



New Research Results from Trees for Bees

*Linda Newstrom-Lloyd, Jean-Noel Galliot, Valentine Tournon,
Jules Boileau, Finn Scheele, Marco Gonzalez, Karyne Rogers,
Ian Raine, Xun Li, Gaye Rattray, Angus McPherson, Tony Roper*



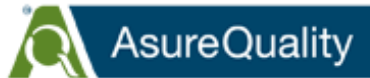
NZ Apiculture Industry Conference
June 25th 2014

www.treesforbeesnz.org



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Research Results in Three Parts

Combining 4 projects from 2009 to present

Part 1. Bee plant diversity

Part 2. Pollen quantity and quality

Part 3. Demonstration Farms

100 species with pollen protein analysed

Field work 2011-12

Collected Pollen for Protein analysis

50 sp. Canterbury

50 sp. Eastwoodhill

The pollen load in honey bee
basket is pollen plus nectar.

Weeping beech tree at Eastwoodhill
Fagus sylvatica var *pendula*



Returned to Eastwoodhill National Arboretum



Spring 2013

A selfie photo!

Thanks to our 3
student interns
from France

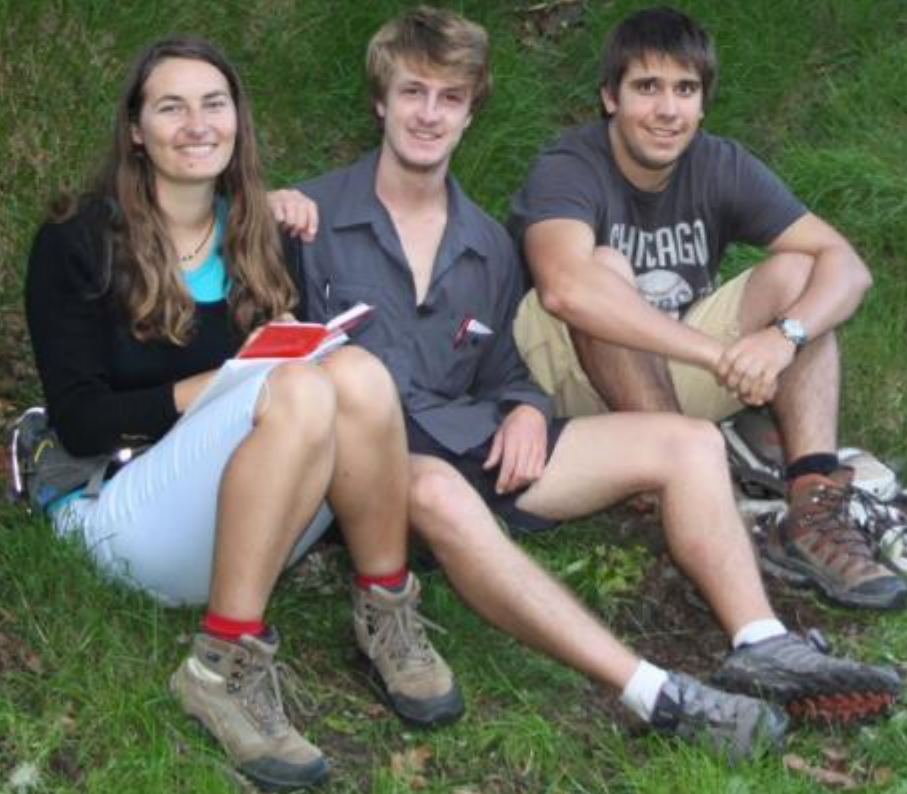
Left to right:

- Jean-Noel Galliot
- Valentine Tournon
- Jules Boileau



Seriously, this is the dream team

Left to right
Valentine Tournon
Jean-Noel Galliot
Jules Boileau



Collected 100 new species September to mid November !!



