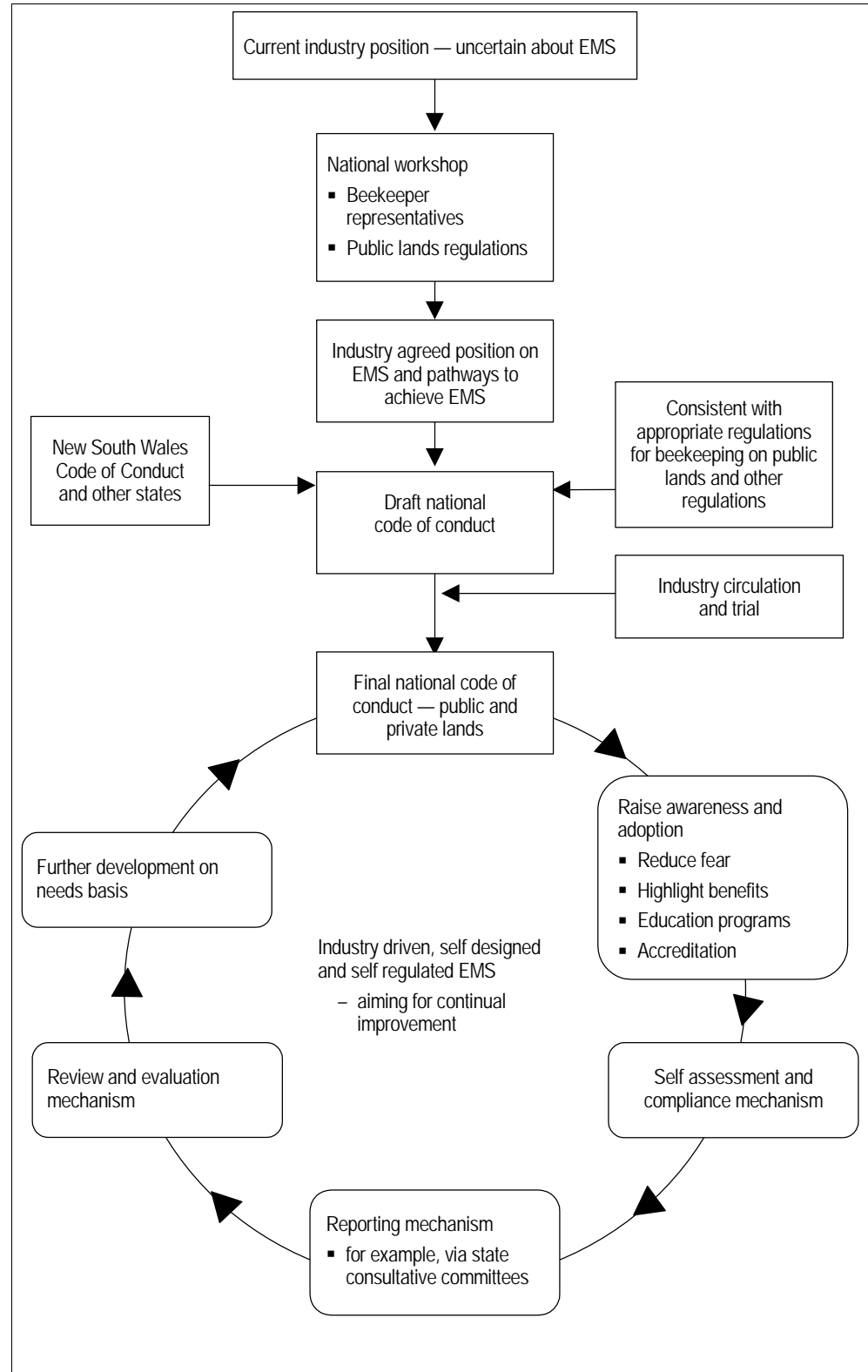
It is recommended that as soon as practicable, a national EMS workshop be held at which, key representatives from the industry's state and federal organisations and public lands regulators from each state attend. The benefits of inviting an independent ecological researcher should also be considered to ensure the approach is not only industry led but well informed by quality empirical data and knowledge. The industry should canvass the issues as raised in this report and synthesised into a short summary for all workshop participants to read before the workshop. The representatives attending the workshops should come well briefed on the views of beekeepers and regulators on the issues under discussion.

The outcome of the workshop will be a recommended EMS approach and the strategic steps for the industry to take in adopting an EMS framework. It should be noted that an EMS is a process of continual improvement in environmental management and that it may take many years for there to be widespread adoption and compliance in the industry.

Step 2: industry endorsement of the EMS

The report of the workshop should be widely circulated among beekeepers and discussed at local level. If the workshop is held in September 2005 the industry should be able to make a final decision on acceptance of the EMS through the AHBIC by early 2006.

7.3 Pathway to EMS for the Australian honeybee industry



Step 3: a national code of conduct for beekeepers

Working from the various state codes of conduct as a base, AHBIC should then set up a mechanism to draft up in detail a *national code of conduct* for beekeepers throughout Australia as a first step in the EMS. This will need to be consistent with the regulations affecting beekeeping on public lands in all states and in certain cases, there may need to be special provisions written into the code for beekeeping in certain areas where special regulations apply. Thus, the code where possible should be general but it cannot conflict with existing regulations. The code should aim to go several steps higher than existing regulations and be proactive. The drafting of a national code and checking for consistency with regulations should be done in conjunction with apiary officers in each state as well as public land managers.

The national code should also cover beekeeping on native forests on private land.

Step 4: trial of the code and review

The industry should consider a trial period for the code, perhaps by nominated beekeepers. After a period of about 12 months, the industry through AHBIC, should thoroughly review the code as to the benefits and costs to the nominated beekeepers and comments from public land managers and the relevant private landowners.

After making necessary changes, the code should be formally adopted by AHBIC and the industry.

Step 5: wide adoption – a sign up and accreditation system

By this time, the national code should have received widespread 'air play' throughout the industry, and beekeepers should be well aware of the code and the obligations it places on them as individuals. AHBIC should consider a system of accreditation and 'sign on' by individual beekeepers so that there is a clear indication of the extent of adoption of the code of practice by individuals. A low cost option to implement this would be to use internet facilities available on the AHBIC web site.

During this phase and before, AHBIC and other industry organisations will need to undertake a campaign of 'selling' the net benefits of the code and the EMS strategy.

Step 6: self regulation

An important part of the EMS documentation will deal with how individual beekeepers can undertake self-assessment of the degree to which they are compliant with the code, and report this to AHBIC or its nominated committee. The industry needs to be in a position to have information on, and report on the extent to which beekeepers are compliant. Any complaints of non-compliance should also be directed to the nominated committee.

This is the first stage of compliance. It is based on a self-assessment process and is not particularly onerous for beekeepers. As time progresses, innovative beekeepers may wish to advance to higher levels of EMS and have their compliance and EMS checked by an industry representative and finally audited by an independent and accredited third party. This is then approaching ISO 14001 standards but the benefits of higher EMS levels will need to exceed the costs for individuals. Higher levels of EMS may be justified in some individual cases where the beekeeper is developing a particular niche market.

Step 7: review assessment and refinement

After about three years, the industry should implement a formal review process to assess overall levels of compliance, net benefits to the industry and refinements that should be made to the national code of practice and the other elements of the EMS. The EMS should include these evaluation criteria at the start of the process. Such a review should of course take stock of any changes to legislation affecting public land access and other legislation impacting on beekeepers. The review should also consider how the EMS ties in with recommended industry BMP, quality assurance programs and occupational health and safety systems.

Finally, the review should assess the benefits and costs of the industry progressing, in a strategic and structured way, to higher levels of EMS.

It would be prudent for the industry to address EMS (see table 7.4) in a conservative way from a modest beginning, and with time, work towards improving the system as the benefits become more apparent. Adoption of EMS approaches is now well supported by agricultural industries nationwide through the Pathways to Industry EMS program and EMS Pilots program administered by DAFF. The danger for the industry of not having any EMS is that public land managers may react adversely to the industry not having an EMS when decisions on access to public lands are made. It is

a question of striking the right balance initially and gradually improving the EMS.

Some may argue that introducing an EMS for the honeybee industry is an admission that managed beehives impact negatively on the environment. Scientific results on the impact of bees on native flora and fauna are inconclusive, but apart from the effect of the bees themselves, access to sites and clearing and management of sites, if not done responsibly by beekeepers, have the potential to cause damage in some cases. An EMS which is comfortable for the industry to adopt initially and where the industry can work towards continual improvement is a good way to start. It will have the effect of warding off criticisms that the industry is indifferent towards the environment. Most rural industries in Australia are now adopting an EMS approach. The danger for industries not adopting EMS of some sort is that it becomes harder for those industries to *demonstrate* their environmental stewardship and when incidents occur it is too easy for critics to lay blame on the industry.

7.4 The potential benefits and costs of an EMS for the honeybee industry

Benefits	Costs
<ul style="list-style-type: none"> ▪ Improved 'environmental credentials' for the industry. ▪ EMS as a lever to argue for maintenance or improved access to public lands. ▪ Greater security of access. ▪ Demonstration of environmental stewardship. ▪ Possible market advantage — product differentiation for future market access. ▪ Improved industry communication with EMS as a focus. ▪ Improved relations with regulators and public lands managers. ▪ Use of code and EMS to persuade jurisdictions to standardise regulations and conditions of access to public parks. 	<ul style="list-style-type: none"> ▪ Compliance costs. ▪ Auditing costs. ▪ Reporting costs. ▪ Costs of industry organisations planning and reviewing EMS. ▪ Costs of education programs.

Key conclusions

- The honeybee industry is heavily dependent on native forests on public lands and faces the real threat of a continuing gradual reduction in access to these lands. This has and will continue to severely impact on the viability of many beekeepers.
- If managed commercial beekeeping has a minimal impact on the environment, beekeepers have been unable to demonstrate this in a

systematic way. A national code of conduct within an industry led and collaborative EMS approach would have advantages for the industry in that it would: better demonstrate the industry's environmental credentials; demonstrate the industry has a serious understanding of its environmental impacts both positive and negative; demonstrate the industry can manage these impacts thus improving environmental outcomes; and, most importantly within the EMS approach, can demonstrate the industry's environmental performance through an assessment or auditing process.

- The industry can claim that its product is 'clean and green'. In the future it will need to be able to demonstrate this. The extent to which additional premiums could be obtained in the market place for honey produced under an EMS of ISO 14001 standard, say, are unknown. There may be small niche markets for such branded honey, but overall and in the short term, such premiums are unlikely to be substantial.
- The key issue the industry faces is that it will need to *prove* its environmental credentials and a way to do this is for the industry to embark on a pathway to EMS. This will take several years and should start from a conservative base, be industry led and driven and involve gradual improvements to achieve higher levels of EMS. Each step should involve gradually higher goal levels, to be achieved at a pace which the industry is comfortable with.
- The prime reason for the industry to embark on this pathway is that it needs to be in a strong position to *demonstrate* its commitment to environmental management to strongly argue its case for maintaining access to public lands.
- It is recommended that the industry adopt a stepped approach to EMS as outlined in this chapter.
- Although this is a relatively small industry, it has a hugely disproportionate impact on the rest of agriculture and the economy — through pollination services. But pollinators mainly depend on honey production for their income. There are no significant alternatives to native flora for honey flows and most of these resources are on public land. It is highly recommended that the honeybee industry make much better use of these facts in *selling* its story to the public and especially to legislators. The consequence of continual erosion of access to national parks can be serious not only for beekeepers but for much of agriculture as well.
- The precautionary approach of conservation reserve management requires engagement with land managers, and strategic, collaborative and well informed responses. Most national parks in Australia have

multiple uses including recreation, tourism and supporting management infrastructure. The honeybee industry stands for and depends on the preservation of native flora and hence has much in common with those in the community whose values support nature conservation and the establishment of conservation reserves. The honeybee industry should explore avenues for forming alliances with community organisations with such values at a national level to maintain both the social, environmental and economic values of the industry and the public lands on which it is dependent.

