

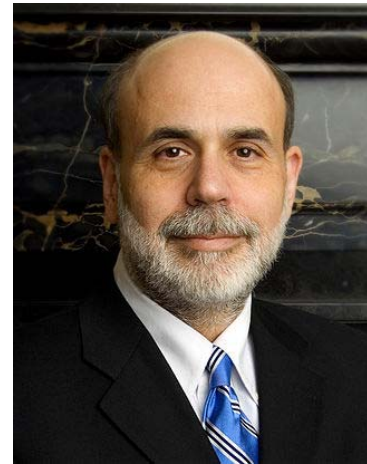
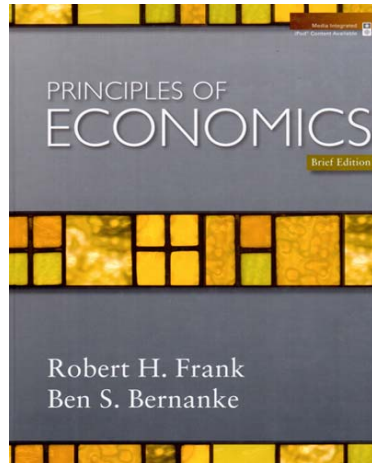


The Economic Value of Australian Managed and Wild Honeybee Pollinators in 2014 - 2015.

Two realistic illustrations of honeybees are placed around the title. One is positioned to the right of the word 'Australian', and the other is to the left of the word 'Managed'.

Presented to:
WABA and WA Farmers Bee Conference
12th May, 2017.
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Economics and Honeybees:

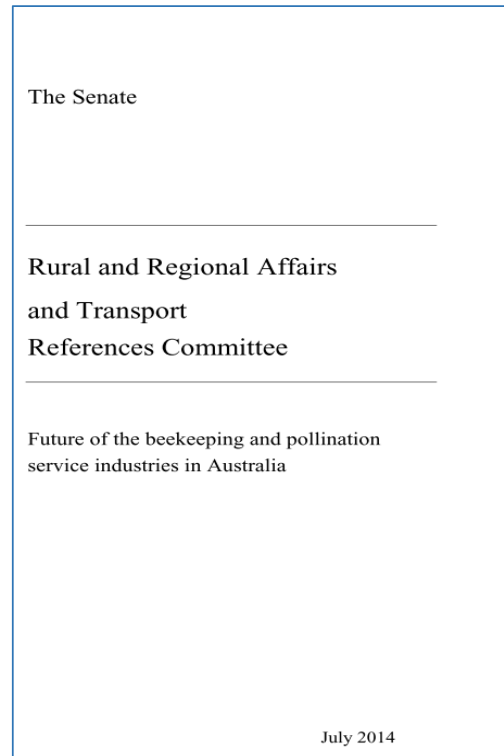


Ben Bernanke
Former Chairman
US Federal Reserve Bank
(2006 – 2014)

“Phoebe earns her living as a keeper of honeybees. Her neighbours on all sides grow apples. Because bees pollinate apple trees as they forage for nectar, the more hives Phoebe keeps the larger the harvest will be in the surrounding orchards... Phoebe’s hives constitute an external benefit or a positive externality...”

Franke, R.H. and Bernanke, B.S. 2009. *Principles of Economics. Brief Edition* Boston: McGraw-Hill Irwin p.268.

Australian Parliamentary Committees of Inquiry into the Honeybee Industry.



“The exact benefit ... is almost certainly valued in the billions of dollars.”

Australian Government. 2015. "Future of the Beekeeping and Pollination Service Industries in Australia: Government Response." p.3.

Measuring the Importance of Honeybee Pollinators

- 1.1 The Australian honey bee industry is a small but vital component of the Australian economy. While the production of honey and associated bee products represent only some \$80 million per annum gross value of production,¹ the value of European honey bees (*Apis mellifera*) to agricultural production is reckoned in terms of billions of dollars. Taking into account all plant based industries and wool, meat and dairy production, it is estimated that honey bees contribute directly to between \$4 billion and \$6 billion worth of agricultural production.² In its submission to the inquiry, the Australian Honeybee Industry Council (AHBIC), the honey bee industry's peak body, noted that:

Footnote 2 : Ms Margie Thomson, RIRDC, *Transcript of Evidence*, 8 August 2007, p. 6.

