Supporting RD&E that will ensure a productive, sustainable and more profitable Australian beekeeping industry and secure the pollination of Australia’s horticultural and agricultural crops.
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AgriFutures Australia's vision is to grow the long-term prosperity of Australian rural industries. In practical terms, this means facilitating:

- Research and development for established industries that do not have their own Research & Development Corporation (RDC), including the commercial beekeeping industry.
- Initiatives that attract capable people into careers in agriculture, build the capability of future rural leaders, and support change makers and thought leaders.
- Research and analysis to understand and address important issues on the horizon for the whole of Australian agriculture.
- Research, development and extension to accelerate the establishment and expansion of new rural industries.

How do we help the honey bee and pollination industry?

The AgriFutures™ Honey Bee & Pollination Program supports research, development and extension (RD&E) to ensure a productive, sustainable and profitable Australian beekeeping industry and secure the pollination of Australia’s horticultural and agricultural crops.

The Honey Bee & Pollination Program RD&E Plan guides investment and is focused on five objectives to deliver research outcomes to benefit the industry:

1. Reduce the incidence and impact of pests and diseases on the beekeeping and pollination services industries
2. Increase the productivity and profitability of beekeepers
3. Increase understanding of the role of flora in honey bee management
4. Understanding of the role of pollination in delivering more productive systems
5. Promote extension, communication and capacity building.

In early 2019, the program underwent an economic review to assist in the development of a new five-year RD&E plan (2019/20 to 2024/25). The new strategy will launch 2019/20 and will focus on areas such as bee technology, product integrity and quality, pollination, disease and nutrition, resources and extension activities to disseminate research outputs to commercial beekeepers.

About your levy

The AgriFutures™ Honey Bee & Pollination Program coordinates investment of the RD&E component of the honey levy.

The levy was first introduced 14 December 1962. Honey that is produced in Australia and sold, exported or used in the production of other goods attracts a levy and export charge. The levy is charged at 4.6 cents/kilogram – 1.5 cents/kilogram is devoted to RD&E.

AgriFutures Australia receives the research and development (R&D) levy allocation to invest in line with the industry objectives of the Five Year Research, Development & Extension Plan. Up to half of program expenditure, including R&D expenditure, is matched by the Australian Government at up to 0.5% of industry gross value of production (GVP). Figure 1 (above) represents the levy breakdown and the annual Program investment inclusive of levy, government and third party investment. Currently, there is no direct investment in objective three (increase understanding of the role of flora in honey bee management). AgriFutures™ Honey Bee & Pollination Program is currently looking to invest in projects associated with this objective. There is also no direct investment in objective four (understanding the role of pollination in delivering more productive systems). AgriFutures Australia is also involved in a Research and Development for Profit project investigating pollination.

The program is funded by statutory levies paid by industry participants. Half of program expenditure, including RD&E expenditure, is matched by the Australian Government at up to 0.5% of industry GVP.

Figure 1: Levy Explanation

<table>
<thead>
<tr>
<th>Cents collected per kilogram sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 4.6c/kg sold</td>
</tr>
<tr>
<td>Emergency Plant Pest Response</td>
</tr>
<tr>
<td>Research &amp; Development</td>
</tr>
<tr>
<td>National Residue Testing</td>
</tr>
<tr>
<td>Plant Health Australia</td>
</tr>
<tr>
<td>AgriFutures Australia R&amp;D Allocation</td>
</tr>
</tbody>
</table>

*Financials are accurate as at 1 February 2019 and subject to change.

Figure 2: Investment by Program objectives

<table>
<thead>
<tr>
<th></th>
<th>FY 2017-18 RD&amp;E Investment</th>
<th>FY 2018-19 RD&amp;E Projected Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the incidence</td>
<td>$474,029</td>
<td>$594,267</td>
</tr>
<tr>
<td>and impact of pests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and diseases on the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beekeeping and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pollination services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase productivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and profitability of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beekeepers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of the role of flora</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in honey bee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding of the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>role of pollination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in delivering more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>productive systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promote extension,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>communication and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>capacity building.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Advisory Panel

The AgriFutures™ Honey Bee & Pollination Program Advisory Panel consists of industry experts who meet regularly to determine research, development and extension priorities and make program investment recommendations. Panel members are appointed for three-year terms.

Dr Doug Somerville (Chair)

NSW Department of Primary Industries

Doug is the Technical Specialist Honey Bees at the NSW Department of Primary Industries (NSW DPI) and has worked with NSW DPI for more than 30 years. Doug's extensive knowledge of beekeeping practices in Australia and abroad was recognised in 2010 with an Award of Excellence from the Australian Honey Bee Industry Council (AHBIC), and in 2015 with the Goodacre Award, the highest accolade in the Australian beekeeping industry. Doug was appointed Chair of the AgriFutures™ Honey Bee & Pollination Advisory Panel in November 2017.

Danny Le Feuvre (Vice Chair)

Australian Bee Services

Danny is the founder and managing director of Australian Bee Services based in Ardrossan South Australia. His previous experience includes immigration consultancy, breeding genetically modified canola, biodiversity agronomy research, development and extension. Danny is an executive on the South Australian Apicultural Association, Chair of the Apis Care Alliance South Australia, South Australia representative to AHBC and sits on several research project steering committees. He has a Bachelor of Applied Science from Melbourne University and is completing a Masters in Agribusiness at the University of Adelaide. Danny was appointed to the AgriFutures™ Honey Bee & Pollination Advisory Panel in 2017.

Tiffane Bates

Cooperative Research Centre (CRC) for Honey Bee Products

Tiff is a fourth generation beekeeper and has worked in the Western Australian bee industry for over 20 years. Tiff is a Specialty Apiary Manager for the CRC for Honey Bee Products, prior to this she was the Apiary Manager for the Centre for Integrative Bee Research (CIBER), and a commercial queen breeder / producer. Tiff’s industry experience spans Better Bees, Western Australian Honey Industry Development Program and Agricultural Produce Commission. Tiff has been a member of the AgriFutures™ Honey Bee & Pollination Advisory Panel since 2014.

Sam Malfroy

Wheen Bee Foundation

Coming from a beekeeping family, Sam worked at Plant Health Australia (2011 – 2016) where he established and managed many national honey bee and pollination programs. For this work, Sam received the AHBC Award of Excellence in 2016 for services to the honey bee industry. From 2016 – 2018 Sam worked at the Department of Agriculture and Water Resources in international trade and market access. Sam is currently employed by the NSW Government’s Department of Primary Industries and Natural Resources where he works on regional infrastructure and programs. Sam has been Director of the Wheen Bee Foundation since 2016, and the AgriFutures™ Honey Bee & Pollination Advisory Panel in 2017.