8

Pest and disease management

Most of the serious pests and diseases that affect honeybees are present in Australia. Fortunately, however, the very serious mites such as varroa mite (*Varroa destructor*), the mite *Tropilaelaps clareae* and tracheal mite (*Acarapis woodi*) are exotic to Australia but pose a real threat of incursion. Other exotic pests include Africanised bees, the giant honeybee *Apis dorsata*, the host of varroa mite *Apis cerana* or the Asian bee, and braula fly (*Braula coeca*). Braula fly is present in Tasmania but not on the mainland.

The most serious endemic diseases are:

- American foulbrood (AFB), caused by the bacterium *Paenibacillus larvae*;
- European foulbrood (EFB), caused by the bacterium *Melissococcus pluton*;
- chalk brood caused by the fungus *Ascosphaera apis*;
- Nosema caused by the protozoan parasite *Nosema apis* Zander;
- Sacbrood caused by the sacbrood virus; and
- Small hive beetle (*Aethina tumida*), introduced into Australia in around 2001 in New South Wales and spreading fast.

All these pests and diseases are notifiable under legislation in each state. There are many other pests, diseases or predators of honeybees such as wax moth, ants, cane toads, the rainbow bee eater and others. Generally these can be controlled by good beehive management. Stone brood disease, caused by an *Aspergillus* fungus, is also notifiable in some states and territories but is very rare.

Exotic pests and diseases

All serious exotic pests and diseases are notifiable diseases under state law and come under the AUSVETPLAN which is a national coordinated response plan for all important exotic diseases and pests. AUSVETPLAN is now coordinated by the Primary Industries Ministerial Council through

Animal Health Australia. Each exotic pest or disease has a specific technical response plan that describes in detail all steps that must be taken and by whom in the event of an exotic incursion. Being part of Animal Health Australia (AHA) (and also Plant Health Australia), and being a signatory of the Emergency Animal Disease Response Cost Sharing Deed of Agreement the honeybee industry has an obligation to share in the costs of response activities following a decision to attempt to eradicate an incursion. A levy on honey has been established to create a fund so that the industry's obligations can be met. The fund for the honeybee industry is capped at \$1 million.

The technical plans in each case are comprehensive and the industry has a say in the decision-making process regarding whether and how any eradication attempt should proceed, or the appropriate control responses should decisions be taken to not attempt eradication. However, by far the best approach is to maintain strong surveillance programs.

Varroa mite (Varroa destructor)

This mite is a parasite of adult honeybees and the brood. The mites feed on the blood of the adult bees and larvae and pupae, and seriously weaken and eventually kill the bee colonies. The mites reproduce in the honeybee brood. They are very mobile and can readily transfer between adult bees, colonies and apiaries. Furthermore, the mite is difficult to detect.

Australia is one of the very few major honeybee producing countries in the world where varroa mite is not present. New Zealand had an incursion in 2000 and after careful consideration of the situation, decided not to attempt eradication in the North Island. The pest is not present in the South Island. The New Zealand incursion emphasises the risk that Australia faces with respect to this pest. The host of varroa mite is the Asian honeybee *Apis cerana*. A swarm of these bees could easily go undetected on a ship and once in an Australian port an incursion could easily take place if the Asian bees settle in Australia and are infected with varroa mite. Because of the migratory activities of beekeepers, and the difficulty of detecting the mite in early stages of infection, the disease, once introduced, is likely to spread rapidly perhaps even before detection. An eradication attempt would be decided on the nature of the incursion, but in all probability, would be extremely costly if such an attempt were to be decided upon at all. If an eradication attempt were successful, it would be the first time any country would have achieved this.

Should the pest become established in Australia it would continue to spread rapidly unless very expensive control measures were enforced.

Most colonies not treated with acaricide would be killed. Control costs for the pest would very substantially add to costs of production and would have a devastating effect on the industry. Most small beekeepers would probably find it uneconomic to continue beekeeping. This pest is to the beekeeping industry what foot and mouth disease is to the livestock industry.

There would be other implications of varroa mite becoming established in Australia. Most feral colonies of bees and native bee colonies would be destroyed and this would have serious implications for pollination of many horticultural and agricultural crops. While this may increase demand for pollination services by managed bees, the price of such services would likely rise substantially.

Tropilaelaps

This mite is much smaller than varroa but would have even a more devastating effect on the Australian honeybee industry if the pest became established here. Its host is *Apis dorsata* the giant honeybee. However, the chances of it being introduced are less than for varroa because it is not present in countries such as USA and Europe.

The pest can be controlled by use of acaricides. As for varroa, it would be expensive to eradicate even if that were possible, and would severely impact on the profitability of the industry if control was the only option.

Tracheal mite

This mite infects bees' tracheas and slowly weakens and eventually kills them. *Apis mellifera* has a reasonable degree of tolerance to the mite and establishment of the pest would not be as serious as varroa or tropilaelaps.

The National Sentinel Hive Program

Following consultations between Biosecurity Australia, state departments of agriculture and AHBIC, this program was established in 2000 to enhance surveillance for exotic honeybee pests, most notably varroa, in the immediate vicinity of Australian ports. Sentinel hives with sticky strips can trap exotic bees, thus enhancing the chances of detecting an incursion and eradicating it at minimal cost.

This program operates at 27 ports throughout Australia, and it has recently been reviewed by Biosecurity Australia (Boland 2005). The review covered

20 ports in New South Wales, Victoria, Queensland, South Australia, Northern Territory and Western Australia. It is worth noting the key recommendations of this report.

- A comprehensive analysis of the benefits of the program to be conducted by the honeybee industry and those horticultural and seed crop and pastoral industries identified as significant beneficiaries of pollination.
- A review of the long term funding and coordination of the program, including the costs.
- Surveillance for Asian honeybee be extended to all ports on the eastern seaboard as far south as Brisbane.
- Investigating the feasibility of establishing or re-establishing hives at various locations.
- Increasing the intensity of surveillance by more regular sampling of hives at certain locations.

There are other programs that enhance surveillance. These include:

- a program of awareness of vessel masters and port personnel of honeybees on incoming vessels; and
- a program of inspection of vessels on arrival.

The dangers of some of these exotic pests, particularly varroa and *Tropilaelaps clareae*, becoming established and the relative ease with which incursions could occur in the absence of good surveillance cannot be overstressed. Not only would the beekeeping industry be seriously affected by a successful incursion, but so too would most of Australian agriculture through effects on pollination. Previous detections of exotic pests at Australian ports are summarised in table 8.1. It is also worth noting that in no country in the world has there been a successful eradication of varroa mite.

Endemic diseases

The endemic diseases of honeybees listed earlier are notifiable diseases under various state legislations. However, there are differences between states in actions beekeepers must take and control methods for these diseases. For example, in all states, the antibiotic oxytetracycline (OTC) hydrochloride is recommended for the control of EFB, but Tasmania is the only state where OTC can be used to control AFB.

8.1 List of incursions and potential incursions involving honeybee pests

<i>Date</i>	<i>Agent</i>	<i>Place</i>	<i>Comments</i>
Early 1970s	<i>Apis dorsata</i>	Fremantle	From Java, Indonesia. No further details.
February 1994	<i>Apis scutellata</i>	Fremantle	A nest of live bees was found on a container. Destroyed.
April 1995	<i>Apis cerana</i>	Near Brisbane	No further details.
June 1996	<i>Apis cerana</i>	South Australia	No further details.
February 1997	<i>Apis scutellata</i>	Fremantle	Abandoned nest only. Originated from Durban in South Africa.
December 1997	Bumble bee (<i>Bombus vosnesenskii</i>). Not the same as that in Tasmania	Buderim, Qld	Not diagnosed till May 1999. Mites were found <i>Kunzenia</i> sp. which are basically scavengers in bumble bee nests - not significant for <i>Apis cerana</i> .
June 1998	<i>Apis cerana</i>	Darwin	Nest discovered by a local beekeeper. Eradication program instituted and intensive surveillance.
July 1999	<i>Apis dorsata</i>	Sydney	Air freight from Penang Malaysia – computer motherboards. Examination showed no mites.
September 1999	<i>Apis cerana</i>	Brisbane	Asian honeybees were detected on a ship (ex Singapore, Lae and Port Moresby) berthed in Brisbane. Swarm of approximately 50-100 absconded but follow up monitoring revealed nothing.
December 1999	<i>Apis cerana</i>	Brisbane	Introduced with heavy earth moving equipment from Lae, PNG. Hive of 5,000 bees destroyed. DNA test showed the bees were Java Flores type. <i>Varroa jacobsoni</i> found.
March 2000	<i>Apis dorsata</i>	Brisbane	A swarm was found under a container at the Brisbane wharves. Destroyed.
January 2002	<i>Apis cerana</i>	Melbourne	Swarm on a container ship from Lae, New Guinea. Destroyed. Inspection revealed <i>Varroa jacobsoni</i> .
January 2002 (or earlier)	<i>Aethina tumida</i>	Richmond, NSW	Discovered October 2002 but probably already present for at least a year. Means of arrival unknown. December 2002 <i>Apis cerana</i> Brisbane One bee found on ship from PNG. Follow up surveillance in Hamilton area revealed nothing.
February 2003	<i>Apis dorsata</i>	Vessel off north Australia	Oil tanker from Singapore. A 'quite large swarm' found by crew and (inexpertly) destroyed before arrival. Only dead bees found. No mites seen on inspection.
February 2003	<i>Apis dorsata</i>	Vessel off north Australia	Vessel from Indonesia. Seven dead and one dying bee found. No evidence of swarm found despite repeated checks. No mites found on inspection.
May 2003	<i>Bombus terrestris</i>	Fisherman Island, Brisbane	A single bee was found by AQIS.
May 2004	<i>Apis cerana</i>	Cairns Vessel from PNG	Swarm of <i>Apis cerana</i> found in hold on arrival in port. Bees destroyed. Spread considered unlikely. No mites found on inspection.
Nov 2004	<i>Apis cerana</i>	Brisbane Vessel from PNG	Nest of <i>Apis cerana</i> found under a container in port. Bees destroyed. Spread considered unlikely. <i>Varroa jacobsoni</i> found on inspection. Surveillance for <i>Apis cerana</i> put in place within 6 km radius for 12 months.

Source: Boland (2005).

Many of the endemic diseases are widespread and mostly are not of major concern if good beekeeping practices are maintained. For example, viral diseases such as sacbrood are frequently present in colonies and only become a problem under certain conditions when colonies are under stress.

The same goes for most of the fungal diseases such as Nosema and Chalkbrood. Incidents of those diseases are minimised by good husbandry or in some cases antibiotics can be used to control them. Even EFB infection can be minimised by good beekeeping practices.

American Foulbrood

The disease which is of most concern is AFB, and most activities of state agencies are directed at controlling this disease. It is highly infectious so that actions by one beekeeper whose hives are infected can cause the disease to spread, and seriously impact on many other beekeepers.

This disease is caused by the bacterium (*paenibacillus larvae*). It infects and kills only the bee larvae but if left unchecked it will affect the hive and honey production, and eventually the colony will die out. The disease is spread in many ways, including by infected bees drifting into healthy hives, healthy bees robbing a weak infected hive, healthy bees feeding on contaminated honey or where watering places are contaminated by infected dead bees. Importantly, the disease is also spread by beekeeping practices such as interchange of combs of brood and honey between infected and healthy hives. The migratory nature of beekeeping means that unless beekeepers are vigilant in testing for the disease in their hives, the disease can spread very quickly.

Control of AFB is regulated in all states and territories with each state having legislation to minimise spread of the disease and on how the disease, once notified, is to be treated. Use of OTC is not permitted except in Tasmania. It could be, however, that OTC is sometimes used supposedly to treat EFB but at the same time to treat AFB. Three dangers arise. One is that indiscriminate use of OTC for treating EFB can suppress symptoms of AFB. Secondly, resistance may be built up to this antibiotic. Thirdly, there is a danger that late applications of OTC could contaminate honey. A publicised contamination of any honey with OTC could severely damage the industry's image and result in reduced honey consumption.

Despite all the measures to control the disease the evidence is that it continues to spread, although to a degree, the reported increase in occurrences could be due to better detection methods – honey can be tested for AFB spores but honey as a rule is not regularly tested.