Dangerous mite threatens billion-dollar bees

PM By Tom Nightingale

Updated Fri 17 Feb 2012, 11:45am

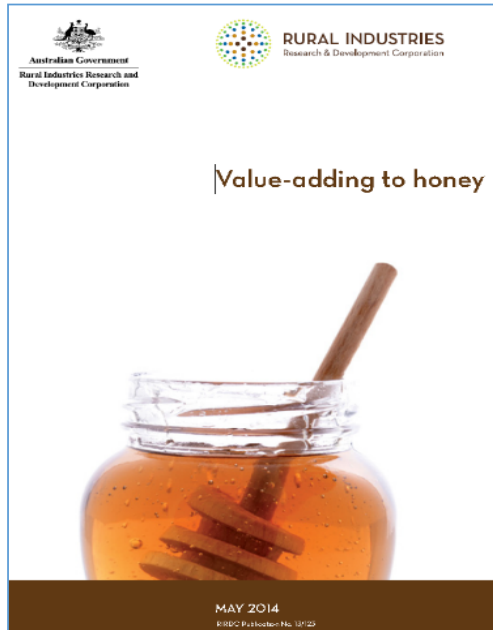
There are fears that Australia's bees, which help pollinate up to \$4 billion worth of crops each year, may be at risk of exposure to a dangerous mite that could devastate the fruit and vegetable industries.

Australia is the only remaining honey-producing country in the world not exposed to the varroa mite which wipes out 20 to 30 per cent of the bee populations it encounters.

Across the world apiarists have thrown everything at the mite, but all in vain. It is feared it will inevitably enter Australia, with the weakest spots being ports in north Queensland.

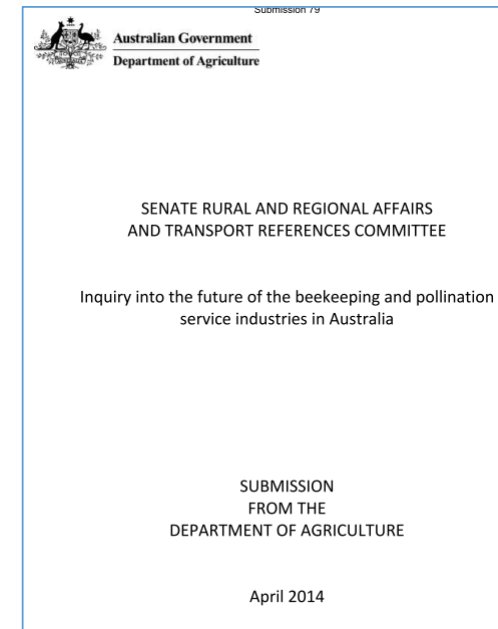


Measuring the Importance of Honeybee Pollinators



“Furthermore it has been estimated that the industry contributes directly to between \$4 billion and \$6 billion worth of agricultural production.”

Dawes, J and Dall, D., 2014 Value –adding to Honey Rural Industries Research and Development Corp May <https://rirdc.infooservices.com.au/items/13-123> p.11



“The contribution made by honey bee pollination to Australian agriculture has been estimated to be in the range of \$0.6 to \$1.7 billion (Gill, 1989; Gordon and Davis, 2003).”

Australian Government Dept. of Agriculture. 2014. "Inquiry into the Future of the Beekeeping and Pollination Services Industries in Australia. Submission 79." edited by Australian Government Dept. of Agriculture. p.4.

Measuring the Importance of Honeybee Pollinators

Australian Government
Department of Agriculture
and Water Resources
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Combing through the honey bee industry

8 December 2016

Beekeeping business cash income averaged \$70,400, and was significantly higher in Tasmania, Victoria and New South Wales, according to the Australian honey bee industry report by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

Acting Assistant Secretary of ABARES' Agricultural Productivity and Farm Analysis branch, David Galeano, said the report's survey results provide government and stakeholders with important data for analysing the industry.