Professor Saul Cunningham

Australian National University

Saul is a pollination researcher with more than 20 years experience. He has worked directly with beekeepers in his research on crop pollination, particularly his work in Australia on almond pollination, conducted over six flowering seasons. His research has also taken him around the world learning about crop pollination and bee health in many countries. Saul has been a member of the AgriFutures™ Honey Bee & Pollination Advisory Panel since 2014.

Ashley Zamek

Hort Innovation

Ashley is the Research and Development Manager of the Pollination Fund, part of the Hort Frontiers strategic partnership initiative at Hort Innovation. Ashley works with the 35 industries Hort Innovation represents, to address the need to create a sustainable and resilient Australian horticultural sector through improved crop pollination services and pollinator options. Ashley was appointed to the AgriFutures™ Honey Bee & Pollination Advisory Panel in 2017.

James Kershaw

NSW Beekeeper

James is a fifth generation beekeeper from Southern NSW and is a partner in his family commercial beekeeping operation, Sterling Kershaw & Co. He currently runs 2,400 honey production hives and 400 nucs for queen rearing and has provided a pollination service for almonds since 2007. James has been an active industry member for the past 14 years and has been President of the Southern Tablelands Branch of the NSW Apiarist Association since 2012. James has been a member of AgriFutures™ Honey Bee & Pollination Advisory Panel since 2014.

Diana Leemon

Queensland Department of Agriculture and Fisheries

Diana is a mycologist and principal scientist for bee health and anthropod pest management within Agri-Science Queensland, the Research and Development division of the Queensland Department of Agriculture and Fisheries (QDAF). Over the past 18 years, she has conducted and led research projects across a range of livestock industries including honey bees. Diana has been an amateur beekeeper since 1997 and has been associated with small hive beetle (SHB) research, almost since it arrived in Queensland in 2002. Diana joined the AgriFutures™ Honey Bee & Pollination Advisory Panel in 2017.

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AgriFutures™ Honey Bee and Pollination Program RD&E investment

35 projects contracted between 2014/15 – 2018/19

3.14m invested in the AgriFutures™ Honey Bee & Pollination program 2014/15 – 2018/19

Funds invested or committed per financial year:

<table>
<thead>
<tr>
<th>Financial Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/15</td>
<td>$326,271</td>
</tr>
<tr>
<td>2015/16</td>
<td>$478,002</td>
</tr>
<tr>
<td>2016/17</td>
<td>$753,221</td>
</tr>
<tr>
<td>2017/18</td>
<td>$403,743</td>
</tr>
<tr>
<td>2018/19</td>
<td>$676,766</td>
</tr>
<tr>
<td>2019/20</td>
<td>$415,118</td>
</tr>
<tr>
<td>2020/21</td>
<td>$80,882</td>
</tr>
<tr>
<td>2021/22</td>
<td>$10,000</td>
</tr>
</tbody>
</table>

Number of projects per financial year (committed):

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/15</td>
<td>10</td>
</tr>
<tr>
<td>2015/16</td>
<td>19</td>
</tr>
<tr>
<td>2016/17</td>
<td>28</td>
</tr>
<tr>
<td>2017/18</td>
<td>28</td>
</tr>
<tr>
<td>2018/19</td>
<td>36</td>
</tr>
<tr>
<td>2019/20</td>
<td>13</td>
</tr>
<tr>
<td>2020/21</td>
<td>5</td>
</tr>
<tr>
<td>2021/22</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: these figures are accurate as at 1 May 2019
## Investment snapshot

Between 2014 and 2019 AgriFutures™ Honey Bee and Pollination Program invested $3.4 million in RD&E across 35 projects.

These completed and contracted projects are listed to the right. A selection have been described in further detail in this report.

### Between 2014 and 2019 AgriFutures™ Honey Bee and Pollination Program

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-009186</td>
<td>Active Australian Leptospermum honey: new sources and their bioactivity</td>
<td>30/08/2014</td>
<td>28/10/2019</td>
</tr>
<tr>
<td>PRJ-010879</td>
<td>Increasing the value of Australian honey as a health food</td>
<td>2/07/2018</td>
<td>1/08/2021</td>
</tr>
<tr>
<td>PRJ-010777</td>
<td>Market and production potential for Australian produced propolis</td>
<td>9/07/2018</td>
<td>31/05/2019</td>
</tr>
</tbody>
</table>

### Objective 1: Reduce the incidence and impact of pests and diseases on the beekeeping and pollination services industries

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-009334</td>
<td>External attractant trap for small hive beetle</td>
<td>6/06/2014</td>
<td>29/01/2018</td>
</tr>
<tr>
<td>PRJ-010226</td>
<td>Improving biosecurity resources and better understanding bee of health in Australia</td>
<td>15/04/2016</td>
<td>30/07/2019</td>
</tr>
<tr>
<td>PRJ-010818</td>
<td>Improving the health of hives used in pollination</td>
<td>23/07/2018</td>
<td>15/07/2020</td>
</tr>
<tr>
<td>PRJ-010815</td>
<td>Investigating factors that influence chalkbrood outbreaks in Australia</td>
<td>6/07/2018</td>
<td>31/11/2020</td>
</tr>
<tr>
<td>PRJ-009878</td>
<td>Probiotic development for bees: analysing gut bacteria in healthy bees</td>
<td>13/07/2018</td>
<td>29/02/2020</td>
</tr>
<tr>
<td>PRJ-009748</td>
<td>Reducing the impact of Nosema and viruses by improving honeybee nutrition</td>
<td>1/08/2015</td>
<td>14/12/2017</td>
</tr>
</tbody>
</table>

