

SANBI

Biodiversity for Life

South African National Biodiversity Institute



Insect research at SANBI and links to agriculture biodiversity threats and responses

by Ruan Veldtman

Past & **current** SANBI projects

- **(P&R)** Global Pollination Project – 2008 to 2014, 3MSc, 1PhD, 1pdoc; collaboration SU & UP
- **(R)** Honeybee Forage Project – 2011 to 2015, 1MSc, 1PhD; collaboration SU, Strelitzia 37
- **(P)** Invasive wasp project – since July 2012, **ongoing**: 1 Hons, 2MSc, 2PhD, 1 Post doc, 1 international expert
- **(R)** Ecological Infrastructure (EI) and pollination **ongoing** – EI and Agric

(2) Invasive wasps in Western Cape agriculture



Pictures by Dr Simon van Noort

Polistes dominula
(Family Vespidae) or
'European paper wasp'

Vespula germanica
(Family Vespidae) or
'German wasp'



The two culprits...



Vespula germanica



Polistes dominulus



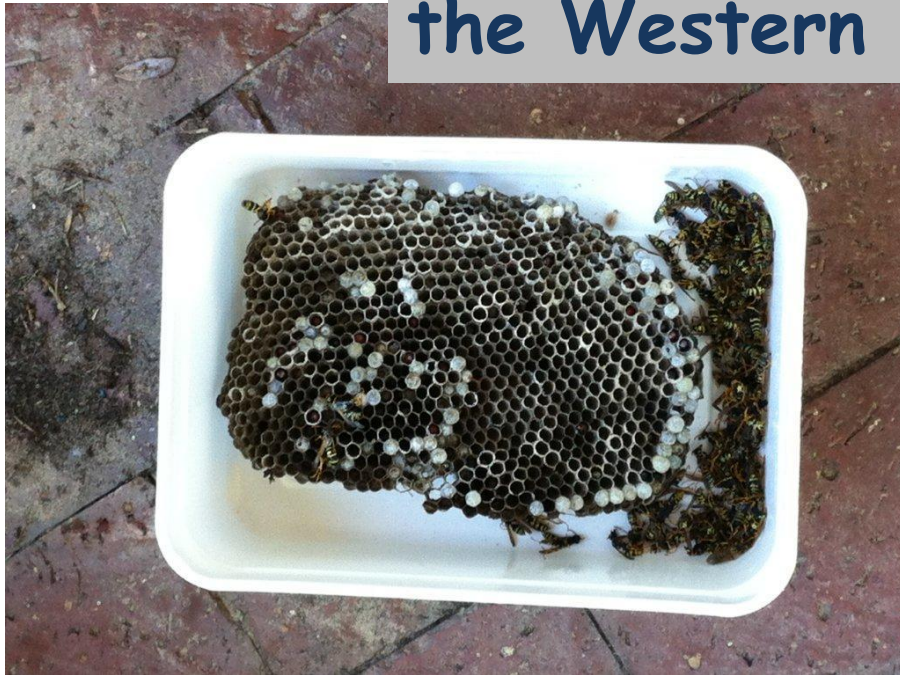


German wasp invading the Western Cape





Paper wasp invading the Western Cape





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ANNUAL STONE FRUIT DRYING EVALUATION HELD AT ARC INFRUITEC-NIETVOORBIJ

