Regional Forest Agreement for

Western Australia

Apiculture

Background Report

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FOREWORD

This background technical report provides an overview of the economic significance of the apiculture industry in WA. The relative importance of honey and other products sourced from forests within the RFA area is estimated, while administration, land management and industry outlook issues are summarised.

This report was prepared jointly by officers of The WA Department of Conservation and Land Management (Ms Joanne Wallace and Dr Martin Rayner) and the Australian Bureau of Agricultural and Resource Economics (Mr Peter Connell).

1.1 Introduction

The European honeybee (*Apis mellifera*) was introduced to Western Australia during 1846 for the purpose of honey production (Allan, 1976). Various factors combine to make conditions in south-west Western Australia ideal for apiculture. The Mediterranean climate with short, mild winters, together with an abundant native plant resource that is rich in nectar and pollen, provides for almost continuous nectar flows. This enables honey production to occur for up to 11 months of the year. The absence of economically-important bee diseases such as European Foul Brood disease, Chalkbrood disease and *Varroa*, as well as development of a quality Queen bee breeding program, have also led to the success of the industry.

Unlike most other honey producing areas around the world, Western Australian commercial honey is primarily produced from natural ecosystems, with only a minor contribution from agricultural crops and weeds. Bees commonly source nectar and pollen from native forests and vegetation, and coupled with the absence of commercially threatening exotic bee diseases, the final product is of a very high quality. The honey has a subtle flavour, high viscosity and ranges in hue from light to deep amber.

The beekeeping industry produces a number of products and makes an important contribution to the WA economy. This report provides an overview of the size, extent and economic activity of this sector.

1.2 Overview of Economic Contribution to the State

1.2.1 Size and structure of the industry

During 1995-96, there were 1,025 registered beekeepers operating in Western Australia*. Approximately 2,500 registered apiary sites occur on public land while about 1,000 unregistered apiary sites are managed on private property[1]. Non-commercial beekeepers use an average 60 hives per apiary site (Manning, 1992) while commercial operations manage up to 1,600 hives, with between 90-100 hives per site (Charlton et al., 1991). Although a beekeeper is considered commercial when managing over 50 hives, to remain economically viable a single full-time operator needs to maintain approximately 400 hives. Using these definitions and figures from the 1995-96 financial year, there are approximately 136 commercial beekeepers managing 44,153 hives in Western Australia. Of these, there are approximately 39 full-time apiarists managing 24,704 hives. Table 1.1 lists the size distribution of operations in WA.

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[1] Personal Comment, Mr. Lee Allan, Senior Apiculturist, Agriculture WA.

*Any person caring for or possessing a beehive is considered to be a beekeeper and should be registered by the Department of Agriculture WA.
Any apiary site occurring on public land must be registered.

Table 1.1 Structure of the Beekeeping Industry

Hive Range	Number of beekeepers	Total number of hives
0-5	587	1362
6-10	244	2064
11-20	34	583
21-50	96	3707
51-100	26	2025
101-200	36	5581
201-400	35	11843
401-600	25	13000
601-800	10	7070
801-1000	2	2000
1000+	2	2634
Total	1097	51869

(Source: Agriculture WA, 1997)

Honey Production

Honey is the most important commodity produced by beekeepers, followed in order of importance by beeswax, "organised" pollination, production of pollen and sale of queen bees. The location of honey production is directly related to the flowering cycles of targeted plants (Manning, 1993). The flowering cycles of plants utilised by the apiculture industry vary from annual to greater than six year cycles. Because nectar flows can be highly variable between seasons beekeepers often have a suite of preferred areas selected based on the reliability and volume of the nectar flow. Commercial apiarists may move hives between areas at least 6 times per year to follow the flowering seasons of important plant species (Charlton et al., 1991).

Most of the commercial beekeepers are based within a 100 kilometre radius of Perth, with a few at each of the rural centres of Albany, Bunbury, Busselton, Gingin, Gidgiegannup and Toodyay. Consistent annual supplies of honey are sourced from the northern coastal sandplain heathlands and agricultural crops and weeds, particularly canola (*Brassica spp.*), patterson's curse (*Echium plantagineum*) and capeweed (*Arcototheca calendula*). Other main areas of honey production are the jarrah mixed forests south of Perth and the karri forests between Manjimup and Walpole. Table 1.2 depicts the important areas used for honey production, dependent on the frequency of flowering cycles.