Even though AFB is a notifiable disease, it is very difficult for state agencies to enforce compliance of their state legislation. This is exacerbated by the migratory nature of commercial beekeeping operations, the very large number of small hobby beekeepers and the limited and, in some cases,

decreasing resources of state agencies devoted to beekeeping inspection activities. Some states/territories such as Tasmania and the Australian Capital Territory have no apiary inspection officers and others are scaling back. In some states, general stock inspectors are now required to take up the task of apiary inspections. Given these trends and the remoteness of bee sites, it is not surprising that little real progress has been made to more effectively control the disease.

The best option for the industry is to take a national approach to AFB control and to somehow impose a system of self-regulatory control on the industry. Commercial beekeepers will no doubt point to the large number of small hobby or part time beekeepers as the source of the problem, but many small beekeepers are stationary and anecdotal evidence suggests that not all commercial beekeepers do the right thing with respect to vigilantly controlling AFB in their hives.

A report on a national approach to management and control of AFB has already been prepared (Hassels and Associates 2003) and state agencies are focussed primarily on control of this disease.

AHA has also prepared a proposal for a nationally coordinated program for the improved management and control of AFB (AHA 2003-04). It is proposed that AHA would manage the implementation of this national program. Its key elements are:

- enhanced research and development;
- review of current state legislation and control mechanisms and uniform management techniques;
- better quality assurance and biosecurity systems by having beekeepers formally adopt biosecurity measures;
- national monitoring and surveillance and reporting program; and
- a communication and awareness program.

It was proposed that this national program be funded through agreement between industry, state/territory governments and the Australian government. Unfortunately, this proposal has been dropped because of governments' unwillingness to commit resources to the plan.

Steps the industry could take

Learn from New Zealand's experience with varroa

Given the importance of varroa mite and other serious exotic pests, there are additional steps the industry could take in addition to the AUSVETPLAN to enhance its preparedness for any incursion. Some steps are already in progress.

Later in 2005, the industry will take part in a simulated varroa mite incursion exercise to test the response plan and make adjustments where weaknesses are found. This is admirable and follows on from a similar exercise where an incursion of foot and mouth disease was simulated. The industry is also taking the initiative to learn from New Zealand's experiences with its varroa mite incursion in the North Island. RIRDC is requesting proposals for a study group to visit New Zealand and learn from their experiences first hand. A New Zealand published book on their varroa experience is being updated. And finally, RIRDC is seeking research proposals to develop genetic resistance to varroa.

In addition, the industry could give consideration to an other possible response: experts from New Zealand should be invited to take part in the simulated incursions of varroa mite, as 'umpires' or part of the review team. New Zealand authorities now have considerable first hand experience with responding to an incursion of varroa. They made mistakes and have learned from those mistakes. They would have much to offer their Australian counterparts.

Adopt the recommendations of the National Sentinel Hive Program Review

An immediate first step would be for the industry to give very serious consideration to the recommendations in the recently released Biosecurity Australia Review of the National Sentinel Hive Program (see recommendations given earlier). Surveillance is one area where the honeybee industry cannot afford to be complacent. At the earliest opportunity, this report should be widely circulated throughout the industry. A comprehensive industry response will need to be formulated, but in general, the industry should accept these recommendations. In addition, consideration should be given to extending the sentinel program to other minor parts, for example in Tasmania. This state has been the source of incursions in the past.

Maintain strong relationships with AQIS and biosecurity

It is vital that Australia maintains and where appropriate enhances its quarantine facilities and procedures to minimise the risk of exotic disease incursions. The industry should engage regularly with AQIS and Biosecurity Australia to satisfy themselves that all that can be done is being done to minimise risks of incursions. This means the industry taking a proactive approach rather than just relying on AQIS and Biosecurity Australia. Also, the industry should monitor AQIS resources and procedures to ensure there is no dilution of quarantine efforts.

Re-engage governments on a national AFB control program

The honeybee industry will now have to rethink its strategy to better control AFB. There are three options. One is to attempt to reactivate a scaled down version of the AHA Business Plan and attempt to persuade governments to adopt a less ambitious plan. The second option is to devise an industry self-regulatory scheme based on, or combined with, a BMP program. Much could be learned from the cotton industry in this regard. The program may need to include some system of accreditation. The third option only has relevance in the longer term. That is to breed stock that is resistant to AFB. This has been done overseas and could be done here through importation of genetic material, but it would take a lot of effort to keep up the 'resistance'.

Key conclusions

- One of the biggest threats facing the honeybee industry is an incursion of varroa mite. This would have a very serious effect on the industry by destroying large numbers of bee colonies and most, if not all, feral bee colonies. In the event that eradication was judged not feasible, control measures would substantially add to costs of production and make many businesses non-viable. Horticultural and agricultural industries would be adversely affected because of lack of pollination services, but fees for such services would rise.
- There are measures already in place through AUSVETPLAN to minimise the risk of an incursion. A cost sharing agreement is also in place to fund any eradication program should it be decided that eradication was a feasible option.
- A simulated incursion to test Australia's response strategies is planned for later this year. The industry should consider augmenting the effectiveness of this exercise by inviting experts from New Zealand,

who have had first hand experience with varroa mite incursion in New Zealand, to take part in reviews.

- The industry should also encourage a comprehensive research project funded through RIRDC, to study in detail the New Zealand response to varroa mite and the lessons for Australia.
- The industry should adopt the recommendations of the recent Biosecurity Australia Review of the National Sentinel Hive Program. It should go further and consider requesting extension of the program into other minor parts, in Tasmania for example.
- Most endemic diseases are notifiable and good beekeeping practices go a long way to controlling them. The most troublesome is AFB. AHA in 2003-04 drafted a national plan for better coordination and control of AFB but this has been dropped because of a lack of willingness on the part of governments to commit resources to the plan. The industry might reconsider this plan and sell itself more to state governments in terms of its impact through pollination on a wide range of horticultural and agricultural crops. Alternatively, the industry could consider a self-regulatory plan as part of a BMP program, with accreditation.

9

Contamination and quality control

Contamination of Australian honeybee products is a serious risk for the Australian industry not only because it could taint the valuable clean and green reputation Australia has built up over the years, but also it can represent a health risk to consumers.

However, risk from contamination is not just a product of inadequate testing. It also stems from the inadequate labelling laws (or policing of the laws) that have permitted some Australia distributors of medicinal products such as royal jelly and propolis to use Chinese imports known to have a high risk of contamination in products labelled 'Made in Australia'. This practice must be stopped if the industry wants to reduce its risk and encourage investment. Contamination of honey is also closely linked to use of antibiotics and chemicals to control pests and diseases in hive management.

This section outlines the current issues in contamination and labelling and offers suggestions to reduce the risk these impose on the Australian honeybee industry.

Contamination

Australia has managed to build up a reputation in the international market as being clean and green. However, an incident in 2003 involving honey from Argentina that was possibly contaminated entering the Australian market and then being re-exported to Canada has highlighted the high risks Australia faces. This is especially the case if Australia continues to import honey in times of short supply and international suppliers start to look for non-resistant antibiotics that may not be approved.

The major concern regarding contamination is the amount of residue found in honey from pest control activities undertaken by beekeepers. To address this issue, provide advice on residue policy, and mitigate risks involved

with contamination, AHBIC has recently established the Australian Prevention of Residues Committee.

Currently, AQIS is responsible for testing honey imported into and out of Australia. It can either test honey exported at the request of the exporter to satisfy customer needs (on a fee for service basis), or it can act as a competent authority which requires it to issue documentation certifying the goods meet a trading partners requirements. This has only been established with Papua New Guinea, the EU and Canada. In addition, there is some private testing being undertaken by some packers and marketers.

However, not every batch of honey exported is currently tested so there is a real risk that contaminated honey, either from imports mixed into Australian honey or from local producers using unregistered chemicals and antibiotics, may slip through the AQIS barrier. Therefore the industry needs to establish programs that are approved by AQIS that require that a product for export 'meets the market and is fit for purpose' and that 'good manufacturing practice' was used in its production (Jordan 2004).

At a minimum, the industry either needs to make B-Qual compulsory for every honey producer supplying a commercial packer and marketer or exporting overseas, or ensure these producers undertake some other form of food safety program that meets export requirements. As a significant part of the industry still does not have B-Qual training, the program should be extended to increase access across Australia, and a reasonable time limit set for complete accreditation of these honey producers. The industry also needs to provide an incentive for these honey producers to undertake this training by educating the industry on the importance of a clean and green reputation to the industry and the individual beekeeper. The end goal for the industry should be to ensure honey is a prescribed good under the *Export Control Act 1982* for all export markets.

In addition, effective communication within the industry and exchange of information between honey producers and packers and marketers is essential. An emergency response plan has already been developed by AHBIC that deals with contamination issues and the subsequent negative publicity that may result, but this must be kept up to date and be readily accessible to all industry participants. Therefore the industry should continually invest in updating their crisis management plan that sets out practices and procedures ensuring effective communications to government, regulators, industry participants, consumers, and the general community to mitigate any negative publicity it may receive.

Contamination of honey can only be controlled by implementing the appropriate quality control programs at both the beekeeping and packer level, and continually testing both imported and exported products. Australia needs to take the lead in ensuring honey exports do not contain unacceptable levels of contaminants and that honey imported to Australia meets world's best practice standards. This will not only ensure the Australian image is maintained but will signal to the international community that the honeybee industry in Australia is serious in delivering the cleanest product in the world. This will assist any future marketing and promotion campaigns in differentiating Australia's honey from cheaper options, reduce risk across the entire industry, and maintain continual access to the highest value markets in the world.

Labelling

Labelling of honey and honey products needs to be tightened up and properly policed within the industry. This will enable the industry to differentiate itself from poor quality products and reduce the risk of contaminated products being associated with the Australian honeybee industry, thereby protecting its clean and green reputation. Industry consultations suggest labelling needs to be improved in the following areas:

- batch labelling to ensure traceability of products
- 'Made in Australia' and 'Product of Australia'
- claims of being organic.

These three areas of labelling are discussed below.

Batch labelling

The industry must ensure that labelling of all honey products is consistent with the standards set under the Australian and New Zealand Food Standards Code. At a minimum this includes:

- name of food
- lot identification
- name and address of supplier
- any ingredients added to the product
- date marked
- statement of storage conditions.

This will ensure any contamination that is discovered within the domestic or international markets can be easily traced back to the original supplier to minimise any further risk of use by consumers or industry.

'Made in Australia' and 'Product of Australia' labelling

The Australian government has been leading international attempts to harmonise 'country of origin' descriptions. The place where goods are made is important in the international trading context, and for the domestic market for both producers and consumers. Labelling rules regarding the country of origin are administered under the Trade Practices Amendment (Country of Origin Representations) Bill and it is the responsibility of the Australian Competition and Consumers Commission (ACCC) to enforce this. Any business that deliberately misrepresents the country of origin is subject to the full weight of the Trade Practices Act.

In general, to claim a good is 'Made in Australia' it must have been substantially transformed in Australia and at least 50 per cent or more of the cost of manufacturing the good must have been incurred in Australia. To claim the product is a 'Product of Australia', each significant ingredient of the product must have come from Australia and virtually all processes in its production must have happened in Australia (ACCI 2005).

Industry consultations suggest there is a large amount of royal jelly and propolis being imported into Australia from China by Australian health food distributors and then re-exported to Asia and Europe with a 'Made in Australia' label. This introduces huge risk into the industry due to the high risk of antibiotic contamination in Chinese products. Already there have been two incidents where Chloramphenicol was detected in royal jelly that was labelled Australian made, one in Europe and the other in Japan.

However the complicating factor is that these distributors are technically satisfying the current labelling laws due to the small portion of royal jelly and propolis content within the products (around 0.03 per cent royal jelly in some cases). This suggests the problem may not be with labelling the product as Australian, but labelling the products as 'royal jelly' or 'propolis'.