### Objective 2: Increase productivity and profitability of beekeepers

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-007765</td>
<td>A pheromone trap to catch queen bees</td>
<td>25/06/2012</td>
<td>31/03/2018</td>
</tr>
<tr>
<td>PRJ-009757</td>
<td>Assessing the mating quality of Australian queen bees</td>
<td>1/09/2015</td>
<td>30/04/2018</td>
</tr>
<tr>
<td>PRJ-010313</td>
<td>Development of honeybee products from a biodiversity hotspot</td>
<td>30/09/2016</td>
<td>30/09/2019</td>
</tr>
<tr>
<td>PRJ-010167</td>
<td>Market opportunity Australian royal jelly produced with new labour saving technology</td>
<td>1/07/2016</td>
<td>15/04/2017</td>
</tr>
<tr>
<td>PRJ-010267</td>
<td>Progressing implementation of genetic selection in Australian honeybees</td>
<td>30/07/2016</td>
<td>28/12/2021</td>
</tr>
<tr>
<td>PRJ-011685</td>
<td>Review of chemistry associated with honey testing</td>
<td>4/03/2019</td>
<td>3/05/2019</td>
</tr>
<tr>
<td>PRJ-011643</td>
<td>Review of honey bee industry levies and fees</td>
<td>14/12/2018</td>
<td>19/04/2019</td>
</tr>
<tr>
<td>PRJ-009904</td>
<td>Selection and development of Australian hygienic honey bee lines,</td>
<td>30/09/2015</td>
<td>14/02/2019</td>
</tr>
<tr>
<td>PRJ-009770</td>
<td>Verifying the origin of Australian honeys by analysis of their pollen content</td>
<td>31/07/2015</td>
<td>19/02/2018</td>
</tr>
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</table>

### Objective 3: Understand the role of pollination in delivering more productive systems

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-010219</td>
<td>Regional economic multiplier impacts potential pollinator deficits across crops</td>
<td>1/07/2016</td>
<td>31/01/2017</td>
</tr>
</tbody>
</table>

### Objective 5: Promote extension, communication and capacity building

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-011031</td>
<td>Review of investment in the AgriFutures™ Honey Bee &amp; Pollination RD&amp;E Program</td>
<td>14/12/2018</td>
<td>19/04/2019</td>
</tr>
</tbody>
</table>

AgriFutures™ Honey Bee and Pollination projects and investment (Note these are not detailed in this report)

<table>
<thead>
<tr>
<th>Project number</th>
<th>Project title</th>
<th>Start date</th>
<th>Finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRJ-011338</td>
<td>2018 Conference Sponsorship - South Australian Apiarists' Association</td>
<td>30/07/2016</td>
<td>30/05/2024</td>
</tr>
<tr>
<td>PRJ-011321</td>
<td>2018 conference sponsorship: Bee Industry Council of Western Australia</td>
<td>2/04/2018</td>
<td>27/05/2018</td>
</tr>
<tr>
<td>PRJ-011329</td>
<td>2018 NSWAA Annual Conference</td>
<td>30/07/2016</td>
<td>30/05/2024</td>
</tr>
<tr>
<td>PRJ-011332</td>
<td>2018 Queensland Beekeepers Association Annual Conference</td>
<td>13/04/2018</td>
<td>22/06/2018</td>
</tr>
<tr>
<td>PRJ-011328</td>
<td>2018 Tasmanian Beekeepers Annual Conference</td>
<td>30/07/2016</td>
<td>22/06/2018</td>
</tr>
<tr>
<td>PRJ-009818</td>
<td>AgriFutures™ Honey Bee &amp; Pollination Program communications 2015-18</td>
<td>1/06/2015</td>
<td>30/05/2018</td>
</tr>
<tr>
<td>PRJ-011385</td>
<td>AgriFutures™ Honey Bee &amp; Pollination Program Communications 2018-2020</td>
<td>27/07/2018</td>
<td>29/05/2020</td>
</tr>
<tr>
<td>PRJ-011742</td>
<td>Development of the AgriFutures™ Honey Bee &amp; Pollination 2019-2024 5yr RD&amp;E Plan</td>
<td>30/07/2017</td>
<td>1/06/2019</td>
</tr>
<tr>
<td>PRJ-011704</td>
<td>Facilitation of AgriFuturesTM Honey Bee &amp; Pollination RD&amp;E five year plan workshop</td>
<td>28/01/2019</td>
<td>31/05/2019</td>
</tr>
<tr>
<td>PRJ-011117</td>
<td>Gold Partner Sponsorship of the Third Australian Bee Congress</td>
<td>19/12/2017</td>
<td>30/06/2018</td>
</tr>
<tr>
<td>PRJ-010987</td>
<td>Participants agreement - CRC for honey bee products</td>
<td>1/07/2017</td>
<td>31/12/2021</td>
</tr>
<tr>
<td>PRJ-009073</td>
<td>Speakers for the Third Australian Bee Congress</td>
<td>19/12/2017</td>
<td>1/07/2018</td>
</tr>
<tr>
<td>PRJ-011402</td>
<td>Victorian Apiarists Association Annual Conference 2018</td>
<td>25/06/2018</td>
<td>1/06/2019</td>
</tr>
<tr>
<td>PRJ-011592</td>
<td>Women in beekeeping scholarship - 2018 queen rearing workshop</td>
<td>31/10/2018</td>
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Summary

Honey has gained acceptance as a high value medicinal product. This is largely due to the result of research showing that New Zealand (NZ) manuka (Leptospermum scoparium) honey is a potent killer of numerous bacterial (including antibiotic-resistant) pathogens. This antimicrobial activity is attributed to the unusually high level of methylglyoxal (MGO) in manuka honey. Significantly, manuka honey does not invoke resistance and can act synergistically with common antibiotics. Furthermore, unpublished data suggests manuka honey has potent synergy with antifungal agents. The proven therapeutic value of manuka honey has led to a premium price for NZ beekeepers (for this honey), and an increase in all NZ honey prices.

There are two hypotheses underpinning this project:

1. Australia, is home to the largest diversity of Leptospermum plants in the world. It has an enormous, untapped resource of highly active medicinal honey that can command a premium price locally and globally. A comprehensive study encompassing a structured survey of Australian Leptospermum honey, along with laboratory assessments of antimicrobial and antifungal activity will provide the scientific data required to capitalise on this resource.

2. To test highly active Australian Leptospermum honey collected against common problematic bacterial and fungal pathogens, including those that are resistant to multiple antibiotics, and determine i) the range and spectrum of activity; ii) whether pathogens can develop resistance to Australian Leptospermum honey; and iii) whether these honeys are potently synergistic with other antimicrobial drugs.

Objectives

1. To perform a comprehensive, Australia-wide survey of Leptospermum honeys to identify floral sources and geographic locations that yield honey with the highest antimicrobial activity.