"The honey bee industry is an important sector of the Australian economy, with the gross value of production estimated at \$101 million in 2014–15," Mr Galeano said.

"The industry survey found that the majority of beekeeping income came from honey sales (85 per cent of cash receipts) in 2014–15.

<http://www.agriculture.gov.au/abares/news/media-releases/2016/combing-through-honey-bee-industry>

4 Common Valuation Methods used to measure importance of Honeybee Pollinators since late 1980's.

1. Replacement Method:

- Cost of replacing some part of the Bee Keeper's business inc. bees, hives, artificial pollinators.
- Costs are then extrapolated for the number of registered beekeepers or hives in a region, state or the country. The final value is the replacement cost.

2. Gross Value of Production (GVP):

- ABARES – 2014/15 GVP = \$101m

3. Crop Value of Honeybee Pollination:

- A commonly cited industry measure.

4. The Economic Value:

- Launhardt – Marshall (L-M) Welfare Method



- Replacement Method - the cost of human pollinators used in China's "apple valley" and in parts of the Himalayan Mountains.

3. Crop Value of Honeybee Pollination

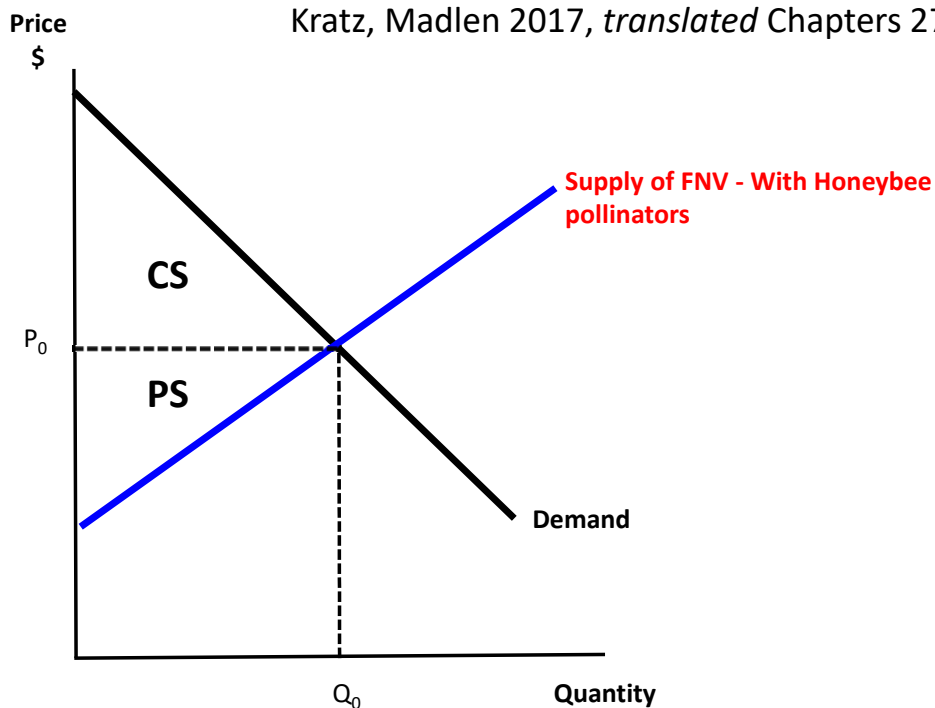
Honeybee Pollination Factor (HPF)

- Canadian entomologists Kevan and Phillips (2001) urge for the “pollination requirement” “... (to) be completely re-evaluated because (most of it is dated, anecdotal, and not based on scientific methods.”
- I acknowledge and appreciate the assistance given by Robert Manning in developing this material.
- A HPF is assigned to each fruit, nuts and vegetable crops which is then multiplied by the local value of each agriculture crop and then totalled.