Table 1.2 Annual Contribution of broad Vegetation Resource "types" to Total Honey Production

Vegetation Resource	Main nectar producing plants	Flowering Cycle (years)	% of Annual Production
Coastal Sandplain	*Dryandra* spp., *Hakea* spp. and *Banksia* spp.	1	60
Agricultural land	Weeds eg. paterson's curse, capeweed		
Northern forests, south of Perth	jarrah (*E. marginata*), blackbutt (*E. patens*), marri (*Corymbia callophyla*)	2	20
Wandoo and southern karri forests	wandoo (*E. wandoo*) and karri (*E. diversicolor*)	3-4	10
Coolgardie/ Kalgoorlie goldfield forests and southern karri forests	Karri	6	10
Estimated contribution of area considered by the RFA.	Northern, Central and Southern Forests	2-6	30-40

(Source: Manning, 1993; Agriculture WA, 1997)

The most important vegetation resource is the heathland of the northern sandplain due to the copious nectar flows over spring months and the timing of flowering during late winter when few other plant species are flowering. The northern eucalypt forests that occur within the area considered by the RFA are also very important due to the high nutritional value of pollen produced by the marri trees; which many beekeepers use to strengthen their hives prior to winter. Beekeepers who utilise this resource and practice requeening have very high survival rates over winter. If overwintering is not successful or hive populations decline to low levels for reasons such as drought, it can take up to 3 months to increase the population to productive levels, at what would otherwise be the most productive time of the year (Davies, 1985).

The areas utilised over the remainder of the year depend on flowering cycles. The karri flowering period, approximately every 6 years during autumn to early winter, is preferred over other nectar flows due to the high quality honey produced from this source. The southern coastal area between Albany and Esperance is utilised from early winter and often throughout summer. Other summer flows may be tapped from either the eastern goldfield areas near Kalgoorlie every 5 years when average rainfall levels promote heavy budding and flowering or from the Southern wandoo forests. Map 1 (Manning, 1992) illustrates the areas of importance to the commercial apiculture industry.

State Forest is a major land resource for the apiculture industry (Table 1.3, Table 1.4). Over 75% of commercial honey production is sourced from registered apiary sites on public land (Manning 1992). Most non-commercially produced honey is sourced from apiary sites situated in State Forest, despite the fact that most non-commercial apiary sites occur on private property.