Although in the short term it may be profitable for Australian distributors to label these products as Australian made, it is not an appropriate long term strategy if they want to continue supplying and developing their markets in the future. Any discovery of a contaminated product labelled 'Made in Australia' creates a perception within the international market that the Australian industry is either using an unacceptable level of

antibiotics or it does not have the appropriate testing arrangements in place, both of which are detrimental to Australia's image.

According to the Australian Food Standards Code developed by Food Standards Australia New Zealand (FSANZ), if any of the ingredients of a food does not originate in the country which the food was packed for retail sale, a statement on the label should:

- identify the ingredients' country or countries of origin; or
- note that the food is made from ingredients imported into Australia or from local and imported ingredients.

These general requirements should be applied on all labels of honeybee products, including royal jelly and propolis.

Furthermore, because royal jelly, propolis and pollen can cause serious health problems for some people who are allergic to these products, the Food Standards Code specifically states that labelling on these products must contain appropriate warnings immediately following the name of the product in text no smaller than three millimetres. The industry must ensure this labelling is undertaken, and report any distributors to the FSANZ that do not comply.

The industry needs to take a pro-active approach in tightening up 'country of origin' labelling by reporting those who do not follow the Trade Practices Act to the ACCC immediately. This will not only benefit the industry but the entire value placed on 'Made in Australia' labelling across all export industries.

Organic labelling

Industry consultations suggested that there were a number of honeybee producers who are labelling their products as organic when in fact they are not. This represents a risk to the industry in its ability to develop a trusted market for organic products, especially in international markets such as Europe where organic food is in high demand and organic food standards are relatively strict.

Organically certified honey means the honey is free of chemical fertilisers and pesticides, genetically modified organisms, and antibiotics, and is collected, prepared and transported in systems that guarantee the honey is not contaminated by synthetic chemicals or fumigated. Currently there is no national body that certifies whether a product is organic or not. This

means honey that is sold as organic but in fact does not meet national standards is not contravening any direct laws regarding organic products.

There are seven independent organic certifiers in Australia who can provide a label to a honey producer if they want their product to be certified organic. These certifiers are monitored and audited by AQIS.

Due to the lax rules regarding organic products, the honeybee industry is currently limited in its ability to stop honey producers from attaching an uncertified organic label on their product. However, it can encourage the industry to undertake appropriate certification by educating honey producers and packers and marketers about the benefits associated with a trusted and respected reputation.

Key conclusions

- Develop and implement effective programs in addition to B-Qual that will ensure residue is minimised and that honey becomes a prescribed good for all export markets.
- Continually update the emergency response plan to reduce risk of impact from any contamination and ensure the crisis management plan sets out practices and procedures to mitigate any negative publicity from contamination, and is accessible to all industry participants.
- Continually test both imported and exported honey and educate the industry on the importance of keeping the clean green image of the Australian honey industry.
- Lobby the government to tighten up the labelling laws and policing of the laws and report those who are known to be misrepresenting imported products as Australian made.
- Educate the industry on the value of a trusted organic brand within Australia and especially in the EU.

10 *Education issues and options*

Education was identified in a number of workshops as an issue to be addressed. It was noted that an increase in education has the capacity to substantially reduce risks within the industry, especially in terms of disease and pest control, limiting the skills shortage, and stopping the continued decline in the access to public land.

In general, there were three primary areas where education was considered essential to achieve a profitable and sustainable industry. This included:

- attracting young people into the industry and educating them and industry incumbents in efficient methods of beekeeping, quality assurance, disease control, and business management; and
- educating the general public and various state governments and federal government on the importance of honeybees in the Australian economy and society, focusing on the contribution of pollination to the horticulture, crop and pastures sectors.

The chapter outlines the current education situation within the honeybee industry, identifies some areas where the industry believes there should be greater investment in education, offers suggestions for addressing the future, and evaluates the issues that need to be addressed when approaching the public and government. Key conclusions are provided at the end.

Educating the industry

Education in the Australian honeybee industry is currently provided by a combination of organisations, including Universities, TAFE colleges, New South Wales DPI and private providers. Universities provide the necessary skills for high-end research into the honeybee industry (for example genetics), and TAFE colleges offer generic courses on farm management and occupational health and safety, and short courses aimed at hobby beekeepers. New South Wales DPI provides some general training in beekeeping along the same lines as TAFEs, and a specialist course on queen rearing. There are also some private training consultancy firms. However

there are no nationally accepted courses that are specifically tailored to beekeepers or potential entrants into the industry. Private firms do fill some gaps in the industry, especially in technical skills development and quality assurance, but information on these courses and the broad reach required to build a known quality reputation is not evident. Furthermore there are only a very small number of these private firms offering such courses so they are not readily accessible across Australia.

Training is usually undertaken in an informal manner through experience gathered on the job. As most apiaries are small family teams with skills either passed on down to children and relatives or lost through retirement, the opportunities for outside individuals to enter the industry and gain experience is limited as the resources for education are not readily available. This is shown by the extremely low number of applicants for traineeships within the industry in the last decade. Furthermore, those few who do acquire new beekeeping skills, or others who have experience within the industry, cannot readily demonstrate their practical and theoretical knowledge to other beekeepers, thereby reducing the ability of skill transfer within the industry. This is particularly the case where conceptual skills and acquired experience may not be transferable, for example in areas of decision making and management.

The combination of these restrictions on formal education and skills development and transfer is placing limitations on expanding the number of skilled beekeepers, particularly the number of queen bee breeders.

Four broad categories were identified within the workshops that required further education within the industry, including:

- business management, including financial management, promotion, and diversification into other beekeeping activities such as pollination services;
- quality assurance, including food safety requirements and hygiene;
- technical skills training, including breeding and rearing queen bees; and
- disease and pest mitigation, including the development of pest management action plans.

Due to the diversity of the industry, business management practices differ across the industry and the level of skill is highly variable. However, workshop participants noted there were some particular core competencies lacking in the industry, especially the ability to properly cost the business operations in order to determine a fair value of services (for example

pollination). Furthermore, it was noted that the ability of honey producers to market their business and generate a price premium was also lacking.

Addressing the education needs of the industry

Recently there has been a set of competency standards created specifically for the Australian beekeeping industry. These have been developed through consultation with industry experts to ensure all tasks and activities that a person would do in that particular aspect of the job are covered within the competency. The competency standards range across the entire beekeeping spectrum. These include provisions on technical skills, business management and promotion skills, human resources, occupational health and safety issues, environmental management, pest and disease management, and production of bee products. They represent the first move towards the development of an Australia-wide recognised training program for the beekeeping industry.

The competencies will provide the foundation for developing vocational training qualifications for certificates II to V. These competencies are now approved by the Australian National Training Authority (ANTA). It is planned that these will be used by public and private organisations to provide a framework for developing courses on beekeeping, educating apprentices and experienced individuals, and assessing the competency of a student. Furthermore, it will allow the recognition of skills accumulated over years of experience within the industry, known within current national training frameworks as Recognition of Current Competencies.

Any public or private organisation that is a Registered Training Organisation (RTO) and has beekeeping included in its scope of registration will be able to develop programs for students to reach these competencies. If an organisation does not have beekeeping in its scope, then it can apply under the Australian Quality Training Framework. This is a nationally agreed quality framework for the vocational education and training (VET) system approved by the ANTA ministerial council. However, to achieve this qualification the organisation must demonstrate that it has the necessary equipment and skilled trainers and assessors to undertake education in this area, and must be open to audit. Industry consultations suggest it may be very costly to achieve in terms of setting up the necessary procedures and systems to ensure quality assurance, and attracting personnel with the necessary skills and teaching ability.

Registering as an RTO with beekeeping in the scope will allow the training organisation to issue Australian Qualifications Framework (AQF) qualifications that are nationally recognised and accepted by other RTOs,

and provide individuals with national portability of their qualifications and statements of attainment they undertake.

To ensure training packages are delivered efficiently and used effectively, the honeybee industry needs to ensure either RTOs have the skills to dismantle the package of competency standards and configure training packages to suit individual business needs, or develop training programs that are nationally endorsed and used by the industry. RTOs should offer short-courses that contain only a few units of training and can be tailored to special interest groups, and longer courses that lead to a full qualification and can be used by individuals on a new apprenticeship.

Challenges to increasing training

There are three main challenges to increasing the education within the industry. These include:

- shift the culture of the industry to encourage the adoption of apprentices and accept nationally recognised qualifications;
- standardise training to ensure the skills set for courses are consistent across Australia; and
- increase the supply of RTOs who have beekeeping within their scope of registration.

Changing the culture of the industry to accept and trust qualifications obtained from training courses may be a long process. This is because the diversity of beekeepers across Australia means there will be a diverse range of skills, and changing habits is hard. Some beekeepers might do things differently and not agree with the industry standards. Therefore the introduction of training programs needs to be accompanied with national promotional activities that explain the courses offered and the expectations beekeepers should have when employing someone who has undertaken formal training. The industry needs to develop an educational brand that is easily recognised and represents quality and consistency.

Any education program must be standardised across the industry to generate confidence and facilitate the transfer of qualifications and skills. Recognised qualifications will bring to the industry a sense of professionalism and allow the industry to develop standards of service (for example recognition of being a professional pollinator), which can be used to instill confidence within the industry and enable those outside the industry to differentiate between the various skills of a beekeeper.

Currently there are very few organisations across Australia that can readily acquire the necessary accreditation as an RTO with beekeeping in their scope of registration. This means that even though competency standards have been developed, the ability of the industry to source qualified trainers is very limited. The inability of individuals to access training facilities may limit any attempts to promote training within the industry.

The primary challenge to increased training in the honeybee industry is developing the necessary infrastructure to deliver programs to increase the supply of individuals and organisations who have the capacity to offer AQF qualifications. This includes developing an education program to train potential educators, which could be done through public training organisations (such as TAFE colleges and DPIs) or private organisations. To leverage off the existing infrastructure, courses currently offered by New South Wales DPI and TAFE colleges should be extended to cover the full gamut of the honeybee industry skills and ensure access to training is available across Australia.

To address any access issues, the industry should determine whether a program could be developed that combines distance education with practical courses. The New South Wales DPI is currently offering short courses (through the TOCAL College) on farm business management with a beekeeping elective through a combination of distance learning and a practical weekend course at the end. Furthermore, New South Wales TAFE currently offers a number of distance education courses through its Open Training and Education Network that provides graduates with nationally recognised qualifications through the AQF. The industry should determine whether it is viable to extend these programs to deliver training programs that can be specialised, or larger courses that can be used to form the basis of an apprenticeship.

Funding

To address the expected education requirements of the industry, the industry has two general funding options available:

- private funding, where individual organisations invest their own capital to develop training packages; and
- public funding, where the Commonwealth and state governments subsidise the development of education programs.

Private funding will only occur if the return from developing an education program is sufficient to cover any risk that may be involved. This means that expected demand for the education program on a user pays basis must

be sufficient to cover fixed and variable costs of the trainer, including the initial costs of receiving the necessary qualifications to become a RTO with a beekeeping scope.

Government subsidies mitigate some of this risk by reducing the amount of money required to be invested by the individual, and therefore improve the risk reward relationship.

Through ANTA, the Commonwealth provides grants to the states and Territories for the provision and support of VET. Funding decisions are consistent with a national strategic plan for VET, based on agreed national objectives and priorities. Commonwealth funds make up approximately one third of public expenditure on the VET system in Australia.

In addition, the FarmBis program offers an avenue for the industry to source additional funding. It is jointly funded by the state and federal governments, and in Victoria, for example, is managed by the Department of Natural Resources and Environment (DNRE) and administered by Rural Finance Corporation. To gain funding, organisations need to register with FarmBis and be approved as an eligible training provider.

The FarmBis program was developed to reduce the cost of training to individuals and to improve the self-reliance and ability and rural producers to adapt to a changing environment. It subsidises 50 per cent of course costs. Topics available for funding include people management, financial management, marketing, general business management, production management, and natural resource management.

However, AHBIC has recently noted some problems with access to the FarmBis program. These include:

- some FarmBis personnel do not recognise an apiary as a primary production activity and therefore refuse funding;
- different state requirements for funding can cause confusion in the industry; and
- FarmBis funding is not prioritised according to industry requirements, which reduces the ability of the industry to focus education on those areas with greatest need.