Caught bees for pollen loads



Collected herbarium specimens



Collected flower specimens



Collected flowers with pollen



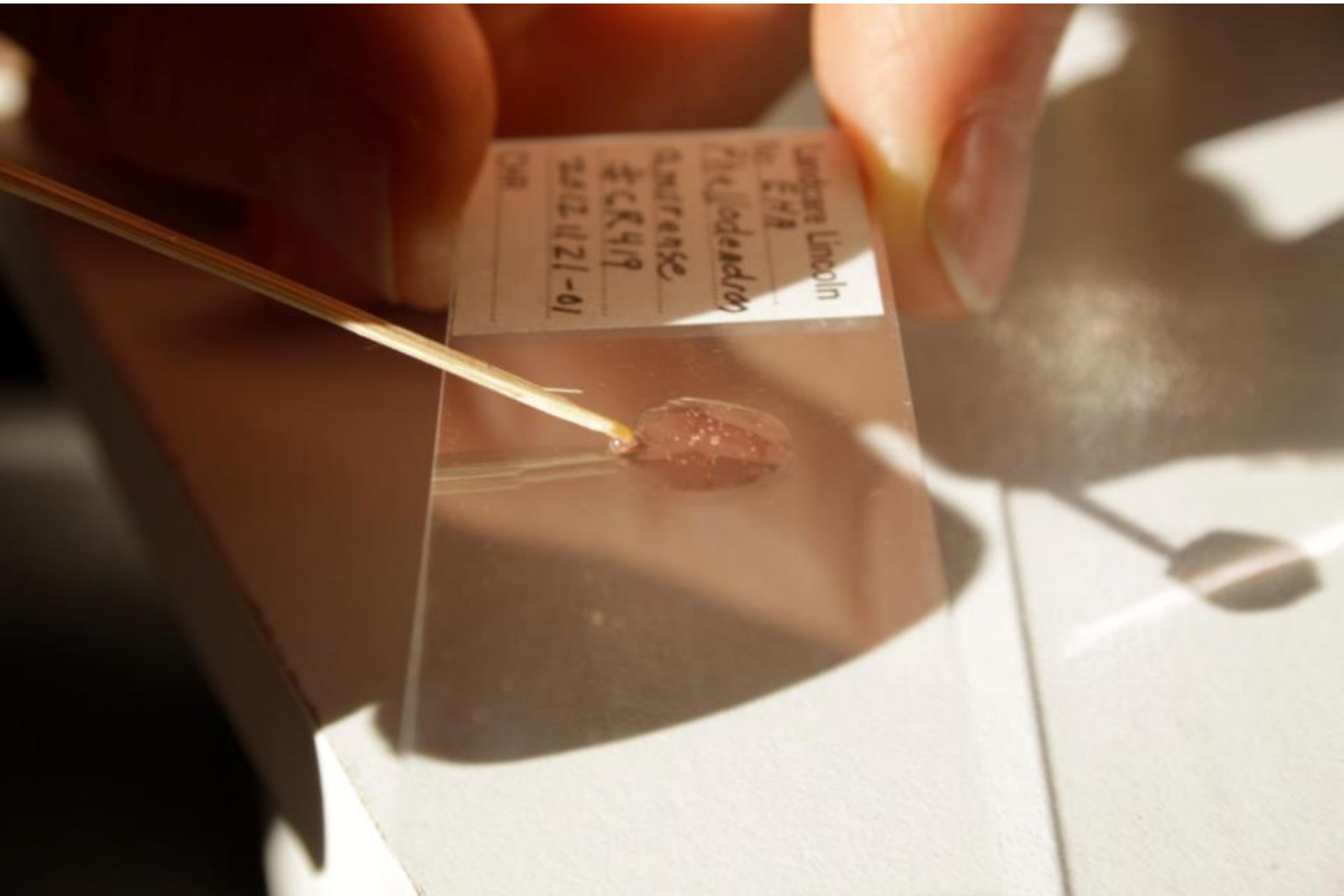
Made sure pollen is in the sample



Extracted fresh pollen with fuchsin jelly



Mounted fresh pollen with fuchsin on slide



Collected 2nd pollen sample
in vial for acetolysis in lab



Photographed flower & bee (macro & twin flash)



Photo of honey
bee behaviour

Photographed the whole tree



Sorted and stored photos in database



Purpose of each field sample

1. Bee pollen loads → pollen protein analysis
2. Plant herbarium samples → ID confirmation
3. Frozen flower samples → reference
4. Pollen samples → reference collection
 - Direct Mount and Acetolysis Treated
5. Photographs → websites, publications

Summary of diversity from field work

In 2011 to 2012:

~100 species from Cant and Gisborne

- Protein analysis completed

In 2013:

~100 new species from Gisborne

- Protein analysis in progress

Field and literature data combined

- Database includes:
 - all 200 plant sp from field work
 - plus plant sp from literature search
 - for NZ --- 345 sp bee plants
 - for International --- ca 800 sp bee plants
- Field and literature overlap
 - Most plants in literature have no protein data
 - Many plants in field are not in NZ or Int'l lists

NZ Native plant species

Plant lists from NZ literature excellent

But difficult to get pollen protein samples

Native: Flax (*Phormium tenax*) - 32% protein



Photo by Finn Scheele
© Landcare Research

Native Tarata (*Pittosporum eugenoides*) – 25% protein



Native FiveFinger (*Pseudopanax arboreus*) 20% protein



Photo by Richard Toft
© Landcare Research

How get samples of manuka & kanuka pollen ?