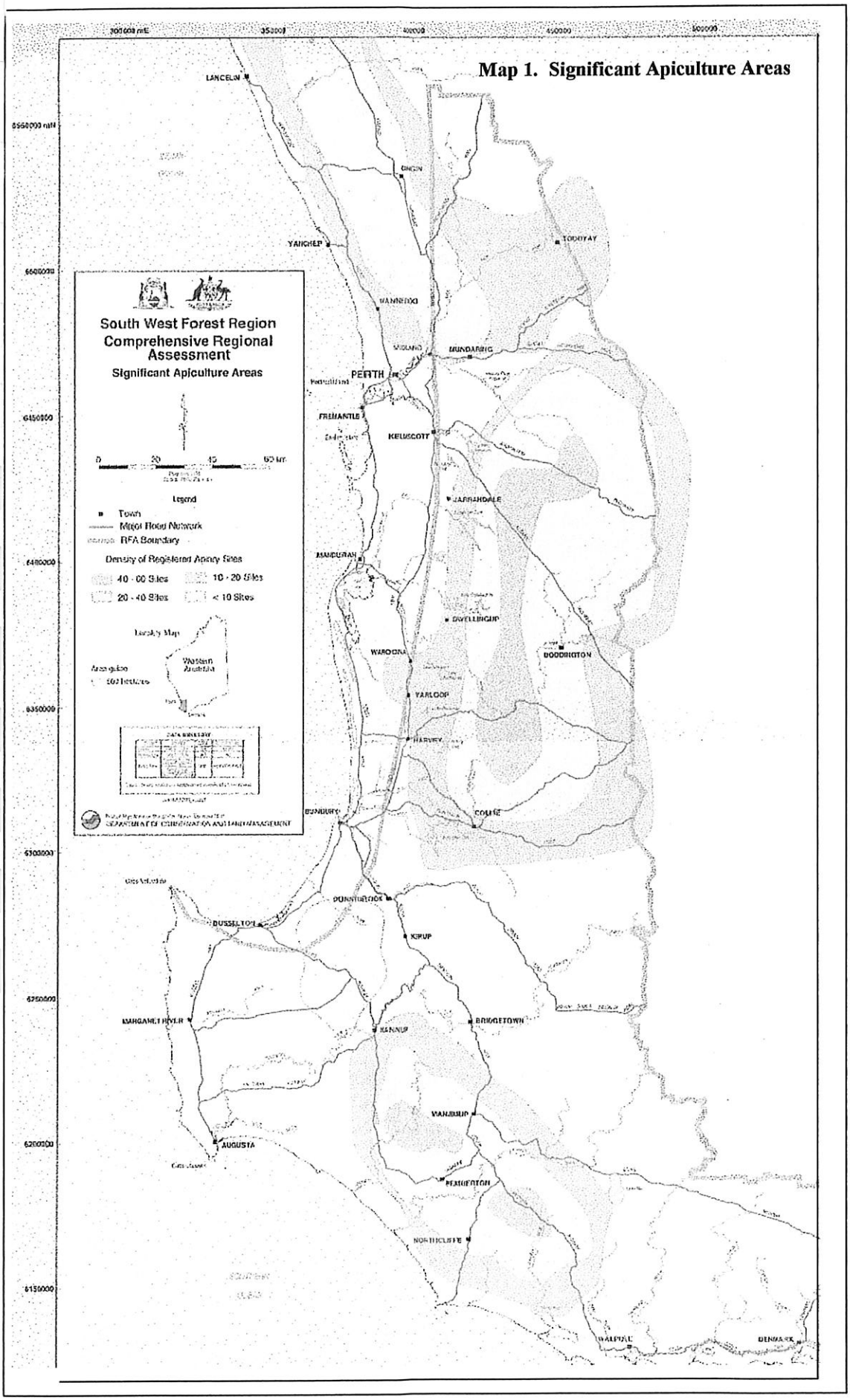
Map 1. Significant Apiculture Areas
South West Forest Region
Comprehensive Regional Assessment
Significant Apiculture Areas
Legend
Town
Major Road Network
RFA Boundary
Density of Registered Apiary Sites
40 - 60 Sites
10 - 20 Sites
20 - 40 Sites
< 10 Sites
Locality Map
Western Australia
LANCELIN
YANCHEP
GINGIN
TODDYAY
WANNEROO
MUNDARING
PERTH
FREMANTLE
KELLISCOTT
JARRAHDALE
MANDURAH
SERPENTINE
DWELLINGUP
WAROONA
BOORDINGTON
YARLOOP
HARVEY
BUNBURY
COLLIE
BUSSELTON
DUNSBOROUGH
KIRUP
MARGARET RIVER
KARNUP
BRIDGETOWN
MANJIMUP
AUGUSTA
PEMBERTON
NORTHCLIFFE
WALPOLE
DENMARK

Table 1.3 Comparison of Honey Production (tonnes) - Registered and Private Apiary Sites (1990-91)

Flowering Cycle (years)	Commercial		Non-commercial		
	Registered	Private	Registered	Private	Total
1	2239.7	605.7	760.8	465.3	4071.6
2	869.4	351.2	162.5	39.8	1422.7
3	367.9	98.3	32.5	16.8	515.5
4	128.4	41.9	18.0	0.5	188.8
6+	532.0	56.1	54.0	5.1	647.3
Sub total	4137.2	1153.2	1027.9	527.6	6845.8

(Source: Manning, 1992)

Table 1.4 Comparison of Number of Apiary Sites - Registered and Private (1990-91)

Flowering Cycle (years)	Commercial		Non-commercial		
	Registered	Private	Registered	Private	Total
1	539	170	252	384	1345
2	439	203	425	30	824
3	227	81	32	16	356
4	131	55	28	12	216
6+	539	82	97	16	734
Sub total	1875	591	561	448	3475

(Source: Manning, 1992)

Figures for 1995-96 indicate that of the 3,850 tonnes of honey produced in Western Australia two thirds was processed by packing companies while approximately one third was sold directly to the public without processing, via "back door" means such as markets or roadside sales. Of the honey that was processed, about half was sold to local markets and half was exported. Honey is pre-packed for the domestic market into containers ranging from 300 gram jars to 3 kilogram plastic buckets. Honey supplied for export is provided in small pre-packed containers and in bulk quantities.