The industry needs to address these problems by working with the government on the classification of beekeeping as a primary production activity, providing industry participants with a booklet that outlines the various approaches that should be taken for each state to gain FarmBis

funding, and demonstrating to FarmBis that funding in a specified area will generate more benefits to the industry and the Australian public.

Educating the public and government

Throughout the workshops a number of participants noted that the public and government needed to be educated on the benefits the honeybee industry provides to the economy from pollination services both paid and incidental. Industry consultations suggest this has been happening on a small scale in Queensland through the Food and Fibre Trail and Rural Discovery Days, where school children are educated on these issues.

However this story is not enough. The industry also needs to address the perceived and actual cost imposed on the environment and society from beekeeping in public areas. These costs can be broadly defined into two categories:

- perceived risk of commercial beekeeping practices on Australian flora and fauna; and
- costs imposed on other users of native forests, including the reduction in value from a perceived reduction of a pristine environment.

The first category has been investigated by several researchers. Moncur (2004) concluded that despite these inquiries, there is no conclusive evidence that commercial beekeeping negatively impacts the native flora and fauna and therefore there is no case for removing commercial beekeeping from native forests in national parks.

Whether beekeeping impacts on native flora and fauna is obviously a concern for the Commonwealth and state governments. However, finding inconclusive evidence will not provide the industry with a strong argument against the Precautionary Principle because that is why it was introduced in the first place, to minimise the risk to forests when there is no evidence otherwise.

Developing environmental management strategies will go some way to convincing the government and public that the industry is minimising the risk managed honeybee enterprises may impose on native flora and fauna. This should be a priority for the industry before it launches any educational campaign. Demonstrating that the industry is concerned for the environment and promoting its efforts to minimise any environmental impact honeybees may impose will provide solid evidence that the industry is serious about reducing risk.

The second category relates to the value society receives from using public land for alternative uses such as tourism and recreation. Every time a beekeeper drives a truck down an access road they impose a cost on those users who are there to enjoy the environment. Placing large numbers of bee hives in public access areas also reduces the value of the area to other users as they are not only confronted with a man-made structure but are at risk of being stung. In some cases this could impose a massive health cost if the person is allergic to bee stings.

In addition there is also a cost from beekeeping on public land imposed on those who do not actively use the land. Knowing an area such as a national forest does not have large trucks driving through it, or access roads interrupting the landscape, provides the individual with the option of using the forest in the future. Furthermore, society derives value from just knowing a forest exists in its pristine state. Any incursion into the public land by beekeepers will reduce these types of value.

Therefore any educational program must also address these issues to generate confidence within government and society that the industry is minimising these costs. To achieve this it must develop a code of practice and industry standards that are independently audited so it can demonstrate on paper that it is taking the necessary steps to preserve the value provided to other users of the park.

Key conclusions

- Although a number of issues relating to education were identified in the workshop, any formal education program developed to address the needs of the honeybee industry must be based on a detailed analysis of the expected future industry training and education requirements. This requires an understanding of both the current numbers and age structure of participants within the industry and how they might change in the future. Developing an education outlook for the industry should be a priority in order to remove any impediments to planning for ongoing industry growth.
- Any formal education within the honeybee industry should be undertaken by registered educational organisations. This means the organisation must be able to demonstrate it employs qualified personnel, has the necessary beekeeping equipment and class resources, and that the course is accessible to the industry. This will enhance confidence in educational standards within the beekeeping industry and help promote the standardisation of courses and the transfer of skills.

- Educational training needs to be accompanied by promotional activities to develop an educational brand that is recognised and represents quality and consistency.
- Educational programs should be standardised to ensure confidence and consistency, which will facilitate the transfer of qualifications and skills.
- The industry needs to invest in developing its training capacity to ensure the necessary educational infrastructure is available. This includes investigating current training programs and the possibility of augmenting them to encapsulate the full skills set of the honeybee industry.
- AHBIC should work with the government for more educational funding, and provide advice to current and potential trainers on how to address various state requirements for funding.
- Educating the government and public should address not only the perceived impacts beekeepers have on native flora and fauna but also the cost imposed on society by beekeepers using national forests and conservation areas. This will only be effective if the industry has a nationally recognised code of conduct relating to the use of national forests.

11 *Risk analysis and assessment*

There are several risks facing the Australian honeybee industry although some will have a higher impact than others. Table 11.1 outlines the various risks that have been identified throughout this study and chart 11.2 presents a risk assessment matrix that categorises the level of risk (probability of occurrence) with the likely impact on the industry. This chart should be used to assist the industry to identify the immediate areas of concern and where limited resources should be appropriately used.

Decisions about which risks to tackle first should be based on sound financial management practices that match up the expected cost of reducing the risk with the potential reward to the industry. However, there are some risks that should be immediately addressed, including:

- introduction of exotic pests and disease into Australia;
- access to natural resources;
- contamination and labelling of Australian honeybee products.

These three represent the biggest risks to the industry as they have the potential for the biggest impact.

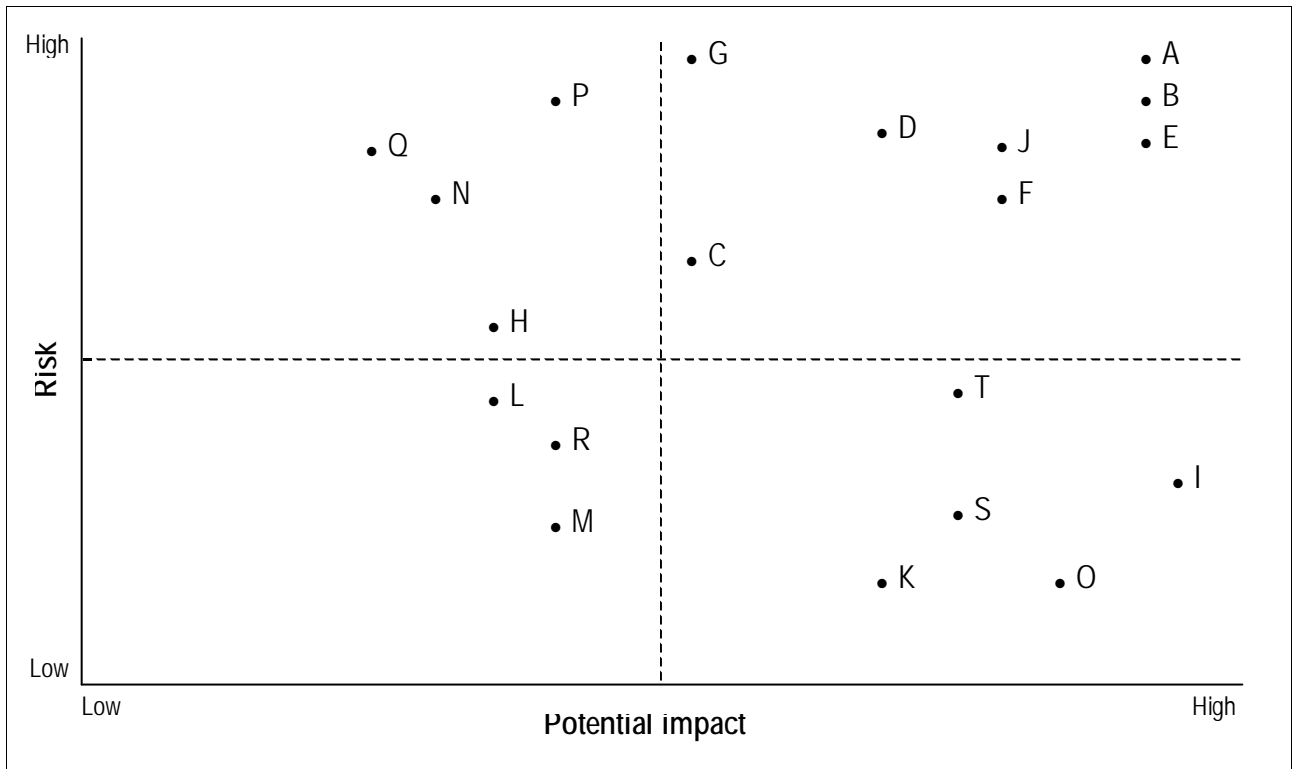
There are some risks that the industry can completely remove. For example, the risk of loss of access to native forests can be substantially reduced through working with government as outlined in chapter 6. This may only require continual investment until favourable decisions are made.

However, there are some risks that the industry has no real direct control over. For example honey prices on the domestic and international markets are a result of complex interactions between supply and demand, and Australia cannot influence these to any great extent. Also the possibility of exotic disease and pests entering the country. For these types of risks, the industry will have to develop programs that minimise these risks and continually invest in their operation to ensure risk levels do not increase. This means developing programs that do not impose unnecessary financial restrictions on any industry participant, or create distortions within the market, or limit competition within the industry.

11.1 Identified risks in the Australian honeybee industry

<i>Risk matrix code</i>	<i>Description of risk</i>
A	Introduction of varroa mite
B	Introduction of exotic disease
C	Increase in domestic disease
D	Introduction of foreign bee species
E	Further decrease in access to resources
F	Contamination discovered in Australian honey
G	Contamination discovered in other Australian honeybee products
H	Low demand for pollination services from growers
I	Australia Post stopping delivery of queen bees
J	Continued low prices in honey
K	Reduced international market access
L	Increased market pressure from Australian retailers
M	Increased competition from imported retail honey packs
N	Increased competition from generic honey brands
O	Continuing decrease in demand for Australian honey on the domestic market
P	Increased supply of honey on world markets from large international producers
Q	Rising fuel prices
R	Adverse publicity on the impact of beekeepers on native forests
S	Adoption of chemicals by some beekeepers
T	Poor public perception of Australian honey both domestically and abroad

11.2 Risk assessment matrix of the Australian honeybee industry



Appendixes

A

The resource base in each state

Victoria

The apiary industry in Victoria uses a combination of both private and public land with around 30 per cent of hives located on private land (Goodman 2001, p. 11). Beekeeping is permitted in designated public land apiary sites located in state forests, parks and reserves, including selected national parks and other public land. To access this type of land a licence or permit fee is required. This can be either a long term tenure that is renewed annually or a short term tenure where permits are issued for a period of between three and six months.

The primary targets for Victorian beekeepers are eucalypts. Table A.1 shows the top ten target plants for nectar and pollen. The majority of these plants are native vegetation found in public areas.

The management of public land in Victoria is undertaken by the Environment Conservation Council (ECC). Their responsibility is to ensure a balanced use of public land. However the actual administration of bee sites in Victoria is undertaken by the DNRE.

In the early 1980s, the ECC started to reduce access to public land for beekeepers through the establishment of buffer zones around Reference and Wilderness areas. This prohibited beekeepers from establishing new apiary sites within and around the Reference and Wilderness areas. With

A.1 Top ten plants targeted by Victorian beekeepers

Nectar plants

Grey box
Red gum
Red ironbark
Yellow box
Clover
Banksia
Messmate
White mallee
Yellow gum
Canola

Pollen plants

Capeweed
Red gum
Grey box
Wild turnip
Clover
Banksia
Messmate
Wattle
Canola
Red stringybark

Source: Goodman (2001).

the creation of additional large wilderness areas in the late 1980s, beekeepers found themselves even more restricted in available land (Benecke 2003, p. 15).

According to Bob McDonald, Resource chairman of the Victorian Apiarists Association, a large part of public land is not available for commercial beekeeping (Benecke 2003, p. 19). Consequently there is a lot of competition for bee sites with temporary tenures being held permanently. The only way beekeepers can obtain access to national parks is if the area has a history of being used for beekeeping before becoming a national park. Therefore, new beekeeping sites are not allowed.