2. To determine whether antibacterial activity in Australian Leptospermum correlates with MGO/DHA levels, as is the case for manuka honey.

3. To test highly active Australian Leptospermum honey collected above against common problematic bacterial and fungal pathogens and determine i) the range and spectrum of activity; ii) whether pathogens can develop resistance to Australian Leptospermum honey; and iii) whether these honeys are potently synergistic with other antimicrobial drugs.

Progress Report

Sample collection was conducted until February 2019 because the identification, quality, and purity of Leptospermum honeys hugely improved over the course of the study. In addition, last season USC performed extensive nectar analysis field work, and we wanted to collect honeys from these same sources to see whether the nectar chemical analysis could predict the bioactivity levels of the honeys.

Sample collection for the study is now complete. A total of 1,199 honey samples have been collected from around Australia with the majority of samples coming from New South Wales and Queensland (see Figures 1 and 2).

We continue to report the results from the chemical analysis (honey and nectar) and biological antimicrobial activity testing (honey samples) to the beekeepers who provided samples. The beekeepers involved in the study have noted that this information has been invaluable in providing a better understanding of the activity, and subsequent value of their honey.

The USC team have also tested the DHA (dihydroxyacetone) and MGO (Methylglyoxal) content of over 2000 nectar samples to date, and this data is currently being analysed. Preliminary analysis suggests that variations in the levels of DHA can occur within species, and within geographical regions, and that these are further affected by environmental conditions. While the species are largely driving the DHA content, long-term weather effects are seen in the way that the species adapts. Preliminary analyses are currently underway to understand if the nectar analyses (DHA levels specifically) can predict honey bioactivity (determined by levels of MGO). While some trends have been observed the correlation is not yet clear. This is largely due to a lack of honey supply in some of these areas. Further analyses of these data are currently being performed.

We have also initiated honey resistance tests against two problematic wound pathogens, Staphylococcus aureus (related to golden staph) and Pseudomonas aeruginosa. Pilot experiments, using New Zealand manuka honey, have been performed to optimise the assay and for comparison to our previous results. These pilot experiments confirm that resistance to honey cannot be induced under the same conditions that induce resistance to antibiotics for both bacteria tested. Resistance to MGO as well as artificial honey containing MGO was observed in the S. aureus experiments, suggesting that there are other components in honey that contribute to its low propensity for resistance. We continue to optimise these experiments with the NZ manuka honey control, before performing them with selected Australian Leptospermum honey samples.
The overall aim of this work is to provide a rigorous evidence base for the value of Australian honey as a prebiotic food that can promote digestive health. The outcomes will be to increase the value, use and acceptance of our honey as a health product.

The specific R&D objectives are:

1. To investigate the prebiotic effects of Australian honeys from dominant floral sources and their potential for treating gut-related diseases in a laboratory gut model. We will identify the diseases most responsive to honey treatments, and honeys with the highest prebiotic activity based on composition and function of the microbes in the system. This will extend the current knowledge of the spectrum of prebiotic activity of honey, help to increase the value of our non-premium honeys, and may promote the use of honey as a treatment for conditions related to having a compromised balance of gut microbes.

2. To perform a pilot human clinical study investigating the effect of daily honey consumption on the composition of gut microbes in patients suffering with gut-related conditions. This will determine whether the laboratory results are translatable, and will increase the acceptance of honey as an effective prebiotic. There may also be commercialisation potential for a new prebiotic honey product as a treatment for gut-related diseases, complementing the prophylactic product (for healthy people) currently on the market. The overall reputation, profile and price of Australian honey as a natural product for health care and medicine will also be enhanced.
Spotlight projects

Market production potential for Australian produced propolis

Summary

Propolis is a resinous mixture that honey bees produce from saliva, beeswax and the exude of tree buds, sap flows, and other botanical sources. It is used as a sealant for unwanted open spaces in the hive. Humans make use of the antimicrobial properties of propolis for wound treatment, cold sores, mouth ulcers, suppressing immune responses, and potentially, as an anti-diabetic. Propolis is used as a dietary supplement. Propolis has also been used in the manufacturing of musical strings and varnish, chewing gum, and car polish. New Zealand has a propolis industry and it is understood that beekeepers on Kangaroo Island harvest Australian propolis. The product has enjoyed increased exposure on the back of demand for natural therapies. Consequently, the purpose of this study is to better understand the market and the potential for profitable production of Australian produced propolis.

Objectives

The final report and a project summary are available at agrifutures.com.au/honey-bee-pollination

1. To understand the status of propolis production in Australia and New Zealand.
2. To investigate the market for Australian produced propolis.
3. To determine the potential for additional profitable Australian propolis production.

Potential for additional profitable propolis production in Australia

Using “best estimate” assumptions, harvest of raw propolis is modestly profitable. Propolis harvesting appears to be a useful addition to total income for all beekeepers, especially smaller operations where the beekeeper is more likely to have uncommitted time and additional income may provide a boost to overall enterprise viability. For example, raw propolis production in a 100 hive enterprise has the potential to add $900 per year to net revenue if paid labour is used and $1,400 per year if the owner’s labour is employed and has no opportunity cost. The economics of raw propolis production is enhanced for all beekeepers if the processor provides a New Zealand style mat pickup and extraction service. Mat pickup and extraction is thought to require access to at least five tonnes of raw propolis and substantial capital for processing equipment if a sustainable enterprise is to be created. Production of value added propolis tincture is relatively straightforward and is profitable for beekeepers for the “best estimate” assumptions used.

Next steps for beekeepers interested in propolis production

For beekeepers interested in propolis industry participation it is suggested that they:

1. Buy a small number of mats and trial them for a full year – or longer to account for seasonal, locational and hive strength variation
2. Weigh propolis recovered from mats and scraping separately – some potential purchasers have indicated they may not be interested in propolis recovered from hive scrapings
3. Keep an approximate record of the time required to crack mats and scrape hive materials – decide on the appropriate cost of labour for your enterprise
4. Follow up with the potential buyers identified in this report – determine willingness to purchase, standards/specifications used to purchase, their assessment of the propolis harvested and proposed commercial arrangements
5. Rework guide budgets provided in this report for your enterprise to determine whether either propolis harvest or tincture production is economically viable for your business.
Projects & Objectives

Each research project funded by the AgriFutures™ Honey Bee and Pollination Program must address one or more of the objectives defined in the five-year RD&E plan. It is the Advisory Panel’s responsibility to ensure that these objectives are addressed.