Manuka flower with honey bee

Tiki Tiki in East Cape



Manuka flower with native bee

Ruatahuna in Urewera forest



Male manuka flower with pollen on nectary



Summary Part 1: Bee plant diversity

- Over 800 candidate bee plant species to use
 - NZ and international literature
 - field work especially Eastwoodhill
- Will have protein values for 200 sp
- Need flowering calendars to check feed budget

Research Results in Three Parts

Part 1. Bee plant diversity

Part 2. Pollen quantity and quality

Part 3. Demonstration Farms

Emerging field --- bee nutrition

**If we can do nutrition for sheep and beef
why can't we do it for bees?**

**Artificial feed – emergency rations when needed
or convenience/junk food all the time?**

New papers published this last year:

Pasquale et al. 2013 in France

The influence of Pollen Nutrition on Honey Bee Health: Do Pollen Quality and Diversity Matter? In PLoS ONE

Sajawani et al. 2014 in Oman

Studies of bee foraging plants and analysis of pollen pellets from hives in Oman. In Palynology.

Protein results for 59 selected species

% protein	Number Species	Range of crude protein
High	22	25 % and over
Medium	29	> 17 % and < 25 %
Low	8	17% and lower

See www.treesforbeesnz.org for this species list

What makes a Buzz Plant? Cost of reward

Ease of Access and Landing Platforms

1. Open access flowers

- dishes, bowls, brushes, catkins

2. Directed access flowers

- floral tube: bee tongue length too short?

3. Closed access flowers

- flag flowers (e.g., in beans, peas, gorse)
- does bee have the strength to open the flower?

Landing Platforms

- what will the bee hold on to?

Rosa sp Garden Plant



***Camellia* sp. – super bowl flower**



***Malus sieboldii* – Apple has open dish flower**



***Malus sieboldii* – Apple**



***Malus sieboldii* – Apple**



Acer coriaceifolium

Yunnan Maple



***Acer coriaceifolium* Yunnan Maple**



***Acer buergerianum* – Trident maple**



***Photinia beauverdiana* – Christmas berry**



Quercus – *Oaks* have catkins



Q. laeta



Q. mongolica



Q. canariensis



Q. robur

Photos : Jean-Noël Galliot
© Landcare Research

Quercus robur ***huge oak tree***

- Volume pollen
- Vertical rise
- Longevity 100 yrs



Photo : Jean-Noël Galliot
© Landcare Research

***Fagus sylvatica* var *pendula* – Weeping beech**



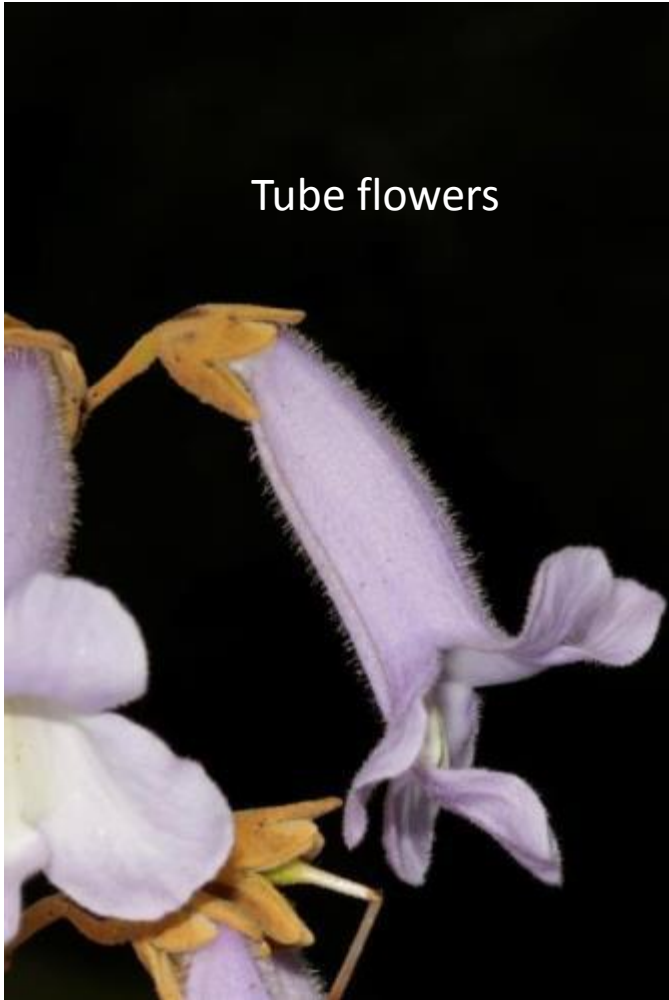
Fagus sylvatica
var pendula
Weeping beech