New South Wales

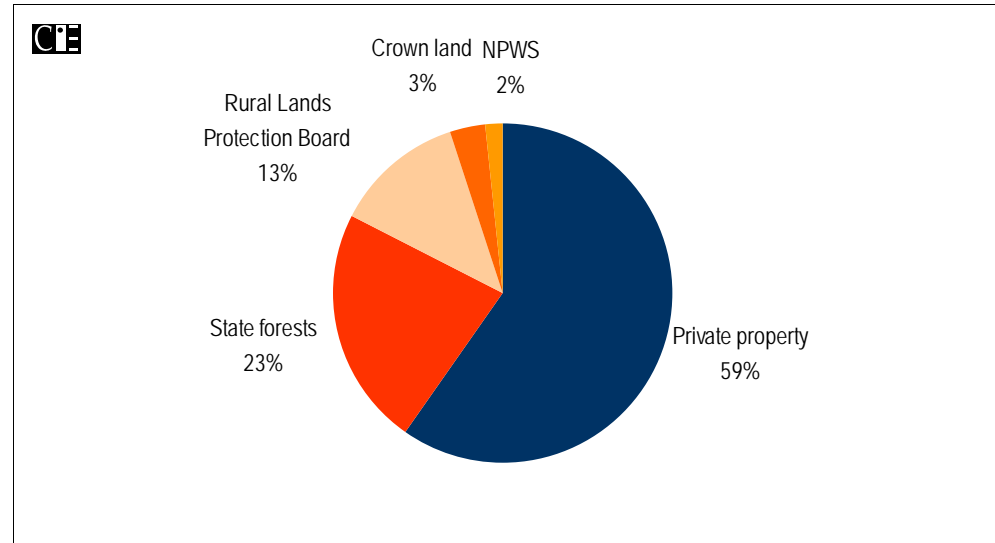
The New South Wales beekeeping industry is the largest in Australia, producing approximately 45 per cent of the Australian honey crop (Somerville 1999). There are over 227 species of flora used by New South Wales commercial beekeepers (those with more than 200 hives), although there are approximately 51 core species that are used across the state (Somerville 1999).

In 1997, it was estimated that 35 per cent of New South Wales woodland was located on private property, while the other 65 per cent was made up of various types of conserved areas, including Crown lands (24 per cent), state forests (20 per cent), national parks (19 per cent), and various water authorities (1.5 per cent) (Benecke 1998, p. 2).

Chart A.2 shows the portion of sites for each type of land used by commercial beekeepers in New South Wales. Private property is the largest contributor to the apiary industry with approximately 59 per cent of the total number of hives being located on this type of land.

Table A.3 shows the top ten honey and pollen flora stated by New South Wales apiarists. State forests are essential in providing beekeepers with high yielding floral resources. To obtain a site in a state forest, the beekeeper must obtain a licence, usually for six or twelve months. These can be renewed annually. Many sites are booked by beekeepers on an annual basis and maintained from year to year. However these sites might only be used sporadically, depending on the floral production within the site (Somerville 1999).

A.2 Portion of commercial hives by licensing type



Data source: Somerville (1999).

A.3 Top ten plants targeted by New South Wales beekeepers

Nectar plants

Paterson's curse, Salvation Jane
 Yellow box
 Grey ironbark
 Spotted gum
 Canola
 Red stringybark
 River red gum
 Mulga
 White box
 White clover

Source: Somerville (1999).

Eucalypt species are the most important types of plants for beekeepers in New South Wales. These provide high honey yields and relatively good flowering potential. Although canola is not grown on public land, bees on public land can also access canola blossom from neighbouring private property.

Bee sites on private property mainly rely on pasture weeds and agricultural crops, including Paterson's curse, canola, and lucerne.

Restrictions on public land access in New South Wales began in 1984 when the National Parks and Wildlife Service started to phase out beekeeping from national parks. Although lobbying by the industry resulted in an amendment to the policy in 1990, this only covered those apiary sites that were being leased at the time and therefore resulted in many sites that were not leased being lost to the industry (Benecke 2003, p. 14).

Since then there have not been any new beekeeping sites permitted by the National Parks and Wildlife Service. Existing sites can generally only be obtained by buying an existing business, although if a site does become available, the New South Wales Apiarists' Association allocates the vacant site by ballot.

In addition, New South Wales beekeepers are facing pressure from a shift in forest categorisation from state forest to national park. As fewer access roads are maintained in national parks compared with state forests, beekeepers are faced with a reduction in access to sites.

State forests have also limited the allocation of new sites. The most sensitive zones (zones 1 and 2) as established under the RFA limit transferability of existing sites and do not allow the establishment of new sites (Benecke 2003, p. 17).

South Australia

Commercial honeybee sites are widely dispersed across the arable parts of South Australia. However, most beekeeping in South Australia is conducted on private land, with approximately 25 per cent located in a small number of public parks and public conservation areas including forest reserve, water catchment areas, national parks, and heritage agreement areas (Benecke 2003, p. 18).

There are over 98 plant species that have been identified as providing important floral resources to beekeepers in South Australia (Paton et al. 2004). This is made up of native species (67 per cent), exotic species (19 per cent), and crop plants (14 per cent).

The most important types of plants to South Australian beekeepers are eucalypts. Table A.4 shows the top ten plant species that honey delivered to Capilano was produced from between 1991 and 2002.

According to Paton et al. (2004), the major factors that South Australian apiarists have listed as limiting resources include:

- dieback of eucalypts;
- grazing of understorey shrubs;
- more frequent drought conditions; and
- reduction in agricultural weeds associated with a shift from grazing to cropping.

Queensland

Commercial beekeeping in Queensland uses approximately 62 per cent private and 38 per cent public land. Chart A.5 shows the portion of land type used for commercial beekeepers in Queensland in the mid 1990s.

The majority of the most sought after plants by beekeepers in Queensland are the eucalypts. There are approximately 145 nectar producing plants and 205 pollen producing plants that have been identified as important by the Queensland beekeeping industry (Rhodes and Trueman 1999). Table A.6 shows the top 10 plants for both nectar and pollen.

The heaviest concentration of beekeeping sites is in the south eastern corner of Queensland, although there are a number of commercial beekeeping sites all along the entire eastern coast.

The Queensland apiarist industry has a consultative committee with the public land managers, which includes the DPI, Lands, Forestry, Conservation and National Parks, Fisheries and Wetlands.

A.4 Top 10 plants that honey was produced from by South Australian beekeepers^a

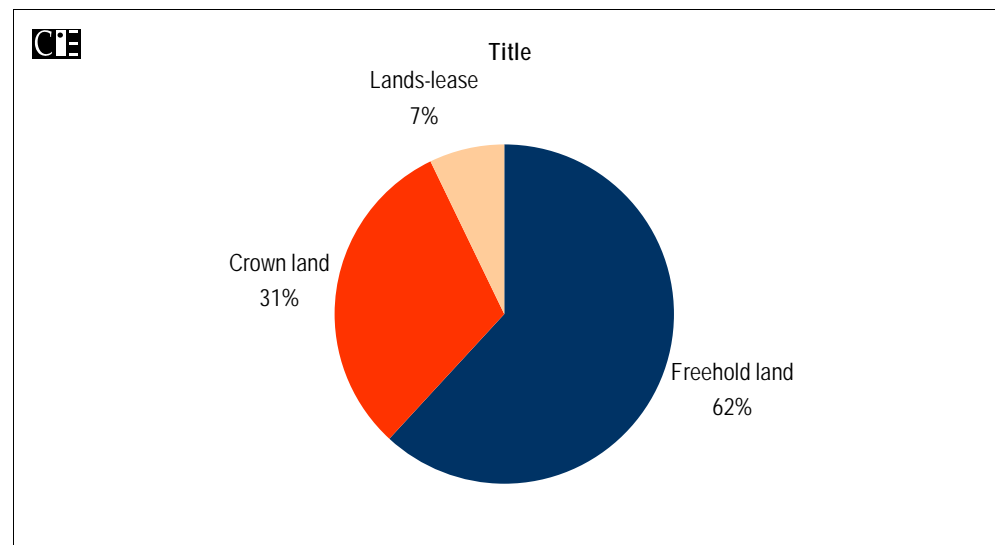
Nectar plants

	%
Mallee spp	19.3
S.A. blue gum	19.2
Lucerne	16.3
Salvation Jane	12.6
Ti tree	3.3
Canola	3.1
Red gum	2.8
Clover	2.5
Red mallee	2.0
Orange	2.0

^a Based on total honey delivered to Capilano between 1991–2002.

Source: Paton et al. (2004).

A.5 Portion of commercial hives by land type



Data source: Rhodes and Trueman (1999)

A.6 Top 10 plants targeted by Queensland beekeepers

Nectar plants

Grey ironbark
Narrow leaved ironbark
Spotted gum
Blue gum
Paper barked tea tree
Brush box
Yellow box
Yapunyah
Bluetop ironbark
Mt Coolibah

Pollen plants

Spotted gum
Narrow leaved ironbark
Blue gum
Paper barked tea tree
Turnip weed
Clover
Hill gum
Eremophila spp.
Grey ironbark
White mahogany

Source: Rhodes and Trueman (1999).

Apiarists in Queensland are concerned by the reduction in available suitable flora for honeybees. Initially this was due to clearing of native flora for grazing and agricultural purposes and the use of pesticides and herbicides by adjoining private properties.

Although beekeepers still have access to state forests, they are faced with restrictions on using national parks. In 1990, the National Parks Authority declared that no new sites would be established in national parks and those sites located in new national parks would be phased out within three years. As a result, the *Nature Conservation Act* established in 1992 did not allow beekeeping on newly created national parks even if there has been a history of beekeeping on that site.

However, industry consultations have led to a compromise solution (Benecke 2003, p. 14).

Tasmania

The principal plant used by Tasmanian apiarists is leatherwood, accounting for approximately two thirds of Tasmania's honey production (DPIWE 2005). This type of eucalyptus is found in rainforests in the southern and western areas of the state, primarily within Tasmania's world heritage areas (40 per cent) and state forests and national parks (60 per cent).

Access to these sites is essential for the continual operation of the Tasmanian apiary industry. Although World Heritage Areas still allow apiary sites to be used, transferred, and created, the restriction on building new roads within these areas severely restricts the ability for beekeepers to set up new sites.

Problems with clear-felling in the south of Tasmania has been noted as the greatest problem facing beekeepers (Benecke 2003, p. 19)

Western Australia

Approximately 80 to 90 per cent of the honey produced in Western Australia uses native flora located in conservation areas and state forests (Benecke 2003, p. 20). These are managed by a number of government agencies and local authorities.

The majority of apiary sites are located in the South West region (73 per cent). Chart A.7 shows the portion of land use for hives throughout Western Australia.

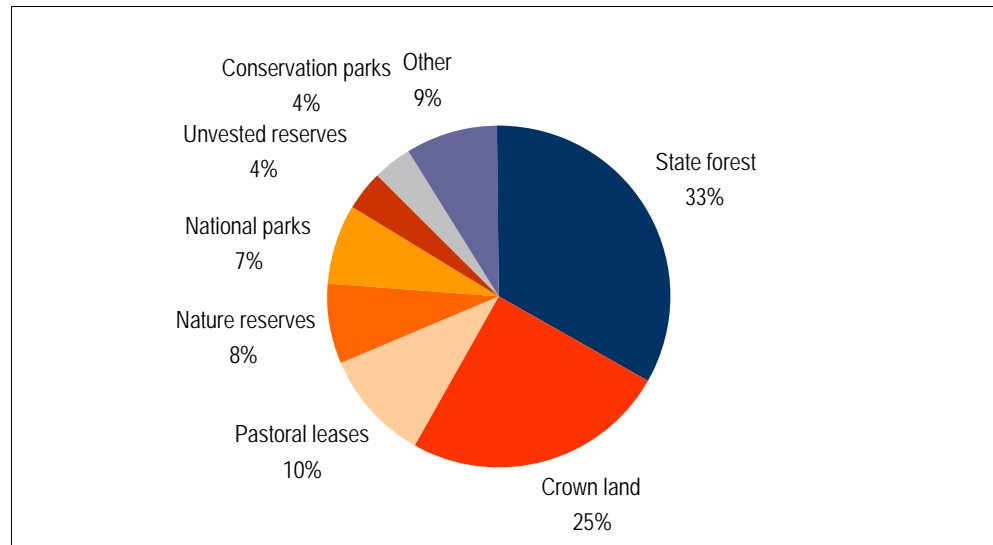
Bee sites can only be transferred with the sale of a beekeeping business. There are strict rules regarding the placement of apiary sites, including a minimum of three kilometres distance between each to reduce the spread of disease.