Four honey packers handle the bulk of honey produced in Western Australia. Two packing companies were originally set up as cooperatives. The Swan Settlers' Co-operative was established during 1913 to pack for farmers. It now produces pre-packed honey and bulk orders for domestic and export markets. The Honey Pool of Western Australia, now Wescobee Ltd. was privatised during 1991, but previously operated under State Government legislation. This is now the largest company and supplies small containers of pre-packed honey to the domestic and export markets which includes 20 countries, most importantly the United Kingdom and Germany. The other large private companies, K.T. Healy & Co., and Honey Bee Enterprises, pack bulk orders for export and address the smaller domestic markets for containers of pre-packed honey (Charlton et al., 1991).

Beeswax production

Beeswax is an economically important by-product of the apiculture industry. It is usually sold as 8-10 kilogram rectangular blocks and either exported, sold locally to make wax foundation comb, or used by beekeepers for beehive construction.

Pollination Services

There is little demand for paid pollination in the south-west due to a perceived large feral bee population. Some growers of seed vegetables, almonds and avocados, however, rent beehives to improve pollination. Around 17% of apiary sites in Western Australia are sited at a distance where primary producers may benefit from pollination (Manning, 1993). The main demand for pollination is from outside the area considered by the RFA, including the Ord River Irrigation Area, where potential exists for pollination of approximately 1,000 hectares of crops (Charlton et al, 1991). Recently, the demand for pollination has increased, offering substantial benefits to beekeepers through returns from both the pollination service and from increased honey production. There is also demand from South Korea, Japan and Taiwan for packaged bees which are used for pollination in greenhouses (Manning, 1996).

Pollen production

Pollen production is an important source of diversification for many beekeepers. A high quality pollen industry exists in Western Australia, selling to both the domestic and overseas markets. There is one beekeeper employed solely on pollen production[2], but most beekeepers trap pollen only during peak flowering periods from flora regarded for quality pollen. Production ranges from 10-14 kilograms per year (Charlton et al., 1991). The most important species for pollen production are jarrah and marri, which provide three quarters of the pollen produced. Most pollen is sold to three processors - Swan Settlers Co-operative, Sylavanside Pty. Ltd. and K.T. Healy & Co. - in a wet condition, who dry, clean, pack and market pollen for sales to local markets, interstate, Southeast Asia and Europe.

Queen bee production

Queen bee breeding and exportation is a growing industry due to the high quality genetic stock developed by Agriculture WA. The importation of Queen bees was prohibited during 1977 for quarantine reasons so beekeepers rear most replacement queens themselves. Packaged worker bees are also produced for export but the level of business in this field is currently insignificant due to the lack of available air freight (Manning, 1996).

1.2.2 Contribution to the WA economy

During 1996, the total value of the beekeeping industry in Western Australia was estimated at $7.03 million. Table 1.4 provides a breakdown of the industry value of production by commodity.

[2] Personal Comment, Mr. Lee Allan, Senior Apiculturist, Agriculture WA.

Table 1.4: Apiculture Industry 1995-96 Production Statistics

Commodity	Volume of Production	Price per unit ($)	Value of Production ($)
Honey	3,850 tonnes	1.55 per kg	5,967,500
Beeswax	90,000 kg	5.50 per kg	495,000
Pollen	30,000 kg	8.5 per kg	255,000
Queen bees	10,000 bees	8.00 per bee	80,000
Pollination	3,500 hives	65.00 per hive	227,500

(Source: Agriculture WA, 1997)

Annual production can be highly variable, due to environmental factors such as wind, rainfall, humidity and temperature, which directly impact on both pollen and nectar production. The 1995-96 estimates are considered average when compared with other annual production levels. In a very good season, a hive can produce one 44 gallon drum (290 kg) of honey while in the same area following fire or drought there may be no nectar flow and no honey produced. During 1990-91, for example, there was negligible nectar flow from the northern jarrah and marri forests due to extreme temperatures, and no honey was subsequently produced (Manning, 1992).

Investment into research and development is made by both Agriculture WA and the Honeybee Research and Development Council. During 1990-91 the cost of the Queen bee breeding program totalled approximately $ 175,000 including salaries and operating costs (Charlton et al., 1991). During the same period, an estimated income from Queen bee and honey sales as a by-product of these investigations was approximately $ 72,000. The value of Queen bees ranged from $ 200 for a Department of Agriculture inseminated *A1* strain queen to $ 8.50 for a queen of unknown genetic stock (Charlton et al., 1991).