- Flowers profusely
- But not every year



Paulownia tomentosa Princess tree

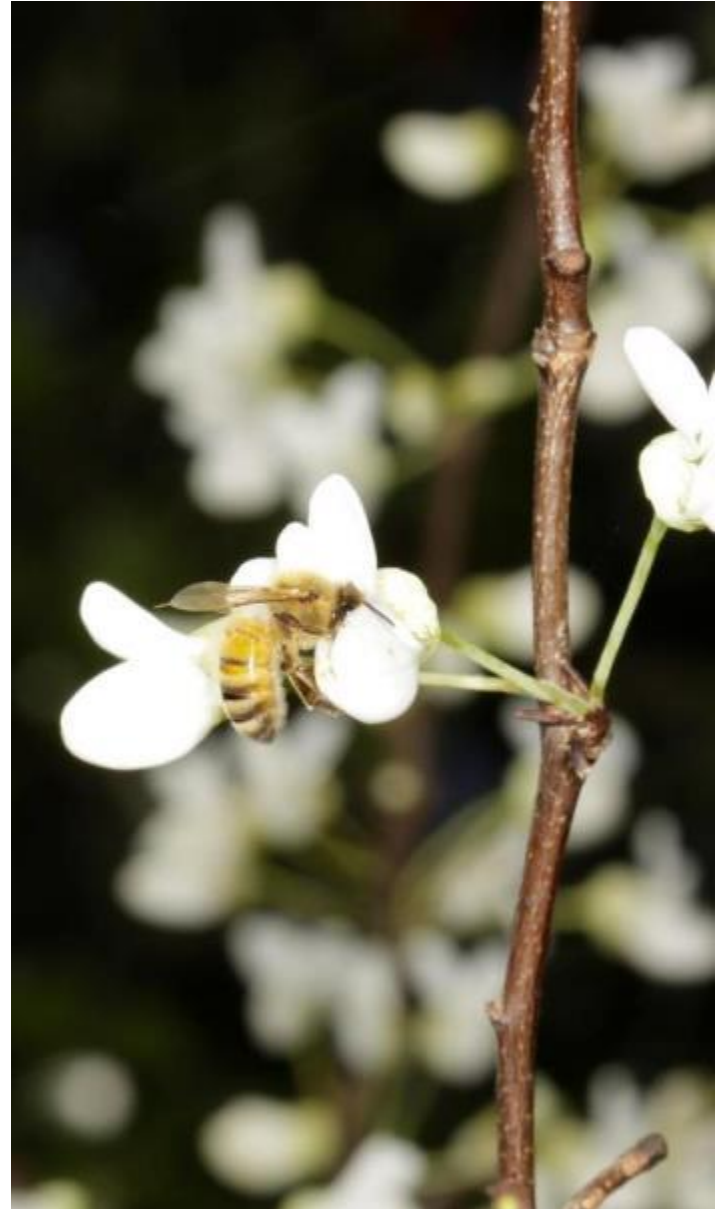
Tube flowers



Few
anthers



***Cercis siliquastrum* cult. alba – Flag Flower**



Summary Part 2: Quantity and Quality

- Maximise quantity pollen
 - Flower level
 - Tree level
- Optimise protein levels in pollen
- Optimise Cost/Benefit (energy budget)
 - Ease of access
 - Landing platforms

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Candidate Bee Plant list is growing