Northern Territory

There is a small beekeeping industry in the Northern Territory located in the tropical north. However the wet and dry seasons impose restrictions on the potential for honey production. Beekeeping is banned from national parks.

Honey producing flora used by Northern Territory apiarists consist mainly of native plants. Table A.8 outlines those plants that are considered useful for honey production throughout the year.

A.7 Portion of hives in Western Australia by land type, 2003



Data source: NatureBase (2005).

A.8 Plants that were sourced from by NT beekeepers^a

Plants	Flowering period
Weeping box	December-January
Spermacoce breviflora (herb)	March-May
Red bud mallee	April-July
Woollybutt	May-August
Stringybark	June-August
Paperbark	June-November
Salmon gum	July-September
Silver-leaved paperbark	August-October
River red gum	August-November
Ironwood	August-November
Northern grey box	September-December
Broad leaved paperbark	November-April

B

*Regulatory framework of public
land access in Australia*

B.1 Regulatory framework of public land access in Australia

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Queensland			
	Department of Primary Industry Forestry (Qld)	Apiaries Act 1982 (Qld)	<ul style="list-style-type: none"> ▪ All beekeepers state wide must be registered under the Apiaries Act (cost \$10.60 per year) ▪ Distances between sites is determined by the number of hives on each site, ranging from no minimum distance to 20km ▪ One hive in fifty is to be marked with the apiarist's Apiaries Act registration number, with lettering to be no less than 25mm high ▪ The Department must be notified within 48 hours of the detection of a notifiable disease
Urban environments		Code of Practice for Urban Beekeeping in Queensland	<ul style="list-style-type: none"> ▪ Limitations placed on the number of hives based on urban density, ranging from 0 to 10 hives per site ▪ Number of requirements surrounding the provision of water, robber bees, docile bees, disease control, flight path management, transportation of hives, swarming, feral swarms and colonies, use of smoke management, lights and honey sheds
Forest reserves	Department of Primary Industry Forestry (Qld)	Forestry Act 1959 (Qld)	<ul style="list-style-type: none"> ▪ Apiary sites in forests are fixed, with allowed sites having been assessed for suitability allowing for forest type, water, microclimate, current forest use and road access ▪ Sites are defined as a 40m radius from the site marker ▪ Sites are located at least 1km apart and 40m from roadways, with each site capable of holding up to 150 hives as well as allowing for truck access and turnaround ▪ Apiarists must construct a firebreak of 2m width, and the whole site is to be maintained in a neat, tidy and non-flammable condition ▪ Fees range between \$59.50 (six months) and \$333.30 (five years) ▪ Permits are obtained from the relevant Queensland Department of Primary Industries Forestry office

(Continued on next page)

B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Queensland (continued)			
Resource Reserve Conservation Parks	Queensland Parks and Wildlife Service	Nature Conservation Act 1992 (Qld)	<ul style="list-style-type: none"> ▪ Apiary permitted if not in conflict with other management objectives ▪ There must be at least 1km between apiary sites, with a minimum distance of 40m from public roads and 300m from public recreation areas ▪ Maximum of 150 hives at each site ▪ Permits recommended to be applied for 30 days in advance of being needed ▪ Fees range between \$59.50 (six months) and \$333.30 (five years) ▪ An environmental Code of Conduct for beekeeping on QPWS land is currently being developed in consultation with Queensland Beekeeping Association ▪ Coordinated Conservation Area and Nature Refuges – beekeeping may be agreed to through negotiation, and depends on underlying land ownership ▪ World Heritage Management Area – beekeeping subject to the requirements of the underlying ownership
National Park and Wilderness Areas	Queensland Parks and Wildlife Service	Nature Conservation Act 1992 (Qld)	<ul style="list-style-type: none"> ▪ Beekeeping not permitted, except for phase-out of existing permit holders in national parks to be completed by 2024
Reserves, local roads and stock routes and unallocated state land	Department of Natural Resources and Mines (Qld)	Land Act 1994 (Qld)	<ul style="list-style-type: none"> ▪ Maximum of 150 hives at each site ▪ Fees are \$87.80 for a one-off three month period or \$75 per year (plus \$132.05 initial fee) ▪ In considering applications, DNR&M seeks views from the relevant local government authorities, the Department of Primary Industry Forestry Apiary section, Department of Main Roads and Environmental Protection Agency
Leasehold land	Land holder		<ul style="list-style-type: none"> ▪ Use allowed so long as the proposed use is not inconsistent with the purpose and conditions of the head lease. ▪ Fees as negotiated with land holder (plus \$124.50 initial fee)
Roads and main roads	Department of Main Roads (Qld)		<ul style="list-style-type: none"> ▪ Each site is 20m x 6m, with no more than 150 hives allowed ▪ Sites have to be a minimum 1km apart, 9m from the closest edge of roadway ▪ 2m fire breaks must be cleared and maintained at the site ▪ No fee applies
Power line easements	Regional electricity authority and owner		<ul style="list-style-type: none"> ▪ No fee applies
Freehold (privately owned)	Land owner		<ul style="list-style-type: none"> ▪ Fees as negotiated with landowner

(Continued on next page)

B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
New South Wales			
	Department of Primary Industries (Forests) (NSW)	<p>Apiaries Act 1985 (NSW)</p> <p>Stock Diseases Act 1923 (NSW)</p> <p>Exotic Disease Act 1991 (NSW)</p>	<ul style="list-style-type: none"> ▪ All beekeepers required to be registered, costing \$18 plus \$3 for every ten hives every two years ▪ Moving bees from interstate requires a health certificate to be issued by an appropriate Apiary Inspector in that state ▪ Beekeepers are required to notify Apiary Inspectors of the presence of a range of diseases within twenty four hours of discovery ▪ Sites are to be identified with their New South Wales Apiaries Act registration number in accordance with the Act
State Forests	Department of Primary Industries (Forests) (NSW)	Keeping Bees of Forested Lands Code of Practice	<ul style="list-style-type: none"> ▪ State forests are divided up into a fixed number of predetermined apiarist sites, which are available for use with applications for site access made through the local New South Wales state Forestry office ▪ Approved apiarists are issued with an Occupation Permit (Bee Farming) which regulates the beekeeping activities on the land ▪ Site fees are \$84.70 per year, though this fee has been waived in previous years due to the impact of the drought ▪ Access to sites is managed by the local New South Wales State Forestry office ▪ The Code of Practice outlines conditions on apiary management, fire prevention, indigenous issues, environmental protection and the movement of apiaries
National Parks	National Parks and Wildlife Service, Department of Environment and Conservation (NSW)	<p>National Parks and Wildlife Act 1974 (NSW)</p> <p>Wilderness Act 1987 (NSW)</p> <p>Threatened Species Conservation Act 1995 (NSW)</p> <p>Keeping Bees of Forested Lands Code of Practice</p> <p>National Parks and Wildlife Service Beekeeping Policy</p>	<ul style="list-style-type: none"> ▪ Licensees will only be issued to beekeepers registered in New South Wales ▪ Sites in wilderness areas must be relocated to areas which are not declared wilderness areas prior to apiarist businesses being sold or transferred ▪ Beekeeping is only permitted on existing sites with no new sites being established ▪ Access to available existing sites is determined by a ballot administered by the New South Wales Apiarists' Association ▪ If available existing sites are not claimed within six months they are then removed from the list of apiarist sites ▪ Except in declared wilderness areas, sites may be transferred to other family members or others through the sale of an apiarist business ▪ When moving bees onto, between, or off sites, apiarists are required to inform the Park District Manager ▪ The National Parks and Wildlife Service has a comprehensive set of conditions which apply to beeping activities in national parks ▪ Site fees are \$75 per year, though this fee has been waived in previous years due to the impact of the drought
Rural lands	Relevant Rural Land Protection Boards		<ul style="list-style-type: none"> ▪ Each Rural Lands Protection Board has their own conditions for beekeeping on lands under their control

(Continued on next page)



B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Northern Territory			
	Department of Business, Industry and Resource Development (NT)	Stock Diseases Act 2004 (NT)	<ul style="list-style-type: none"> When importing bees, bee equipment into the NT, a Bee Health Certificate signed by an appropriate Apiary official from the exporting state is required.
Public lands			<ul style="list-style-type: none"> No beekeeping is allowed on public lands
Urban lands			<ul style="list-style-type: none"> There are no regulations covering beekeeping in urban areas
Leasehold lands			<ul style="list-style-type: none"> There are no regulations covering beekeeping on leasehold lands
Victoria			
	Department of Primary Industries (Vic)	Apiary Code of Practice 1997 (Vic) Livestock Disease Control Act 1994 (Vic)	<ul style="list-style-type: none"> Annual registration fee of \$11.60 for the first 60 hives, or when 61 hives or more, \$0.19 per hive All hives must be branded with the beekeeper's registration number, with lettering at least 19mm in height The Bees Registrar must be notified within seven days of a hive being sold or given away The presence, or suspicion of, American Foulbrood must be reported within 12 hours of detection
	Department of Primary Industries (Vic)	Apiary Code of Practice 1997 (Vic) Livestock Disease Control Act 1994 (Vic)	<ul style="list-style-type: none"> Apiary sites are not permitted on public land within 1.6km in the case of an annual permit or 0.8km in the case of a temporary permit of a wilderness park or zone Apiary sites are not permitted near major recreational zones (note distances vary with local conditions) When importing bees, queen bees, hives and any associated equipment from another state, a certificate stating that the equipment came from a disease free apiary and signed by an appropriate state Government apiary official from the state of export No bee equipment can be imported from Tasmania
National Parks	Parks Victoria	National Parks Act 1975 (Vic)	<ul style="list-style-type: none"> Apiculture is only allowed in parks where authorised by the state government, and only on sites where it is a traditional use not in conflict with other management objectives Apiculture is not permitted within reference areas or on other public land within 2km of the boundaries of a reference area The establishment of a new road or track requires the approval of the Director, National Parks Service, though generally, in principle, construction of tracks to apiary sites is to be minimised

(Continued on next page)

B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Victoria (continued)			
Box-Ironbark reserves	Parks Victoria	National Parks Act 1975 (Vic)	<ul style="list-style-type: none"> ▪ Apiculture is allowed in areas away from recreation areas
State Forests	Department of Sustainability and the Environment (Vic)	Code of Forest Practices for Timber Production 1996 (Vic) Apiculture (Beekeeping) on Public Land Policy 1995 Forests Act 1958 (Vic) Lands Act 1958 (Vic)	<ul style="list-style-type: none"> ▪ Hives must not be placed within 200m of an occupied residence or constructed fireplace or within 50 metres of a road, track, reservoir, tank, waterhole or watercourse without permission ▪ The locations of all sites are pre-determined, with a number of annual and temporary (three to six month) licences available ▪ The Apiculture (Beekeeping) on Public Land Policy sets out specific fire protection, site suitability, access availability and costs of maintaining access and general site requirements for apiculture in state forests
Western Australia			
	Department of Conservation and Land Management (WA)	Conservation and Land Management Act 1984 (WA) Beekeepers Act 1963 (WA) Beekeeper's Code of Practice 1989	<ul style="list-style-type: none"> ▪ Site rental fees are \$60 per annum for a site in the South West zone and \$12 per annum for other areas ▪ Site application fees are \$100 for every five sites in the South West zone and \$50 for every five sites for other areas ▪ Permits are not granted for sites within 3km of an existing site ▪ Permit holders are required to display a sign showing a contact name and phone number, site permit number for each occupied site
	Department of Conservation and Land Management (WA)	Conservation and Land Management Act 1984 (WA) Beekeepers Act 1963 (WA) Beekeeper's Code of Practice 1989	<ul style="list-style-type: none"> ▪ Consent of the Department of Conservation and Land Management is required prior to transferring a site permit ▪ Transferring a permit costs \$8.50 per site permit. Permits cannot be sold, only transferred for no monetary gain ▪ Apiary site permits cover 1.25ha ▪ There are no restrictions on the number of hives that can be placed on each site ▪ All permit applications are handled by a central point in the Department of Conservation and Land Management ▪ Note: the Department of Conservation and Land Management is currently in the process of standardising fees across the state so as not to have South West and Other zones