Crop	Crop Dependence on Insect Pollination Percent (1)	Proportion of Pollinators that are Honeybees Percent (2)	Honeybee Pollination Factor (HPF) (3) = (1) X (2)	Local Crop Value \$ (4)	Crop Value Of Honeybee Pollinators (5) = (3)*(4)
Avocado	1.00	1.00	1.00	100.00	\$100.00
Strawberries	0.60	0.70	0.42	50.00	\$ 21.00
Total Crop Value					= \$121.00

4. The Economic Value: Launhardt – Marshall (L-M) Welfare Method.

- Launhardt, C.W. (1885) *Mathematical Justifications of Economics*, Leipzig: Engelmann, Wilhelm. Kratz, Madlen 2017, *translated* Chapters 27 & 28.



Producer surplus:

$$\begin{aligned} \Delta PS_d &= PS_d^{new} - PS_d^{eq} \\ &= (TR_d^{new} - \int \alpha_d^{new} Q^\beta .dq) - (TR_d^{eq} - \int \alpha_d^{eq} Q^\beta .dq) \\ &= \left(P_d^{eq} (1 + \Delta p_d) \cdot Q_d^{eq} (1 + \Delta q_d) - \left[\frac{P_d^{eq} (1 + \Delta p_d)}{(Q_d^{eq} (1 + \Delta q_d))^\beta} \cdot \frac{1}{\beta + 1} \cdot Q^{\beta+1} \right]_0^{Q_d^{new}} \right) \\ &\quad - \left(P_d^{eq} \cdot Q_d^{eq} - \left[\frac{P_d^{eq}}{(Q_d^{eq})^\beta} \cdot \frac{1}{\beta + 1} \cdot Q^{\beta+1} \right]_0^{Q_d^{eq}} \right) \end{aligned}$$

$$\begin{aligned} \Delta PS_x &= PS_x^{new} - PS_x^{eq} \\ &= (TR_x^{new} - \int \alpha_x^{new} Q^\beta .dq) - (TR_x^{eq} - \int \alpha_x^{eq} Q^\beta .dq) \\ &= \left(P_x^{eq} (1 + \Delta p_x) \cdot Q_x^{eq} (1 + \Delta q_x) - \left[\frac{P_x^{eq} (1 + \Delta p_x)}{(Q_x^{eq} (1 + \Delta q_x))^\beta} \cdot \frac{1}{\beta + 1} \cdot Q^{\beta+1} \right]_0^{Q_x^{new}} \right) \\ &\quad - \left(P_x^{eq} \cdot Q_x^{eq} - \left[\frac{P_x^{eq}}{(Q_x^{eq})^\beta} \cdot \frac{1}{\beta + 1} \cdot Q^{\beta+1} \right]_0^{Q_x^{eq}} \right) \end{aligned}$$

$$\Delta PS_t = \Delta PS_d + \Delta PS_x$$

Consumer surplus:

$$\begin{aligned} \Delta CS_t &= 0.5(P_{avg}^{eq} - P_{avg}^{new}) (Q_t^{eq} + Q_t^{new}) \\ &= 0.5(-\Delta p_{avg} \cdot P_{avg}^{eq}) (2Q_t^{eq} + \Delta q_t \cdot Q_t^{eq}) \\ &= 0.5(-\Delta p_{avg} \cdot P_{avg}^{eq}) [2(Q_d^{eq} + Q_m^{eq}) + \Delta q_t (Q_d^{eq} + Q_m^{eq})] \end{aligned}$$

Figure: Food Crops WITH Honeybee Pollinators.