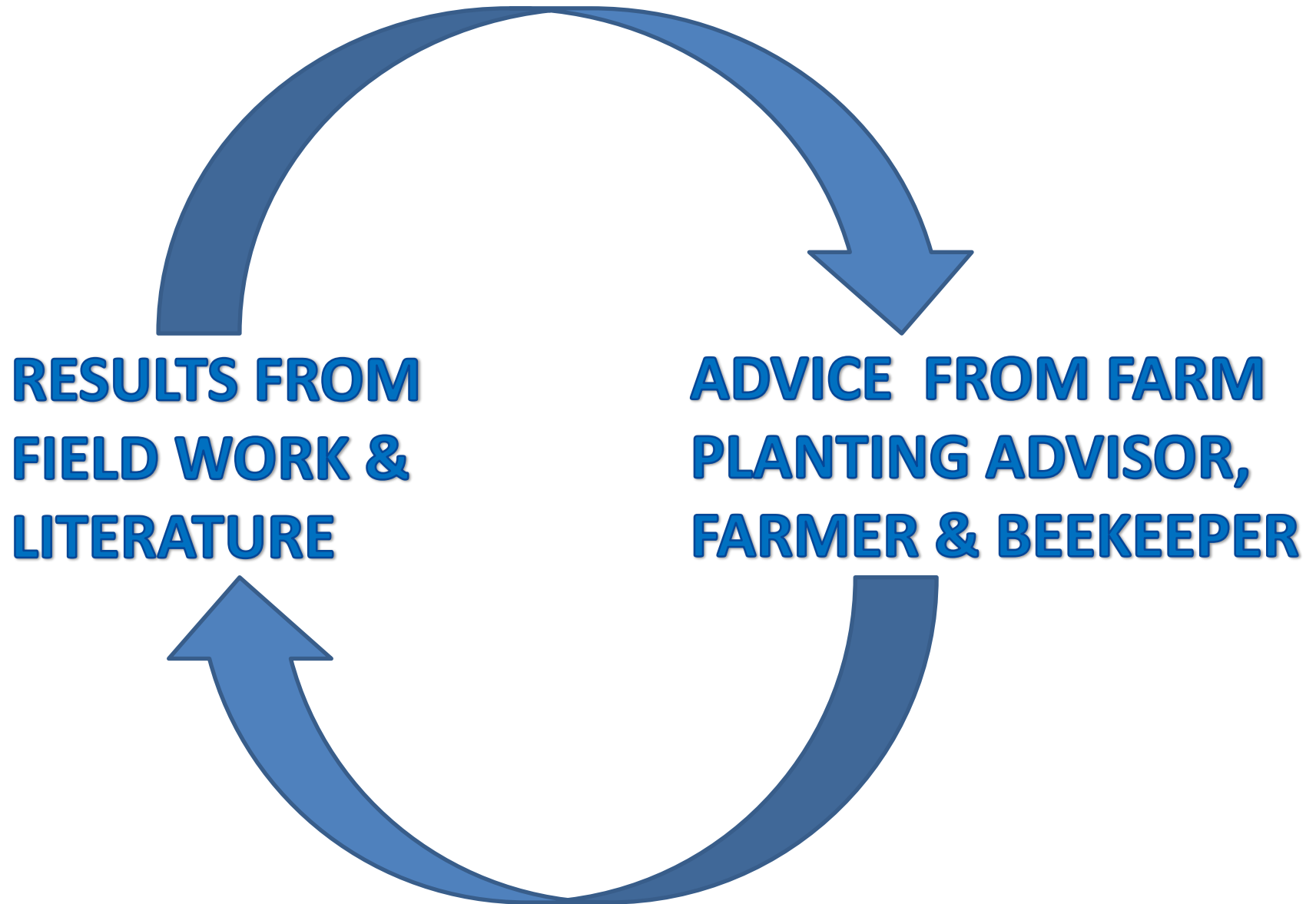
- Creating flowering calendars for species from:
 - Fieldwork + Literature
 - Beekeeper + Farmer + Nursery experiences
- Evaluating and each plant on many characters



Since 2011 - Trees for Bees program

- Planted **9700** trees and shrubs
- Covered ~ **8.1** hectares
- Need landowner + beekeeper + planting advisor
- Developing guidelines for planting

Iterative Process is Essential



Trees for Bees Demo Farms

Primary Category	Planted	Started	Assessed
Arable	2		
Hill Country Sheep and Beef	3	1	2
High County Sheep and Beef		2	1
Home Apiary Yards (queens)		2	1
Dairy			1
Vineyard			1
Maori land (manuka support)			2
Regional Council Park		1	
Truffles			1
TOTAL	5	6	9
<i>Farms include orchards, cropping, and manuka</i>			