Of higher value than the direct price of honey is the indirect value of bees in crop pollination. In addition to the figures shown in Table 1.4, the incidental pollination of fruit, vegetable and seed crops may be worth $ 90 million per annum to the WA agricultural industry (CALM, 1992). No data is available specifically for the south-west region.

The total value of production from the apiary sites located within the RFA area, is estimated to be approximately $ 3 million (Agriculture WA). The value of each commodity is estimated to be in very similar to the proportions shown in Table 1.4.

1.2.3 Direct employment

The number of apiculturalists working in the south-west is estimated to approximate 200 FTE. Most employment is based on honey production, while some beekeepers undertake pollen collection on a small scale and there is one beekeeper that works solely with pollen production. In addition, government agencies employ a research scientist and 2 Apiary Inspectors to control hive disease and conduct administration. Commercial honey packing occurs in Perth, and the four packing sheds employ a total of approximately 50 people (Agriculture WA, 1997).

1.2.4 Trade

The first exports of honey from WA were to London, commencing in 1881 (Allan, 1976). During 1995/96 the total value of Western Australian apiculture exports was estimated to exceed $3.5 million[3]. Approximately 2,000 tonnes of the honey (half of the honey produced) valued at $3.1 million was exported to United Kingdom, Germany, Singapore and other Asian and European countries. During 1990-91, the volume of beeswax exported was 54 tonnes. Considering beeswax export demand has increased and using current prices, beeswax exports are worth over $300,000[1] (Wescobee Limited, 1996). Pollen, pollination services and queen bee export demand is also increasing. Queen bees of highly superior genetic stock are exported to Indonesia, Canada and the Pacific Islands, where they can be sold for $500-$1,000 per bee when ordered by written request (Charlton et al., 1991).

There are negligible imports of honey. During 1996-97, 90 tonnes of honey was purchased from interstate (Agriculture WA, 1997). All imported honey requires pasteurisation to prevent the introduction of disease, which adds cost to the end product.

1.3 Administration and Regulation of Beekeeping

Two government agencies are involved with the apiculture industry in Western Australia. Agriculture WA registers all beekeepers owning one or more hives, administers the Beekeepers Act (1963) and provides technical advice and assistance to beekeepers.

The Beekeepers Act (1963) aims to control and eradicate bee diseases and pests across all land tenure in Western Australia. This is undertaken by registering beekeepers that own one or more hives, who then become legally responsible for reporting the presence of disease in their hives. Agriculture WA may fine beekeepers and quarantine hives if necessary.

The Department of Conservation and Land Management (CALM) regulates apiary sites on public land.

1.3.1 Beekeeping on Public Land

CALM registers all apiary sites on pubic land and charges an annual lease fee to cover the administration and associated costs such as roading. Beekeeping is considered compatible with most other land uses in State Forests but site selection is critical and is coordinated by CALM since factors such as the risk of dieback spread need to be considered. Apiary sites are positioned approximately 3 kilometres apart and each beekeeper is permitted to hold eight public land sites for every 100 hives owned. The positioning of apiary sites is also important when CALM performs prescribed burning and logging operations.

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[3] Personal comment, Mr. Lee Allan, Senior Apiculturist, Agriculture WA.

Beekeeping is permitted in National Parks and Nature Reserves for those areas already under licence. A moratorium, currently under review, prohibits the establishment of any new apiary sites in such reserves. Decisions concerning the lifting or extension of the moratorium or to ban beekeeping in these reserves is dependent on the results of ongoing research into the impact of the European honeybee on native flora and fauna.

Licenses issued in National Parks prior to the moratorium were issued on the provision that beekeeping would not interfere with resource management or park visitors and only if existing tracks and roads were adequate. CALM policy regarding permission to undertake beekeeping on Nature Reserves is the same as for National Parks, with some additional constraints. Beekeeping is only permitted on those Nature Reserves larger than 500 hectares, if feral bees are already present in the area, if no major communities or species of fauna dependent on nectar or pollen occur in the area, and if declared fauna, flora, educational resources or scientific research trials will not be disturbed.

1.3.2 Beekeeping on Private Land

Apiary sites are established on private property through private, casual agreements between the beekeeper and the landowner. Beekeepers working on private property must still however, be registered with Agriculture WA and abide by conditions stated in the Beekeepers Act 1963.

1.4 Land Management for Beekeeping

Factors which influence the area of forest available for beekeeping during a period in State Forest include prescribed and wild fire events, the quarantining of areas of dieback infected forest, some forest harvesting methods and land clearing for mining.

