Strategic Planting to Maximise Bee Nutrition

Dr. Linda Newstrom-Lloyd

3rd Australian Bee Congress
June 29, 2018
Gold Coast Queensland

www.treesforbeesnz.org

Trees for Bees Program

www.treesforbeesnz.org

Sustainable Farming Fund Grants
3 grants over 9 yrs starting 2010
Pollen Protein
By Doug Somerville

Bee Friendly
A Planting Guide ...
By Mark Leech

Almond Pollination and Manuka Honey
Opportunities for Australia
Outline

- Expansion and Intensification
- Problem of the Commons
- Strategic planting → BEE HEALTH

70 years data from 1945 to 2016

- Hives doubled since 2005
- Apiaries steep rise since 2005
- Beekeepers peaks and valleys

Thanks to Murray Reid for AsureQuality data
Data compiled by Trees for Bees NZ
Numbers rising but the issue is the **RATE** of Colony Losses

- Queen health
- Starvation and Malnutrition
- Pest and Diseases
- Pesticides

Unprecedented New Stressors

- Competition for overwintering sites rising rapidly
- Apiary takeovers threaten beekeeper’s livelihoods
- Overstocking new hives near traditional wintering sites
  - Overstocking -> malnutrition -> diseases -> colony loss
  - Pollination services threatened for growers and farmers
Consequences Overstocking

- Bees use up more honey → poor harvest
- Bees malnourished → more diseases
- Bees starving → colony dwindles
- Dead out hives → loss of profit
- Everyone in foraging range suffers

Honey Bee Robbing
Bees at War!
Causes Starvation or Malnutrition

- Floral resources removed or died
  - Gorse and willow
  - Weed free farming
  - Irrigation or other land uses
- Poor weather and no artificial feed
- Weird weather and no flowering or nectar
- AND NOW ADD OVERCROWDING!

Nutrition for One Bee Colony

Pollen → 20 kg per year

Nectar → 120 kg per year

Water → 25 litres per year

Data from Seeley 1995 *The Wisdom of the Hive*
Pollen for Protein, Fat, Vitamins

Weeping beech *Fagus sylvatica* var *pendula*

Nectar for Carbs and Micronutrients

Nectar droplets in Maple

*Acer mono mayrii*
The Role of Artificial Bee Feed?

• Protein patties and sugar water
• Excellent tool for emergency rations
• Not good for steady diet
• BEE CAREFUL !!
• Natural fresh pollen/nectar is superior

Nutrition for Bee Health

OPTIMUM HEALTH

Nutrient deficiency or Starving

X

Nutrient Excess or Unbalanced
Fresh natural and diverse diet

Native: Flax (*Phormium tenax*) - 32% protein
Five Finger (*Pseudopanax arboreus*)
20% protein - Early Spring

Photo by Richard Toft
© Landcare Research

Photinia (*Photinia beauverdiana*) – 25% protein

Photo : Jean-Noël Galliot
© Landcare Research
Outline

- Expansion and Intensification
- Problem of the Commons
- Strategic planting → BEE HEALTH

The Problem of the Commons

Economics of Overcrowded Apiaries

“double negative reciprocal production externality”

Peter Lloyd
Emeritus Professor of Economics
University of Melbourne

Reference:
Competition in the Manuka Honey Industry in New Zealand
Department of Economics, University of Melbourne
Working Paper No. 2033, September 2017
Carrying Capacity for Livestock

Carrying Capacity for Bees
Bees have no fences
Foraging Range  5 to 12 km

Difficult to regulate

Compare to:
  dairy cows
  fishing and hunting
  oil rigs and landowners

Beekeeping is different
bees use up the honey
Bees have no fences

(Unitary authority, government regulation, voluntary cooperation, etc.)
Overcrowding $\rightarrow$ Rising Costs

- Diseases harder to control (resistance)
- Cost and labour for feeding supplements
- Robbing risks require more visits
- More work for less money

Too Many New Entrant Beekeepers

- No entrance licence
- Easy to start up
- Attractive to external investment
Skills and knowledge take experience