A selection of key projects are outlined in the remainder of this report according to the relevant program objective (with the exception of objective 4).

For all project summaries and final reports visit agrifutures.com.au/honey-bee-pollination
Objectives

1. To determine which individual component compounds from fermenting hive products are attractive to small hive beetle (laboratory). 
2. To determine the optimum blend of the above compounds, in terms of attractiveness and longevity (laboratory). 
3. To develop a suitable attractant lure (using the synthetic blend identified above) for use in an external trap for the small hive beetle (laboratory).
4. To investigate optimal trap design including shape, colour and toxicant (laboratory).
5. To investigate the occurrence of an aggregation pheromone in the small hive beetle, the addition of which could enhance trap success (laboratory / field).
6. To examine differences in hive volatile profiles between hives carrying very high and low numbers of SHB (field / laboratory).
7. To evaluate the efficacy of the external SHB trap in apiaries located in a variety of locations in NSW and Queensland, over two summer seasons (field).

Summary

Over the last decade both the range and populations of the small hive beetle (SHB) have increased such that it is regarded as a major apiary pest in warm coastal regions. A number of control measures have been developed in the last few years, most based around some form of in-hive trapping that rely on capability of bees to chase sufficient numbers of the beetles into the traps. There is potential for an alternative approach that would also be compatible with the practises and economics of commercial beekeepers who need to move large numbers of hives around. The development of an external “attract and kill trap” would meet this purpose. Research in the USA and by our group has identified a range of volatiles, particularly those associated with the SHB driven fermentation of hive products which are highly attractive to the SHB. This project would build on these findings to identify suitable blends of synthetic compounds, based on selected fermentation volatiles, for use in a lure to deploy in an external trap for this pest. Investigations to determine if this beetle also produces an aggregation pheromone will be conducted; as such a pheromone will boost the attractiveness of an external trap.

Objectives

To improve biosecurity resources for the honey bee industry in relation to the Biosecurity Code of Practice (CoP) and National Bee Biosecurity Program, as well as better understanding bee health in Australia.

Summary

In an effort to increase uptake and compliance of the CoP PHA will review and re-design elements of the BeeAware website to include a new page specifically for the Code and Program. This will include compiling existing resources, as well as developing new resources for each section of the CoP which would greatly help facilitate uptake and provide an easy and accessible source of information to anyone that wanted further information. This includes:

- **Biosecurity Training Course:** This 35-45 minute online training course will be developed in consultation with industry and technical specialists, and will promote greater understanding of biosecurity best management practices as detailed in the CoP. It will be based on a large selection of questions which will ensure that questions delivered to each user will be randomised. This will allow for greater understanding of established pests and diseases, as well as help beekeepers prepare for exotics. The online training course could easily be updated in the future to include new components, such as a Varroa section if it were to establish. This will be a valuable free resource for all beekeepers (commercial, hobby, part timers or employees of beekeeping businesses)

- **BeeAware updates:** This new section of the website will include all of the relevant inform related to every section of the CoP and Biosecurity Program ensuring successful adoption with all sectors of the industry. This will include compiling existing information and developing new fact sheets. This provides an easy mechanism for industry to know more about the CoP requirements

- **Beekeeper annual survey:** This annual survey will provide an effective annual snapshot of bee health of each sector of the Australian honey bee industry, providing valuable data on colony losses, impact of pests and diseases etc. This will not only help guide industry and government policy and investment.
Improving the health of hives used in pollination

**Objectives**

1. Produce an in-depth literature review of the effects of the active ingredients commonly used in fungicidal sprays on hive health and native bees, to explore known effects and knowledge gaps.
2. Quantify the amount of active ingredient in pollen brought back to the hive within 24 hours after spraying.
3. Experimentally establish the effects of commonly used fungicidal sprays on survival of nurse bees, and their hypopharyngeal gland development through caged experiments.
4. For those active ingredient that prove harmful to nurse bees, investigate the impact on brood development using whole hive trials.
5. Present these results in international, peer reviewed journals.

**Summary**

The project will investigate the effects of three commonly used active ingredients in fungicidal sprays during flowering of almond and canola on the health of honey bee brood. The active ingredients tested will be selected from those most commonly used by the industries, and most likely include iprodione and chlorothalonil. A third active ingredient may be flutriafol, as it is a relatively new ingredient with moderate acute oral toxicity to honey bees. The final choice of active ingredient to be used in feeding trials will be based on the outcome of the literature review and an inquiry among growers of pollination dependent crops. To investigate known effects of fungicides on the health of adult workers, nurse bees, brood, overall hive performance and on native bees, we will do an exhaustive and critical literature search and use this information to produce a literature review, which will be submitted to an international peer reviewed journal. For at least three commonly used active ingredients (possibly chlorothalonil, iprodione and flutriafol), the impact of its presence in pollen will be assessed for (a) survival of nurse bees, and (b) their hypopharyngeal gland development. This will be done using feeding experiments of newly eclosed bees in small cages. For the ingredients that show significant impact on nurse bees or their hypopharyngeal gland development, the effects on larval development will be investigated using whole hive feeding experiments (following Zaluski et al 2017). Care will be taken to use realistic concentrations of the active ingredient, this will be achieved by harvesting the pollen brought back to the hive after spraying in five orchards and (a) using this pollen directly in the small cage feeding trials; and (b) quantifying the amount of active ingredient in the pollen. These concentrations will be used in the hive feeding trials.

Katja Hogendoorn
The University of Adelaide
School of Agriculture, Food and Wine
katjahogendoorn@adelaide.edu.au

**Objective 1**

**PRJ-010818**

Commenced ➔ 23/07/2018
Completed by ➔ 15/07/2020

Investigating factors that influence chalkbrood outbreaks in Australia

**Objectives**

1. Examine the effects of nutritional stress on susceptibility to Nosema and chalkbrood disease at both the individual bee and colony level.
2. Establish whether certain flowering events increase colony susceptibility to Nosema and chalkbrood.
3. Determine synergistic interactions between Nosema and chalkbrood infections that may exacerbate disease outbreaks.
4. Test the effects of nutritional interventions on individual bee and colony health and their effectiveness to mitigate disease outbreaks.