(Continued on next page)

B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Western Australia (continued)			
State forests, national parks, nature reserves and conservation parks		Code of Conduct for Apiary Site Permits 2000 (WA) Forest Management Regulations 1993 (WA)	<ul style="list-style-type: none"> Permit applications take between four to six months for a decision, and have to be approved by the Minister for the Environment (Western Australia)
Unallocated crown land, unvested reserves, shire reserves, pastoral leases			<ul style="list-style-type: none"> Permit applications take between three to four months for a decision For pastoral leases, apiarists must discuss access, hive placement, and water availability with the lessee
Defence Estate areas			<ul style="list-style-type: none"> Along with the public lands requirements, apiarists are required to contact the Western Australia Property Officer at the Department of Defence to confirm arrangements and paper work
Tasmania			
			<ul style="list-style-type: none"> Queen bees and escort bees may be imported in Tasmania provided that they are in new queen cages and the escort bees have been hand-caught Used apiary equipment may not be imported
Hydro Electric Corporation land	Hydro Electric Corporation		<ul style="list-style-type: none"> Site fees are \$10 per site plus \$1.80 per hive Apply directly to Hydro Electric Corporation for access to their sites Applications for sites can be rejected if deemed to be too close to existing sites
World Heritage Area and Wilderness land	Department of Primary Industries, Water and Environment (Tas) Parks and Wildlife Service (Tas)		<ul style="list-style-type: none"> No expansion is permitted unless further research indicates that apiary activities do not pose a threat to the natural processes and biota of the World Heritage Area
Reserved and Crown land	Department of Primary Industries, Water and Environment (Tas)		<ul style="list-style-type: none"> Details to be confirmed

(Continued on next page)

B.1 Regulatory framework of public land access in Australia Continued

<i>Land tenure types</i>	<i>Jurisdiction</i>	<i>Relevant legislative and other controls</i>	<i>Specific requirements and comments</i>
Tasmania (continued)			
State forests	Forestry Tasmania	Forestry Act 1920 (Tas) Guidelines for Beekeeping on state Forest Land (Tas) Community Forest Agreement (Tas) Regional Forestry Land Management Direction	<ul style="list-style-type: none"> ▪ Applications for sites are made centrally to Forestry Tasmania ▪ Transfers of sites must be approved by Forestry Tasmania ▪ Annual site fees are \$33 per site plus \$1 per fifty hives
South Australia			
	Department of Primary and Resource Industries (SA)	Livestock Act 1997 (SA) Industry Funding Schemes Act 1998 (SA)	<ul style="list-style-type: none"> ▪ Beekeepers have to be registered, with an annual registration fee of \$15 ▪ Additionally, beekeepers have to pay \$2 for five or less hives, or \$0.40 per hive for six or more ▪ Beekeepers with 20 or more hives must submit a honey composite annually for the purposes of disease control ▪ When importing bees or bee equipment, Movement Certificates signed by the appropriate Apiary Officer in the exporting state to certify the items are disease free ▪ Apiarists must notify the Department within 48 hours of a notifiable disease being detected ▪ Apiarists must notify the Department in writing of the sale or disposal of their hives ▪ Sufficient clean water of suitable mineral content must be available within 200 metres of the hives ▪ A person must not keep bees in Kangaroo Island or bring bees into the Island ▪ Queen bees being sent into the state require prior approval.
National parks	Department of Environment and Heritage (SA)		
Crown lands	Department of Environment and Heritage (SA)		

References

- AAFRD 2005, Commercial honey industry, Alberta Agriculture, Food and Rural Development, [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex2743?opendocument](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex2743?opendocument), accessed 16 May 2005.
- ABARE (Australian Bureau of Agricultural and Resource Economics), 2005. *Australian Commodity Statistics*, Canberra.
- Access Asia 2005, China continues to dominate world honey production, Access Asia, <http://www.confectionerynews.com/productnews/news.asp?id=53255&k=china-continues-to>, accessed 28 June 2005.
- ACCI 2005, Australian Made, Australian Chamber of Commerce and Industry, www.acci.asn.au/text_files/issues_papers/Aust_Made/AM01.pdf, Accessed 30 June 2005.
- AHA (Animal Health Australia) 2004, 'American Foulbrood Business Plan 2003-04,' Canberra.
- AHBIC (Australian Honey Bee Industry Council), 2004, A statutory levy on domestic and imported honey: The case for a compulsory levy for marketing and promotion for the Australian Honey Industry, Australian Honey Bee Industry Council.
- ANIC 2005, Almonds, Australian Nut Industry Council, <http://www.nutindustry.org.au/almonds.htm>, Accessed 30 June 2005.
- Anon 1990, 'Commercial beekeeping in Tasmania', the Honey Research Council, Canberra.
- Austrade, 2005, Market entry strategies, http://www.austrade.gov.au/australia/layout/0,0_S2-1_4-2_-3_-4_-5_-6_-7_,00.html, Accessed 28 June 2005.
- Beesource 2005, Honey situation and outlook in selected countries, <http://www.beesource.com/news/hso/hso98.htm>, accessed 16 May 2005.
- Benecke F 2003, *Commercial Beekeeping in Australia*, Rural Industries Research and Development Corporation Publication No 03/037.
- Boland, P. 2005 'A Review of the National Sentinel Hive Program: In Queensland, New South Wales, Victoria, Western Australia and the Northern Territory', June.

- CIE (Centre for International Economics) 2005, *Stocktake of the Australian honeybee industry: Workshops held in Orange 25 and 28 May 2005*, Canberra.
- — 1999. *Mid Term Review of the NHT Bushcare Programme*, Canberra.
- DFAT (Department of Foreign Affairs and Trade), 2005, STAR database, Department of Foreign Affairs and Trade, accessed 13 May 2005
- DPIWE (Department of Primary Industries, Water, and the Environment) 2005, Honey bees, <http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/EGIL-5BA9EG?open>, Accessed 19 May 2005.
- FAOSTAT 2005, Food and Agriculture Organisation of the United Nations Database, <http://faostat.fao.org/faostat/form?collection=Trade.CropsLivestockProducts&Domain=Trade&servlet=1&hasbulk=&version=ext&language=EN>, Accessed 17 May 2005.
- FDL (Fuerest Day Lawson) 2005, World honey market reports, http://www.fdl.co.uk/market-report.asp?id_content=290&id_subitem=26&id_division=6&id_parent=34&archive=1, Accessed 16 May 2005.
- Food Navigator 2005, *China restarts EU honey exports*, <http://www.foodnavigator.com/productnews/news.asp?id=57889>, Accessed 18 May 2005.
- — 2005, <http://www.foodnavigator.com/productnews/news.asp?id=53598>, Accessed 16 May 2005.
- Fuerest Day Lawson, 2005, World market honey reports, June 2004, http://www.fdl.co.uk/marketreport.asp?id_content=34&id_subitem=26&id_division=6, accessed 29 August 2005.
- Gibbs, D. and Muirhead, I., *The Economic Value and Environmental Impact of the Australian Beekeeping Industry*, 1998, report prepared for the Australian beekeeping industry, <http://www.honeybee.org.au/economics.htm>, Accessed 10 May 2005.
- Gill, R. 1989, *The Social Value of Commercially Managed Honey Bee Pollination Services in Australia*
- Goodman, R. 2001, Beekeepers' use of honey and pollen flora resources in Victoria, Rural Industries Research and Development Corporation (RIRDC), Pub No: 01/050
- Gordon, J. and Davis, L., 2003, Valuing honeybee pollination, Rural Industries Research and Development Corporation (RIRDC), Project No. CIE-15A, Pub No. 03/077.
- Hornitzky M, McDonald R, Charlton M (1991). Commercial beekeeping in Western Australia. Honeybee Research & Development Council.

- IHEO (International Honey Exporters Organisation), 2005, Member statistics, <http://www.iheo.org/miembro.php?m=1>, accessed 18 August 2005.
- Jordan, B., 2004, 'Paying for a market access assurance program. Ways to pay.' Prepared for the Australian Honey Australian Honey Bee Industry Council Industry Council, Draft report, October.
- Krell, R. 1996, Value added products from beekeeping, Food and Agriculture Organization of the United Nations, FAO Agriculture Services Bulletin No. 124
- Manning, R. 1992, Honey production, economic value and geographical significance of apiary sites in Western Australia. Honeybee Research & Development Council. Project No. DAW-3H.
- Moncur, M.W. 2005, 'Do Current Commercial Beekeeping Practices Threaten Australian Fauna and Flora?', Paper prepared for the Australian Honey Bee Industry Council, Canberra.
- National Forest Inventory, Bureau of Rural Sciences, 2003, *Australia's state of the forest report*, accessed at http://www.affa.gov.au/corporate_docs/publications/pdf/rural_science/forest_vegetation/state_of_the_forest/6_1b.pdf on 10 May 2005
- NatureBase, 2005, Beekeeping on Crown land in Western Australia. Statistical information, www.calm.wa.gov.au/forest_facts/apiary/statistics.html, accessed 19 May 2005
- NHB, 2005a, Spring newsletter, National Honey Board, <http://www.nhb.org/news/index.html>, accessed 28 June 2005
- — 2005b, Applications for honey in foods and beverages, National Honey Board, <http://www.nhb.org/foodtech/FoodApplications.html>, accessed 28 June 2005.
- NLWRA (National Land and Water Resources Audit) 2002, *Australia's Natural Resources 1997-2002 and beyond*, Canberra.
- Paton DC, Crossfield EL, Hurrell B, Rogers DJ (2004). Floral resources used by the South Australian apiary industry. Rural Industries Research & Development Corporation. Publication No: 04/089.
- PIRSA, 2005, Almonds tuned to market and consumer, Primary Industries and Resources South Australia, http://www.pir.sa.gov.au/pages/agriculture/horticulture/almonds_tuned_to_market_and_cons.htm:sectID=1228&tempID=1, Accessed 30 June 2005.
- Queensland Department of Primary Industries and Fisheries, 2005. 'Guidelines for rural beekeeping in Queensland', <http://www.dpi.qld.gov.au/extra/pdf/bees/ruralbeekeeping.pdf>, Accessed May 2005.

- Rhodes, J., and F. Trueman, 1999, Natural resource base for the Queensland apiary industry, Rural Industries Research and Development Corporation, Pub No: 99/43
- Rodriguez, V.B., C. Riley, W. Shafron, and R. Lindsay, 2003, Honeybee industry survey, Rural Industries Research and Development Corporation, Pub No: 03/039
- Rural Industries Research and Development Corporation (RIRDC), 2004, Honeybee research programme, accessed at <http://www.rirdc.gov.au/programs/hb.html#Background> on 10 May 2005
- SAFRR, 2005, Honey industry profile, Saskatchewan Agriculture, Food and Rural Revitalisation, <http://www.agr.gov.sk.ca/docs/crops/apiculture/HoneyIndustry.pdf>, accessed 16 May 2005
- Shoebridge, Joanne, 2005, *Honey industry under pressure*, <http://www.abc.net.au/landline/content/2005/s1353806.htm> Accessed 17 May 2005
- Somerville, D., 2005, Almond pollination—Supply and demand, NSW Department of Primary Industries.
- — 2005, Best practice in a honeybee pollination service, NSW Department of Primary Industries, Agnote: DAI-28
 - — 2004. The floral resources of New South Wales of primary importance to commercial beekeeping. PhD thesis. Australian National University, Canberra.
 - — 1999. Floral resource database for the NSW apiary industry. Rural Industries Research & Development Corporation. Publication No: 99/174.
- USDA 2001, China, Peoples Republic of: Honey, United States Department of Agriculture, GAIN Report, No: CH1017
- Ward, W.H., and K.F. Trueman, 2001, A quality survey of Australian honeys, Rural Industries Research and Development Corporation, Pub No: 01/049