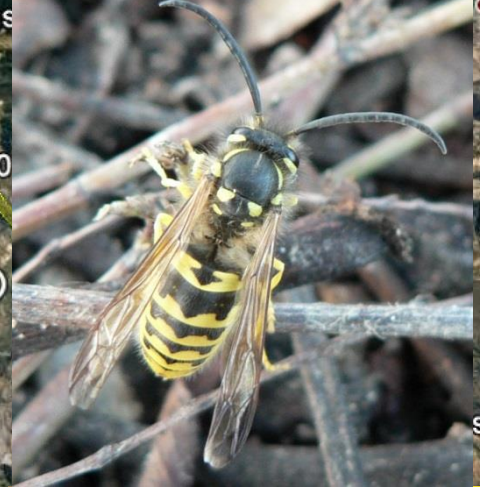
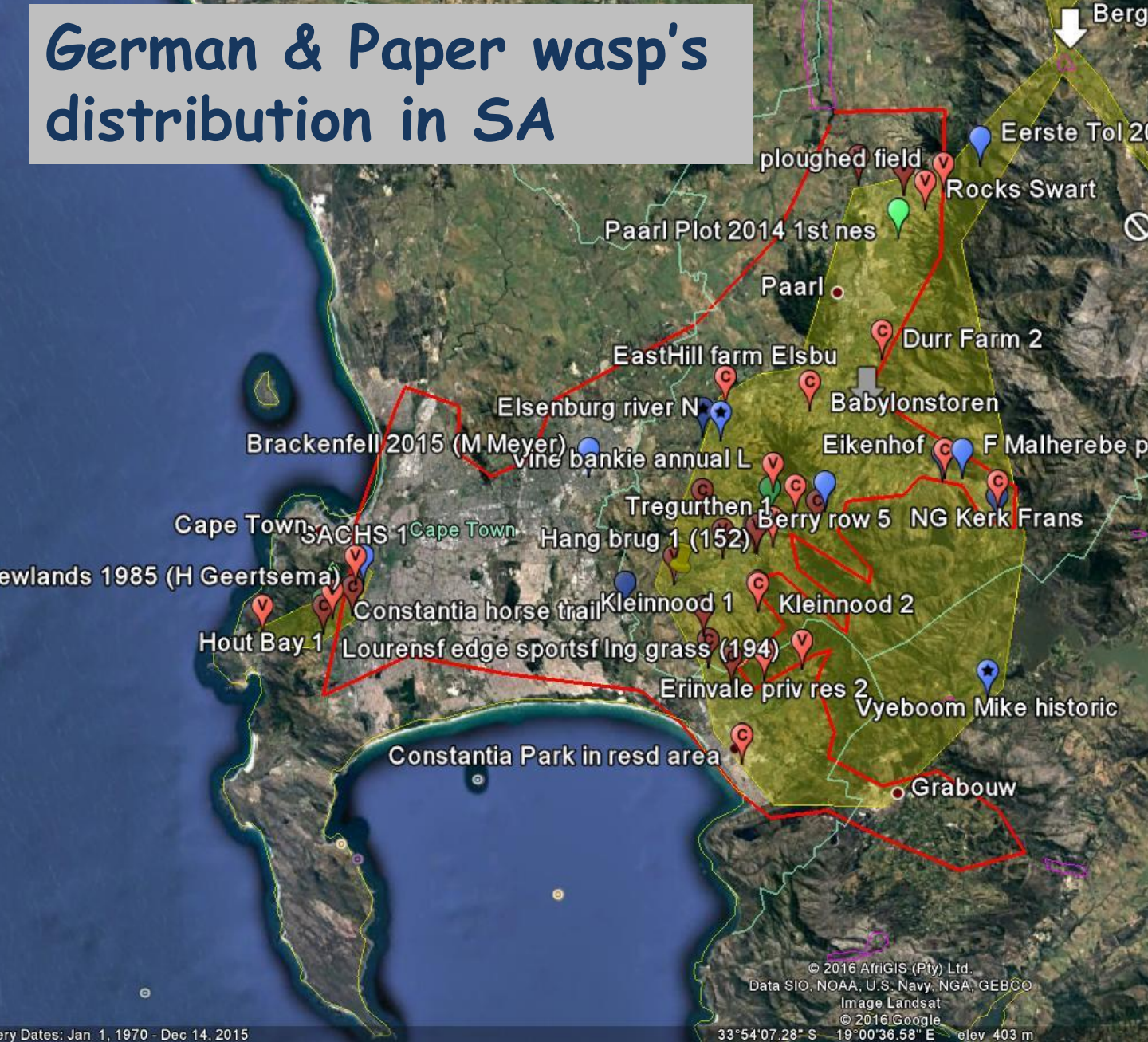
The Agricultural Research Council (ARC) hosted their annual stone fruit drying evaluation on Wednesday, 18 May. The panel was made up of industry and research personnel. According to Dappie Smit, Dried Fruit Technical Services general manager, this annual evaluation is part of the breeding project. Industry spends about R8 million on breeding and evaluation projects, this being the biggest project. Read more here: <http://bit.ly/1Za15IY>