- Hive and apiary balanced
- Weather patterns, flowering times
- Nectar and pollen yield patterns
- Diseases and foraging range
- Low quality pollination services

Wider Risks of Overcrowding

- To Pollination Services
- To Native Bees and other pollinators

See David Pattemore’s Talk at 2:10 pm SAT
Outline

• Expansion and Intensification

• Problem of the Commons

• Strategic planting → Bee Health

Carrying Capacity - Plant for Bees

RESULTS FROM FIELD LAB & LITERATURE

ADVICE FROM FARM PLANTING ADVISOR, FARMER & BEEKEEPER

Angus McPherson
Farm Planting Advisor
**STRATEGY: ID Target Activity**

Number Bees in One Hive

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**Spring Build-up**

- Honey Flow
- Over-wintering

**Pollination Services**

**BUILD UP**

- MANUKA FLOW
- WINTER DOWN

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**Spring to Summer Flowering**

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<tr>
<th>Biostatus</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Winter/Early Spring</th>
<th>Spring/Early Summer</th>
<th>Summer</th>
<th>Early Winter</th>
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www.treesforbeesnz.org
# Autumn Flowering Flowering

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<th>Biostatus</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Winter/Early Spring</th>
<th>Spring/Early Summer</th>
<th>Summer</th>
<th>Early Winter</th>
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<td>Pōriri</td>
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<tr>
<td>Native</td>
<td><em>Hebe stricta</em></td>
<td>Koromiko</td>
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<tr>
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<td><em>Pseudopanax arboreus</em></td>
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<td>Native</td>
<td><em>Pseudopanax lessonii</em></td>
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<td><em>Hohenia populnea</em></td>
<td>Houhere</td>
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# Flowering Calendar & Bee Feed Budget for Species Diversity

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<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
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<td><em>Vitex lucens</em></td>
<td>Pōriri</td>
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Target Plant: [www.treesforbeesnz.org](http://www.treesforbeesnz.org)
### Flowering Calendar & Bee Feed Budget for Number of Trees

#### Number of Trees

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### Can be problem for Spring build-up!

Population Crash in October

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<th>JUL</th>
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Can be problem for Winter survival!

Starving bees going into winter

New Tools to Assess Apiary Site
GNS Science Palynology Team

Identify and photograph pollen

Dr. Xun Li
Dr. Ian Raine

Pollen Profile for John Berry’s Apiary

Tk1 P8 pellets
Scaling up Planting

- 27 Demo Farms across NZ
- Multipurpose Planting
- Landowner pays for plants and labour
- 60,000 plants installed since 2012

Kintail Queen Raising Yard
TECH TRANSFER

• Training and resources in progress:
  – Pollen Atlas (GNS Pollen Lab)
  – Flowering Catalogue (Trees for Bees)
  – Willow Identification Key (Landcare Research)
  – Guides to Planting for Multipurpose (McPherson)

www.treesforbeesnz.org

Platinum Sponsors SFF 2016
Sustainable Farming Fund Project 404868
Strategic Planting for Pollination and Honey

Ministry for Primary Industries
Manatū Ahu Matua

INGLEBY
KINTAIL MANUKA
Airborne
NEW ZEALAND MANUKA
mānuka farming
HAWKE’S BAY
COMVITA
THE NEW ZEALAND POPLAR & WILLOW RESEARCH TRUST

NZ Honey Trust
How many flowers to feed one bee?

Flax averages 5 mg pollen/flower (need 125 to 145 mg)
25 to 30 flowers for 1 worker bee from egg to adult
Using Flax as an example 50,000 bees

- Need 125 mg pollen to grow 1 bee
- Need 6.25 million mg to grow 50,000 bees
- Each flax flower averages about 5 mg pollen
- So 1.25 million flax flowers for 50,000 bees

Using Flax as an example 20 kg / hive

- To supply 20 kg pollen to hive per year
- Need 20 million mg of pollen
- Need 4 million flowers
- If say 200 flowers per plant
- Need about 20,000 flax plants