**Summary**

Nosema (N. apis and N. ceranae) and chalkbrood (Ascosphaera apis) are significant honeybee pathogens that reduce hive productivity and cause colony losses. Outbreaks continue to occur and are generally considered consequences of poor environmental conditions and hive management. Nutritional interventions (i.e. pollen supplements/substitutes and sugar feeding) and managing the hive environment are the only strategies for beekeepers, but the effectiveness and use of these treatments can be variable and often goes unassessed. Furthermore, there is still limited understanding for how the available nutrition (natural forage or supplements) is affecting the quality of brood food and its connection to the disease susceptibility of larvae and adults.

This research will significantly advance our understanding of honeybee nutrition in the context of disease susceptibility and support the development of integrated, non-chemical strategies to reduce the prevalence and severity of Nosema and chalkbrood diseases.

**Objective 1**

**PRJ-010815**

Commenced ➔ 06/07/2018
Completed by ➔ 30/11/2020

John Roberts
CSIRO, Health and Biosecurity
john.roberts@csiro.au

25 Objectives
Probiotic development for bees: Analysing gut bacteria in healthy bees

1. Data on the variation in gut bacterial numbers in normal healthy bees during a full year, i.e. over the four seasons.
2. Characterisation of the antifungal properties of bee gut bacteria that were isolated in the previous RIRDC project. The information gained will be used to select the best candidate bacteria for subsequent probiotic experiments in the field.
3. Results from probiotic feeding studies will reveal which candidate bacteria can be successfully introduced into and maintained in the bee gut.

Objectives

1. Data on the variation in gut bacterial numbers in normal healthy bees during a full year, i.e. over the four seasons.
2. Characterisation of the antifungal properties of bee gut bacteria that were isolated in the previous RIRDC project. The information gained will be used to select the best candidate bacteria for subsequent probiotic experiments in the field.
3. Results from probiotic feeding studies will reveal which candidate bacteria can be successfully introduced into and maintained in the bee gut.
4. Identifying bacterial species/strains that show good potential for the development of commercial bee probiotics.

Summary

The previous AgriFutures project (PRJ-00057) was the first study of gut bacteria in Australian honey bees. We found a rich diversity of bacterial species inhabiting the gut of healthy bees, with a proportion of bacteria showing strong anti-fungal activity against the chalkbrood pathogen.

A number of these chalkbrood inhibiting anti-fungal bacteria were stored for future studies. We showed bacteria can be (re)introduced successfully into the bee gut through probiotic feeding, proving these bacteria have great potential to be developed as probiotics.

Preliminary experiments with chalkbrood-infected hives showed that they recovered more rapidly when bees were fed sucrose solution. This was further improved when a chalkbrood inhibiting anti-fungal agent was added. This project is based on these exciting results and will determine the feasibility of commercialising Australian native bee gut bacteria as probiotics for bees. To do this, we need to obtain specific ecological information on the fluctuation of bacterial numbers in healthy bee guts over a year (i.e. four seasons). Then, bacterial isolates with anti-fungal properties will be tested in probiotic feeding experiments to identify bacteria with the best potential to be used as bee probiotics.

Reducing the impact of Nosema and viruses by improving honeybee nutrition

1. Demonstrate the effects of autumn nutrition on hive pathogen loads in late winter.
2. Determine the effects of pollen intake on virus replication in honeybees.

Objectives

1. Demonstrate the effects of autumn nutrition on hive pathogen loads in late winter.
2. Determine the effects of pollen intake on virus replication in honeybees.

Summary

Nosema (N. apis and N. ceranae) and viruses contribute significantly to the pathogen load of honeybee colonies but their cryptic nature leaves them largely unmanaged by beekeepers. PRJ-8450 found a high prevalence of Nosema and viruses across Australia, particularly during almond pollination. Better management of Nosema and viruses are needed to minimise their impact on hive productivity and pollination activity. This project will deliver improved management of these important pathogens in two ways. Firstly, by testing the influence of different autumn floral types and an autumn pollen feeding strategy to reduce levels of N. apis, N. ceranae and viruses during almond pollination. Secondly, by directly testing the effects of pollen on virus infections using lab infected honeybees in experimental cages. This project is a logical extension of previous studies on Nosema and viruses, which is needed to address ongoing issues with these pathogens.

To demonstrate whether improved autumn nutrition can reduce pathogen loads during almond pollination I will conduct a field experiment in collaboration with 5-10 commercial beekeepers from SA, VIC and NSW involved in almond pollination. Hives using different autumn floral types and given pollen supplements will be compared for pathogen load and honey yield. Pathogen loads of individual hives will be quantified at pre-treatment in February 2016 and post-treatment at winter shutdown in May, pre-almonds in August, post-almonds in August, and post-canola in October. Honey yields will be determined in December 2016. I hypothesise that improved management of autumn nutrition can deliver reduced pathogen loads in late winter and benefit pollination hives. To investigate the effects of pollen on virus infection I will use lab assays to provide adult bees with pollen and experimentally infected them with sacbrood virus, with the hypothesis that pollen fed bees will have reduced virus infections.
1. Provide a clear description of the lifecycle of the LAHB (Oplostomus fuligineus), including the duration of the pupal stage and typical sites of pupation.

2. Conduct interviews with South African beekeepers about the best ways to manage Large African Hive Beetle (LAHB).

3. Photograph all life stages for publication on the BeeAware website.

4. Provide an assessment of the risks posed by LAHB.

Summary

Australian Beekeepers have experience in managing small hive beetle (SHB) but not the large African hive beetle (LAHB) Oplostomus fuligineus and Oplostomus haroldi. SHB, Aethena tumida, from Africa, was introduced to Australia in 2002. SHB is now distributed throughout coastal regions of Australia from Adelaide to Cape York and northern parts of Western Australia.

It is a major pest of managed honey bee colonies. Where it is present, beekeepers must manage the pest or lose their colonies. In large areas of Australia where SHB is present, feral honey bees are now extinct. The threat posed by SHB to Australian beekeepers was not recognised until after it became established. Therefore, it is important to evaluate the risks to Australia of exotic pests and diseases of honey bees, and where necessary, to raise awareness of these threats to beekeepers and biosecurity officials. LAHB is a serious pest of honey bee colonies throughout southern and central Africa. Adult beetles enter colonies where they feed on brood and pollen, causing significant damage.