INVASIVE WASPS STING FARMWORKER MORALE

Farms in the Western Cape are being threatened by the prospects of low worker morale thanks to two species of invasive wasps. The German wasp and Paper wasp are increasing their reach into farm areas and deliver an excruciating sting to humans who cross their path. "It's not good for worker morale when you get stung by [these] things when doing your job," Dr Ruan Veldtman told HORTGRO Science. Read more here: <http://bit.ly/25tGtbv>

German & Paper wasp's distribution in SA



ery Dates: Jan 1, 1970 - Dec 14, 2015

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 Data SIO, NOAA, U.S. Navy, NGA, GEBCO
 Image Landsat
 © 2016 Google
 33°54'07.28\"/>

- **Wasp biology and ecology:** Phase I - student theses and publications. Some aspects ongoing, e.g. genetics
- **Wasp risk assessments:** Ruan will discuss with Sabrina, Claude and John W to see who can do invertebrate RAs.
- **Economic costs of wasps invasion**, including the cost of no action
- **Delimitation (requiring surveillance):** current ToR to survey the edges of current known distributions almost finalised
- **Eradication feasibility:** current contracts to test management efficacy and cost of control (Grabouw, Franschhoek and possibly Wellington @ R300 K per town)
- Detection, handling and storing **public reports** (spots), developing SANBI-ISP response protocols and distributing **communication materials** and possible **citizen science** part