Source: Gordon, J., and Davis, L. 2003. "Valuing Honeybee Pollination." *RIRDC Publication No 07/077*. p.30

**4. The Economic Value:
Launhardt – Marshall (L-M) Welfare Method.
Australian Research since 1984.**

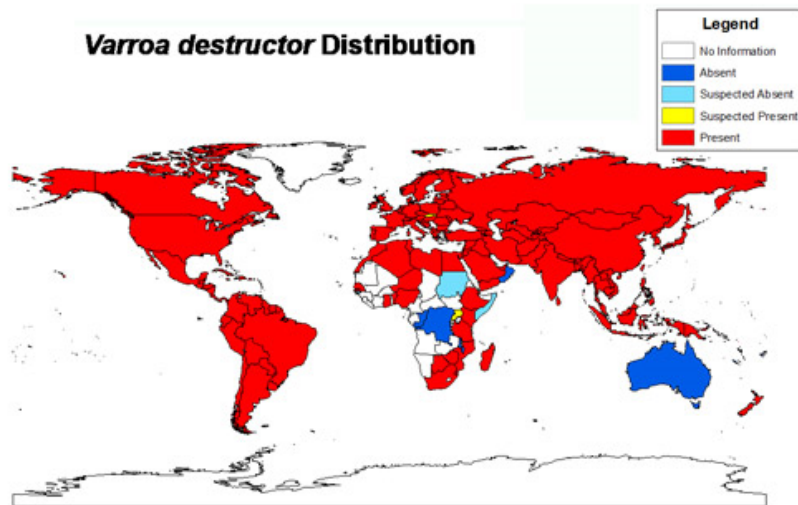
	1	2	3	4	5
Author & Year / Data Year	Gill 1989	Gibbs & Muirhead 1998	Gordon & Davis 2003	Gallai 2009	Aust Dept. of Agriculture 2014
1986 / 87	\$A 604.8m - \$A1,209.69				
1994 / 95		\$A1,200.00			
1999 / 00			\$A 1,726.00		
1991 / 2002				\$A2,113.00	
1986/7 & 1999/00					\$A 604.8 m - \$A1,726.00
Value of Agriculture	\$A6.262 bn	\$A10.0 bn	\$A31.02 bn	UN FAO data	\$A49.84 bn

- IAC Inquiry (1985) \$A545,000; Vic Dept. of Agriculture Submission (1984) to IAC, mentioned \$A158.6m

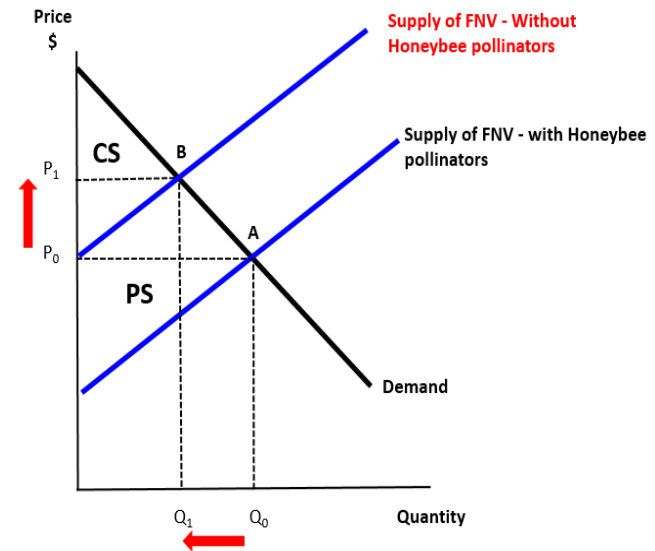
Research Objectives

Simple Objectives:

1. To update the economic value using the latest ABS data - 2014-2015.
2. Provide an insight into the potential cost of a widespread incursion of the Varroa destructor.