The purpose of this project was to draw attention to the threat posed by LAHB; provide a description of its biology and life cycle; and assess potential routes of entry into Australia.
Assessing the mating quality of Australian Queen Bees

**Summary**

This project assessed the mating frequency of 69 queens produced in early-spring (October) and 74 produced in autumn (March). These queens were sampled at the mating yards of four queen producers each season. Three queen producers were sampled in both seasons, while one was sampled only in spring and another only in autumn. We attempted to sample as close to the first and last group of queens produced as possible. One queen producer had already ceased production in autumn and another extended their production so that we could take a sample.

We also examined how many colonies contributed drones to the mating pool of each of the queen producers using knowledge of the queen alleles and worker genotypes to infer the genotype of the males. We then used inferred drone genotypes to infer the genotype of the queens that produced them using the program COLONY.

Following this sister queens were artificially inseminated with the semen of either eight or 16 drones, collected at a drone congregation area at the University of Sydney. We monitored colonies for one year, recording weight, amount of brood and food and disease incidence.

Individual feedback was given to each of the five participating queen producers and discussed methods for improving drone production and preventing drone eviction.

**Objectives**

1. Assess typical mating frequencies of 40 Australian commercial queens purchased in spring and late summer.
2. Assess the genetic variability among the fathering males of the sampled queens.
3. Determine the optimal number of matings for Australian commercial queen in under 10 matings or 20 matings.
4. Engage with queen producers about the best ways to manage adequate supplies of quality drones for queen mating.

Development of honey bee products from a biodiversity hotspot

**Summary**

Western Australia is a biodiversity hot spot of endemic flora. This opens the opportunity for beekeepers to create unique products with different health attributes. The experience Western Australia has already gained through the development of the Jarrah honey as a unique chemically-pure product with both antibacterial and anti-oxidant activity provides the impetus to brand and market other sources. This project will screen Western Australian honey for bioactivity from across the floral range. To ensure honey floral source accuracy, pollen traps will be set to confirm the floral species contributing to the honey. This collection will be done in conjunction with the West Australian beekeeper group and Department of Parks and Wildlife.

All honeys will be assessed for their anti-microbial activity, which in most honeys, is due to the enzymatic production of hydrogen peroxide. However, non-peroxide honeys (of which Manuka honey is one) can display significant antibacterial effects even when the hydrogen peroxide activity is blocked. Alternate mechanisms will be investigated, including methyl glyoxal (MGO) levels, pH and sugar content (osmolarity).

**Objectives**

1. Conduct a thorough investigation of the antimicrobial activity of WA honey.
2. Characterise the physicochemical properties of the honeys from each flora source and determine whether these correlate with antimicrobial activity.
3. Compare the activity of WA honeys to commercial medicinal honey and pasture honey and evaluate the medicinal niche of WA honeys based on the antimicrobial data.
4. Compare the anti-oxidant activity and phenolic compound content.
5. Investigate the logistics of developing a medicinal honey product for the export market (quality control and resource).
Royal jelly is collected from queen cells and used as a human nutrition supplement. To date, Australian royal jelly production has been limited by the need for hand collection and the high cost of Australian labour. New technology pioneered in China, reviewed by apiary officer Doug Somerville and imported into Australia and left with Victorian beekeeper Peter McDonald shows potential for elimination of labour from royal jelly recovery.

The purpose of this project is to investigate the size of the international royal jelly market, the size of the potential opportunity for Australian royal jelly and to what extent the economics of production change with this new technology.

Market opportunity
Australian royal jelly produced with new labour saving technology

PRJ-010167

Commenced  01/06/2015
Completed  30/05/2018

Michael Clarke
AgEconPlus PTY LTD
clarke@ageconplus.com.au

Objectives
1. To investigate the market for Australian produced royal jelly using new labour saving equipment imported from China.
2. To understand cost of production of royal jelly produced in Australia with this new technology.

PRJ-010257

Commenced  30/07/2016
Completed by  28/12/2021

Dr Robert Banks
Animal Genetics and Breeding Unit
University of New England
rbanks@une.edu.au

Objectives
1. Collect more data on production and health traits from the Horner family breeding program.
2. Genotype queens, and samples of drones and workers program, to build a genetic relationship map across their entire program.
3. Using pedigree data and genotypes, analyse the full population in that program.
4. Contribute to the development of educational material on queen bee breeding, to be developed by NSW DPI.
5. Genotype imported semen to allow inclusion of the new genetic sources to be properly evaluated in future through inclusion of source pedigree information.
6. Consult with industry and researchers on scope for an expanded queen evaluation program aimed at systematic evaluation of production and health traits under more environments.

Summary

This project is a follow-up project to AgFutures Australia project PRJ-009276. It aims to progress genetic improvement of Australian honeybees for production and health traits through a combination of:

- Analysis of queen relationships in the breeding program of the Horner family to enable more powerful genetic analysis than was possible in the previous project
- Working with the Horners with assistance of NSW DPI to collect heath data, including rapid hygienic behaviour, for inclusion in this analysis, and other breeders if they can be identified
- Collection of DNA samples from other breeding programs - including the Better Bees program and any others with suitable data - to build a relationship map of Australian queen breeding programs. This map will underpin genetic evaluation of queens from different breeding programs, and inform breeders on the degree of inbreeding in the Australian population
- Working with NSW DPI and others in industry to develop educational material on practical breeding programs
- Consultation with industry on scope for a coordinated queen evaluation program to extend the work conducted by AGBBA to include more traits, including recommendations for the collection and management of queen bee breeding data for use in science-based breeding programs
- If importation of semen is permitted, the project should genotype such semen to allow inclusion of new stock into the relationship map of the population.
1. Identify and review current and new analytical techniques for honey analysis and the limitations of these techniques.

2. Evaluate the chemistry of Austrian honey based on past research, including determination of limitations of different analytical techniques given the particular floral characteristics of Australian-derived honey, as well as the effect of supplementary feeding on analytical results.

3. Review national and international regulatory policies and guidelines on honey testing and the determination of honey adulteration.

4. Provide recommendations as to which analytical methods are likely to be the most appropriate for the Australian honey industry.

Summary

Recent media attention regarding alleged honey adulteration and quality issues has raised some concerns in the Australian honey industry. There are concerns that the analytical techniques used to identify adulterated honey samples, as well as those techniques which measure honey quality, need to be reviewed to determine which methods are suitable.

A literature review will be undertaken to investigate analytical methods to determine adulteration and quality of honey samples. The literature review will be used by key stakeholders, including AgriFutures Australia, key producers/honey processors and the Australian Honey Bee Industry Council to determine future directions the industry should take to ensure the problem is overcome.