Enhancing Queen Raising Yards

1. Kintail Honey -----James and Mary-Anne
2. Midlands Apiaries ---- James Callaghan
3. Hantz Honey ----- Barry and Geoff

Kintail Farm, Hawkes Bay



Queen raising site with specimen trees



25 June 2014

Trees for Bees - AJ McPherson

59

Off-season employment



A family affair: three generations



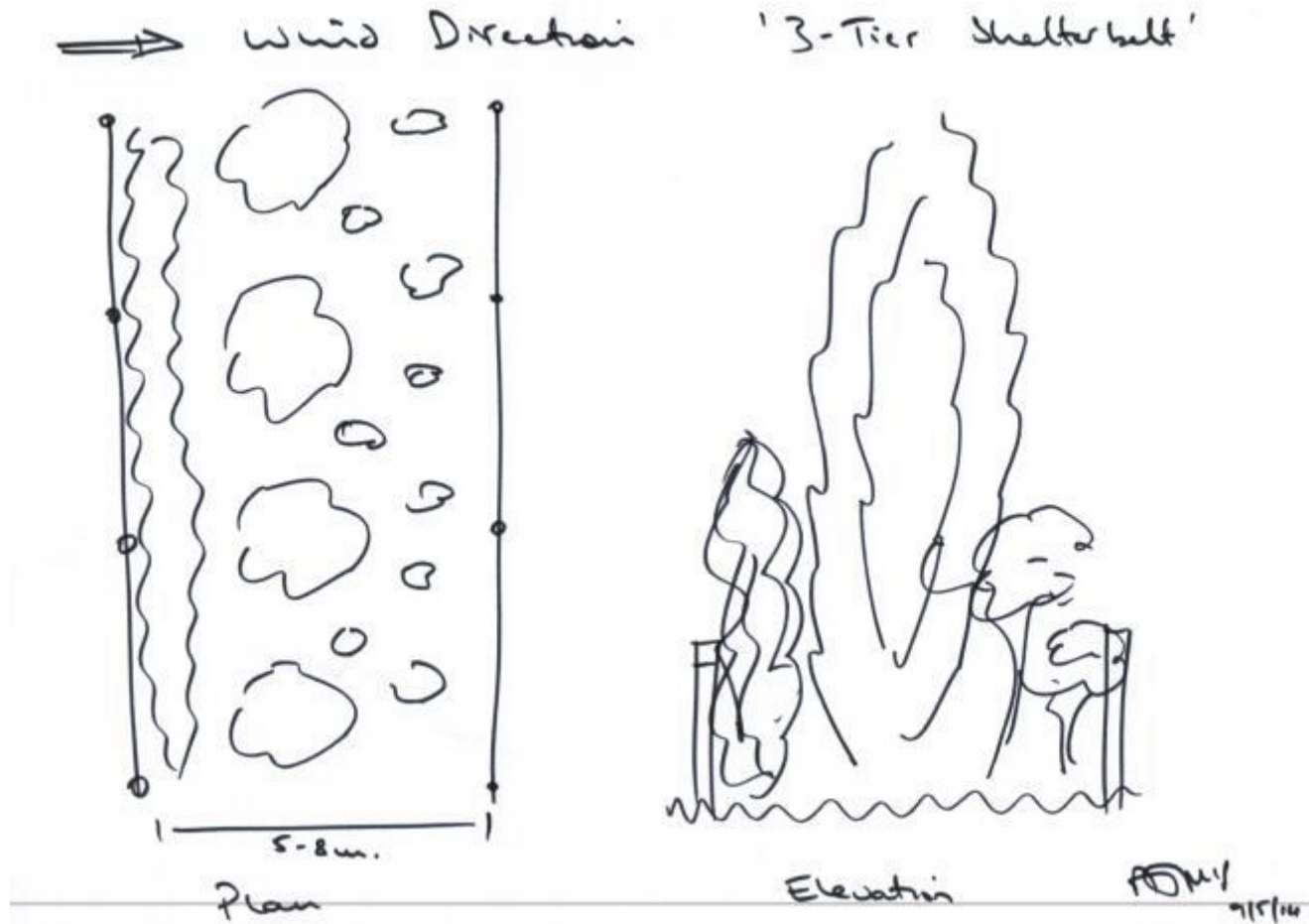
Avenue



River Margin



Shelterbelt



Escarpment



Hoheria flowering in first year



Trees for Bees for future generations



Why Plant Trees for Bees

*“Providing bee forage
as part of your on-farm planting
just makes good farming sense.”*