Forest fires can affect the flowering cycles of trees and if an area is burnt frequently an apiary site may become useless for some years. During 1990-91, approximately 9% of apiary sites were affected by prescribed burning, and a further 9% by wildfire. Prescribed low intensity forest burns generally have no serious impacts on honey production while in some cases the wildfire impact can be so severe, particularly in the northern sandplains, that nectar flows do not resume to normal levels for 9 years in forested areas or until over 25 years in the mallee and goldfields (Manning, 1992).

Changes to the area of forest accessible to beekeepers, particularly undisturbed vegetation adjacent to rivers and streams, can directly impact on apiculture activities. Apiary sites are usually positioned near water sources, due to the greater vegetation species diversity in the riparian zones and ease of access to water.

1.5 Industry Outlook

1.5.1 Resource changes

An ideal forest for honey production is considered to be a mixed age, mixed species forest with a dominant mature age cohort, since large crowns and varying sequences of flowering periods provide for extended nectar flows. The maintenance of structural diversity across the forest landscape is an important component of managing forests for honey production.

Research is being undertaken, independent of the RFA process, into the impacts of honey bees on native flora and fauna, which will determine the future role of apiculture in National Parks and Nature Reserves. If there is reduced access to the northern forests and therefore autumn nectar flows, not only will there be a reduction in honey production for these beekeepers, but losses may be incurred due to weakened hives. Alternative means of maintaining hive populations over winter can be prohibitively expensive.

1.5.2 Markets

The current demand for many WA apiculture products significantly outstrips supply. The strength of market demand is due to the high quality and year round supplies of Western Australian honey, bees and pollen. Increased production levels would generate substantial returns from sales to existing premium markets.

Asia currently has a demand of 30,000 tonnes of honey per year, which Western Australia does not have the supplies to meet. One possibility involves blending Western Australian honey with lower viscosity honey from interstate or overseas. In this way a honey acceptable to the overseas markets could be produced and marketed on a large scale[4].

The export markets for packaged bees and pollen remain strong, especially from countries that have to contend with severe winters, such as Canada, or low vegetation resources, such as the Middle East. There is a large export demand for packaged bees estimated to be worth $7-10 million per year (Manning, 1996). Pollen is abundant in Western Australia and while local markets include health food shops, Spain is considered a major prospective export destination.

1.5.3 Prospects

The potential for product development has recently been recognised due to the existence of niche markets for Western Australian premium honey, pollination services and packaged bees.

The beekeeping industry is currently examining quality assurance. It is possible that the industry would gain from introducing certification of quality standards since the

[4] Personal Comment, Mr. Lee Allan, Senior Apiculturist, Agriculture Western Australia.

honey product is already 'naturally' pure and is not contaminated during production and packaging.

Improved returns from beekeeping might be generated from improved marketing. Honey is currently manufactured as blends from the various areas and plant sources. Such blending can negate the potential niche of individual species honey. Strong product differentiation, and marketing of honey from single species, eg. "White Gum" or karri honey, together with the organic, high quality features could enhance returns.

Paid pollination is a likely area of growth and could become an important source of income for beekeepers. In the United States, for example, pollination contributes up to 40% of annual income and this is regarded as an indicator of its potential in Western Australia. Potential has been identified for beehive use in fruit crops (such as the Donnybrook-Balingup and Manjimup-Pemberton areas) which could also benefit canola (*Brassica napus*) and balansa clover (*Trifolium balansae*) crops in the south-west. Farmers are often unaware of the significant gains which can be made in crop seed production by introducing up to 4 hives per hectare, at a cost of $30-50 per hive, during the crop flowering season (The Western Australian Farmers Federation (Inc.), 1992).

Packaged bee production also has significant potential on the international market, due to the disease free status of the bees. While extracting bees for packaging usually reduces a beekeeper's honey output, it can be profitable in certain circumstances. Manning (1996) compared the costs and returns from packaged bees against the returns yielded from honey and found that packaged bees are viable when annual honey production is low (below 100 kg per hive). This situation could change if costs of production were reduced or if the prices could be raised from around $US 48.00 offered by the Middle East, to $US 66.20 per 1.5 kg package (Manning, 1996).

Beeswax is another likely area of industry growth. Most beekeepers currently produce beeswax from wax cappings with minimal effort but Charlton et al. (1991), suggests that greater production could be achieved with little cost and effort by using press and steam plants (Charlton et al., 1991).

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