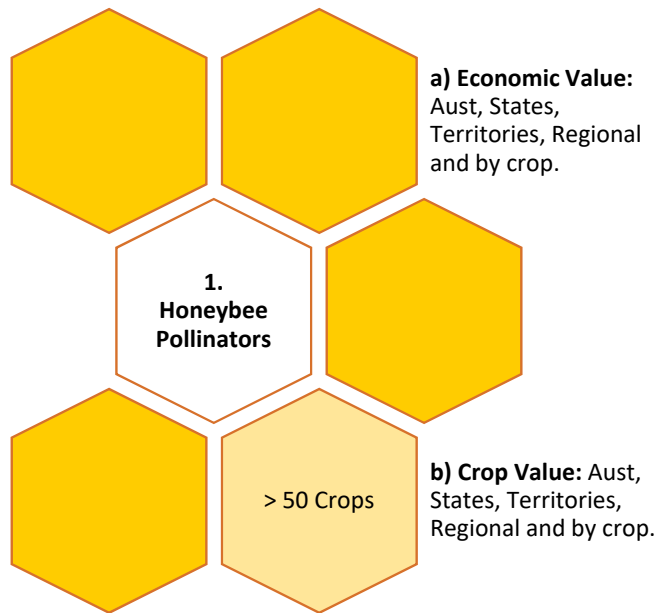
A: Distribution of Varroa destructor



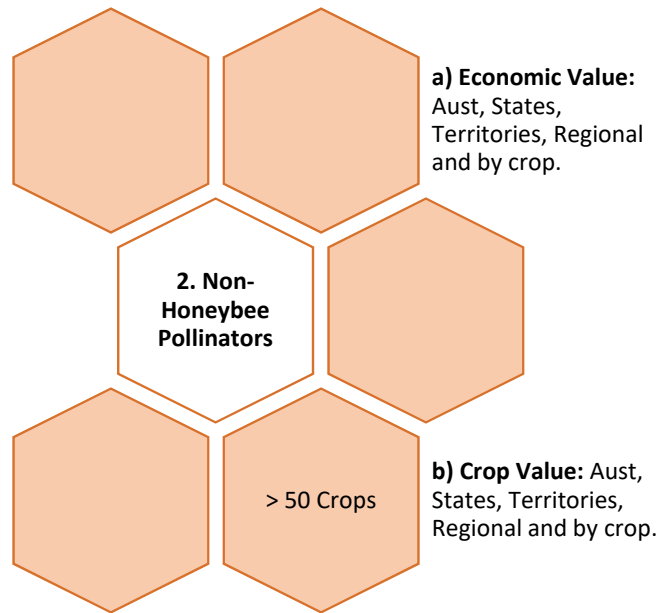
B: Food Crops without Honeybee Pollinators

Research Outcomes

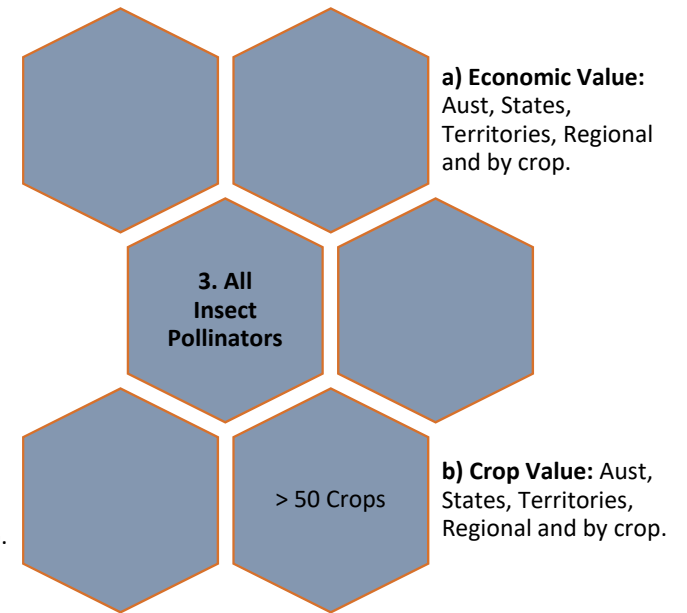
Full Set of Outcomes:



Part A: Honeybee Pollinators

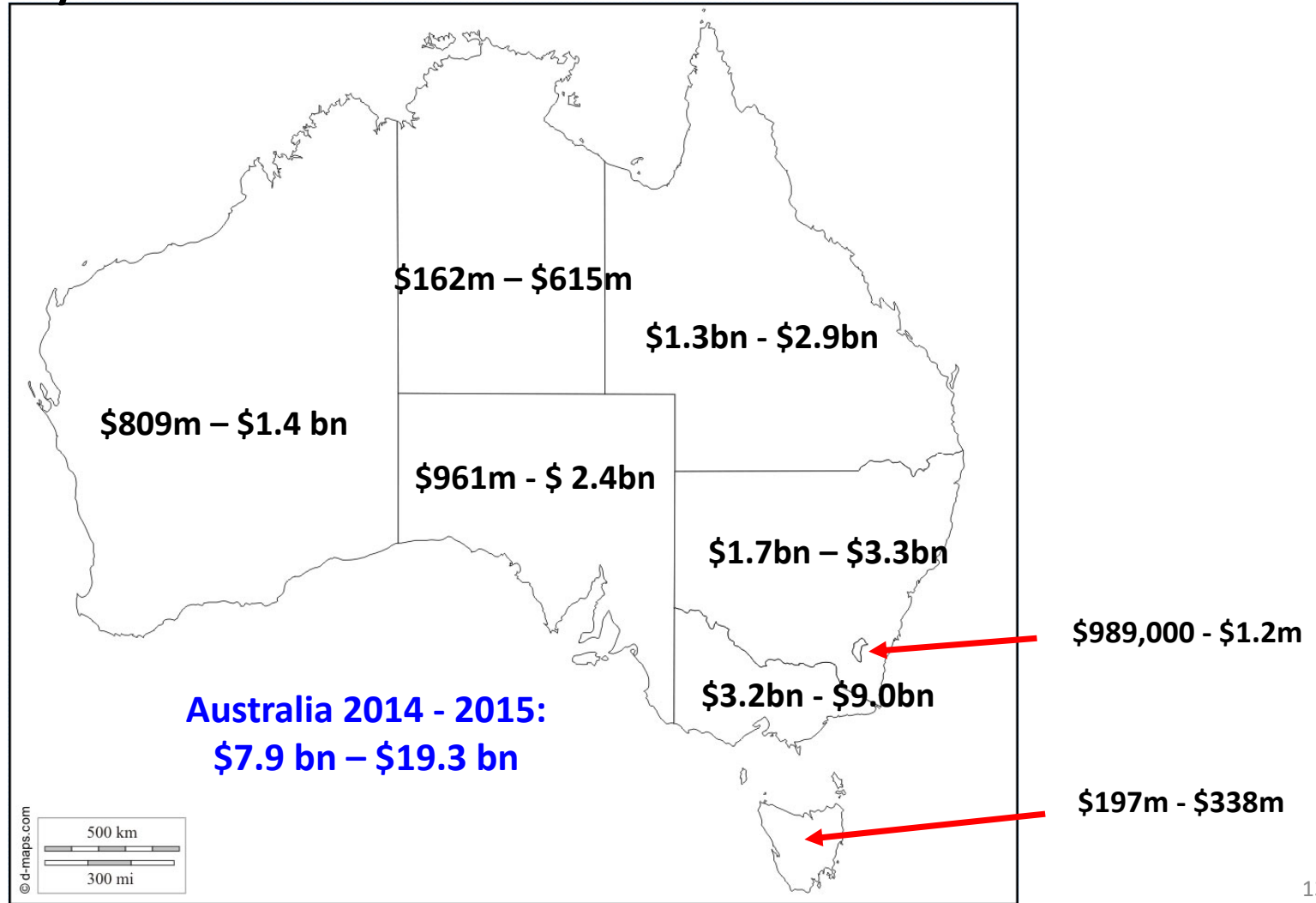


Part B: Non-Honeybee Pollinators



Part C: All Insect Pollinators

The Results: *The Economic Value of Managed and Wild Honeybees: Aust and States and Territories 2014 - 2015.*



**The Results: Regional Economic Value:
Avon Region - Strawberry crop
2014 - 2015.**

- The Avon region strawberry industry has an economic value of between \$A 4.65 m and \$A 5.57 m, accounting for one quarter of the WA strawberry industry.

Location	Range of Economic Value \$	
Australia	146,563,470	126,756,234
Western Australia	22,175,701	18,517,608
Avon Valley, WA	5,570,305	4,651,430

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Thank you!