Objectives

1. Identify and review current and new analytical techniques for honey analysis and the limitations of these techniques.
2. Evaluate the chemistry of Austrian honey based on past research, including determination of limitations of different analytical techniques given the particular floral characteristics of Australian-derived honey, as well as the effect of supplementary feeding on analytical results.
3. Review national and international regulatory policies and guidelines on honey testing and the determination of honey adulteration.
4. Provide recommendations as to which analytical methods are likely to be the most appropriate for the Australian honey industry.

Review of chemistry associated with honey testing

PRJ-011685

Commenced ➔ 04/03/2019
Completed by ➔ 07/06/2019

Jamie Ayton
NSW Department of Primary Industries
jamie.ayton@dpi.nsw.gov.au

Review of honey bee industry levies and fees

PRJ-011643

Commenced ➔ 14/12/2018
Completed ➔ 14/12/2018

Michael Clarke
AgEconPlus Pty Ltd
clarke@AgEconPlus.com.au

Summary

The purpose of this project is to review current honey bee industry levies and fees and make recommendations on an appropriate levy structure to serve the industry in the future. The national honey levy addresses biosecurity, residue testing, PHA membership and R&D. An analysis of industry trends including contraction in honey production and growth in pollination services will be required. The current national honey levy will be reviewed and the review will include analysis of revenue generated, where the revenue is directed and value delivered to industry. Future national honey levy commitments will be assessed and conclusions drawn on the sustainability of current levy arrangements.

The project includes an analysis of previous honey bee levies and reasons for their rejection. Options to reduce the cost of the national honey levy collection will be developed including scope for changes in the honey production threshold at which the levy is payable. Beekeeper levy payments will be compared to similar sized agricultural industries and conclusions reached on the current burden of levy payments.

The scope to increase resources available to the industry with government matching RD&E payments will be assessed as will the potential for a pollination services levy and a honey marketing levy. An analysis of state-based compulsory and voluntary fees will be delivered. Levy review conclusions and reform recommendations will be presented in a fact sheet/summary document for beekeepers and a more detailed discussion paper for beekeepers and policymakers.
Selection and development of Australian hygienic honey bee lines

Summary
This research serves both the honey bee and pollination reliant industries by working toward improving endemic disease resistance of Australian honey bee stocks while preparing for living with Varroa.

Objectives
1. Create a temporal and spatial resolution of Ascospharea apis strain distribution in Australia.
2. Identify hygienic lines of honey bees in Australia.
3. Compare two methods for assessing the hygienic behaviour of honey bee colonies increasing the accessibility of breeding for hygienic behaviour in commercial operations.
4. Understand social and innate mechanisms for chalkbrood resistance in honey bees.
5. Determine the feasibility of using marker assisted selection for breeding innate resistance to chalkbrood.
6. Provide science based information to the beekeeping industry about breeding disease resistant honey bees.

PRJ-009904
Commenced → 30/09/2015
Completed → 14/02/2019

Jody Gerdts
Bee Scientifics
beescientifics@gmail.com

Verifying the origin of Australian honeys by analysis of their pollen content

Summary
This project analysed the pollen content of representative samples of Australian honeys to develop objective pollen analytical criteria for verifying the geographic authenticity of honeys sourced in Australia.

Objectives
This project directly addresses objective two of the AgriFuturesTM Honey Bee & Pollination Program five year R&D strategy to “Increase productivity and profitability of beekeepers”. An improved basis for recognition of the provenance and authenticity of Australian honeys should help efforts to expand markets both domestically and for export.

Objectives
1. Identify hygienic lines of honey bees in Australia.
2. Verify the origin of Australian honeys by analysis of their pollen content.

PRJ-009770
Commenced → 31/07/2015
Completed → 19/02/2018

Dr Kale Sniderman
School of Earth Sciences
University of Melbourne
kale.sniderman@unimelb.edu.au

The Australian honey industry would benefit from an internationally recognised certification process that could verify the Australian origins of a honey sample. The principal aim of this project is to develop baseline data on the pollen content of individual honeys, which could subsequently be used to develop such a verification process. This project also explored whether it is possible to identify honeys more narrowly, to geographic region or, in selected cases, to unifloral source. To achieve these goals we have paid careful attention to variation in the presence of relatively rare accessory pollen types unique to Australian vegetation, in contrast to accessory types unique to other landmasses.
1. To quantify the regional economic impact of a pollinator deficit across crops.
2. To provide more general conclusions on the national economic impact of pollinator deficits.
3. To provide an evidence base for decision makers in relation to the broader economic and social costs of pollinator deficits.

Summary

The AgriFutures™ Honey Bee and Pollination Program funded the analysis of yield and crop value loss as a result of Australian pollinator deficits (e.g. Keogh et al 2010, Barry et al 2010). This project proposes to use these data to develop a more complete picture of the economic cost of Australian pollinator deficits.

Regional economic multiplier impacts will be estimated for a representative region. An input-output model will be developed for the region. The model will be used to determine both the direct and multiplier impacts of a pollinator deficit on regional business turnover, value add, income, and employment. Results from the regional analysis will be used to draw more general and somewhat more speculative conclusions on the national economic impact of a pollinator deficit.

PRJ-010219

Commenced → 01/07/2016
Completed → 15/04/2017

Michael Clarke
AgEconPlus Pty Ltd
clarke@ageconplus.com.au

Objective 5

Objective 5

Promote extension, communication and capacity building

Review of investment in the AgriFutures™ Honey Bee and Pollination RD&E Program 2014/15-2018/19

Summary

The AgriFutures™ Honey Bee and Pollination Program Five Year RD&E Plan 2014/15-2018/19 is nearing completion and a new plan for the Program is being developed. As part of its planning and review process, AgriFutures™ requires an impact assessment of past investment in the Honey Bee and Pollination program.

PRJ-011631

Commenced → 14/12/2018
Completed → 19/04/2019

Michael Clarke
AgEconPlus Pty Ltd
clarke@ageconplus.com.au

Objectives

1. Inform industry, the community and Government about the net benefits derived from investment in AgriFutures™ Honey Bee and Pollination program
2. Support RD&E planning and decision-making through detailing returns on investment from past RD&E (2014/15-2018/19)
3. Signal to researchers and collaborators how research projects and research performance are evaluated by AgriFutures Australia
4. Ensure good governance and transparency in the administration and management of AgriFutures™ Honey Bee and Pollination program.