You are invited to the 2016
WWF Sustainable Agriculture
Producer Day



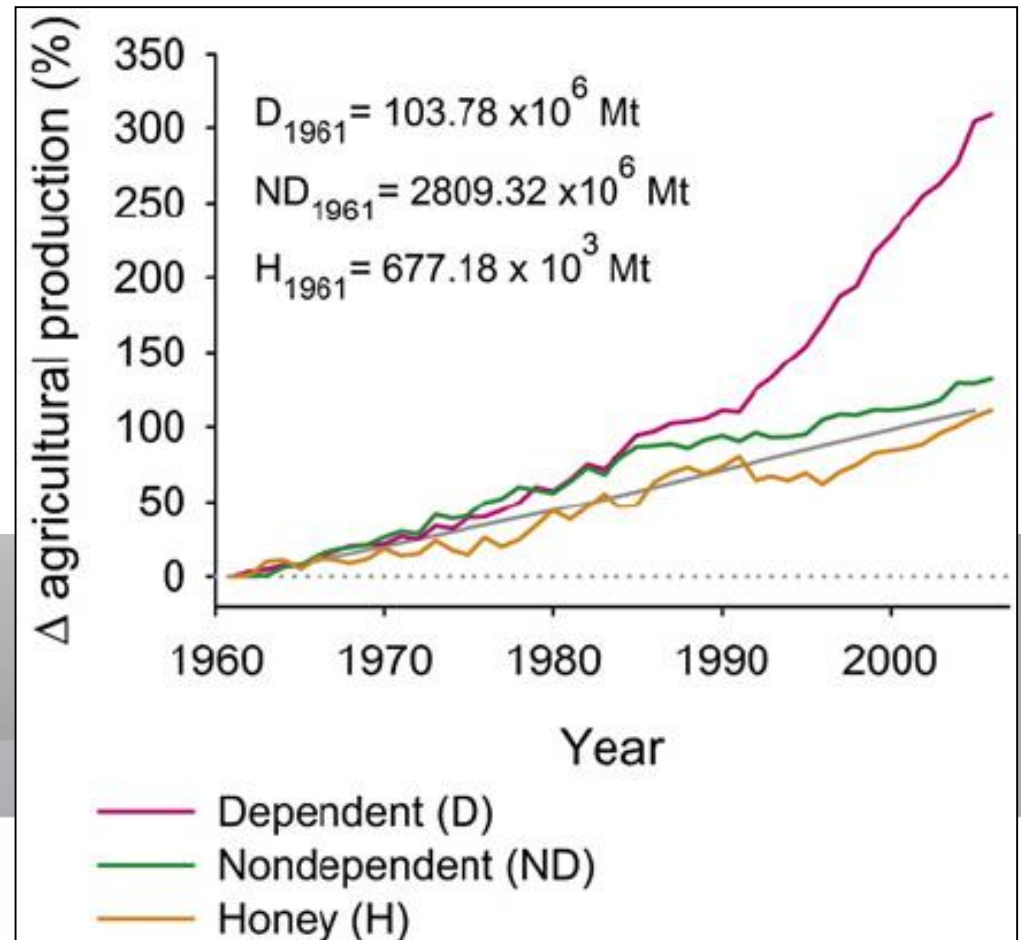
Pollination of insect-dependent crops

- Crop pollination by wild pollinators resident in neighbouring natural habitat = ecosystem service
- Same crop pollinated by honey bees coming from hive boxes rented from a beekeeper is not
- Thus can only make a case for biodiversity if crop uses the ecosystem service
- First step is thus to determine what proportion of pollination is by wild versus managed honey bees

The Global Stock of Domesticated Honey Bees Is Growing Slower Than Agricultural Demand for Pollination

Marcelo A. Aizen^{1,*} and Lawrence D. Harder²

¹Laboratorio Ecotono
INIBIOMA-CONICET and Centro Regional Bariloche
Universidad Nacional del Comahue
Quintral 1250
8400 Bariloche
Río Negro
Argentina
²Department of Biological Sciences
University of Calgary
Calgary, Alberta T2N 1N4
Canada



Global Pollination Project in SA



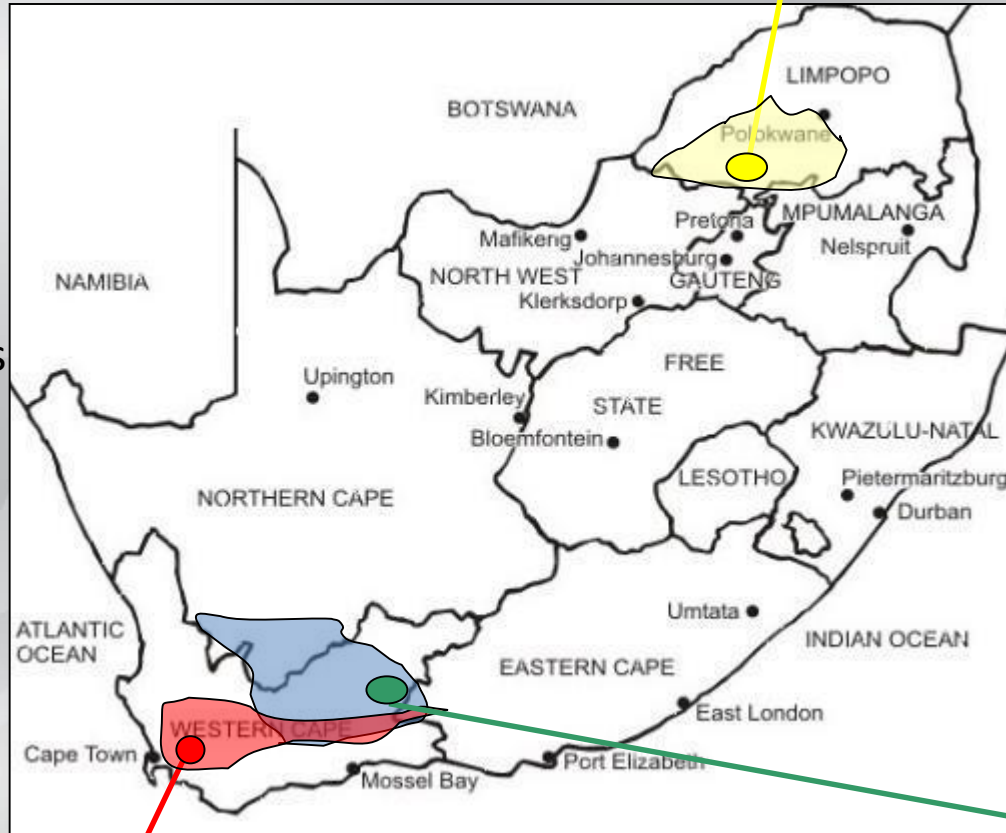
Springbok Flats sunflowers



- No payment for mgd bees
- Vast landscapes
- Attractive to pollinators

- Payment for managed bees
- Export regulations
- Attractive to pollinators

Biodiversity Hotspot!



Little Karoo hybrid onion seed

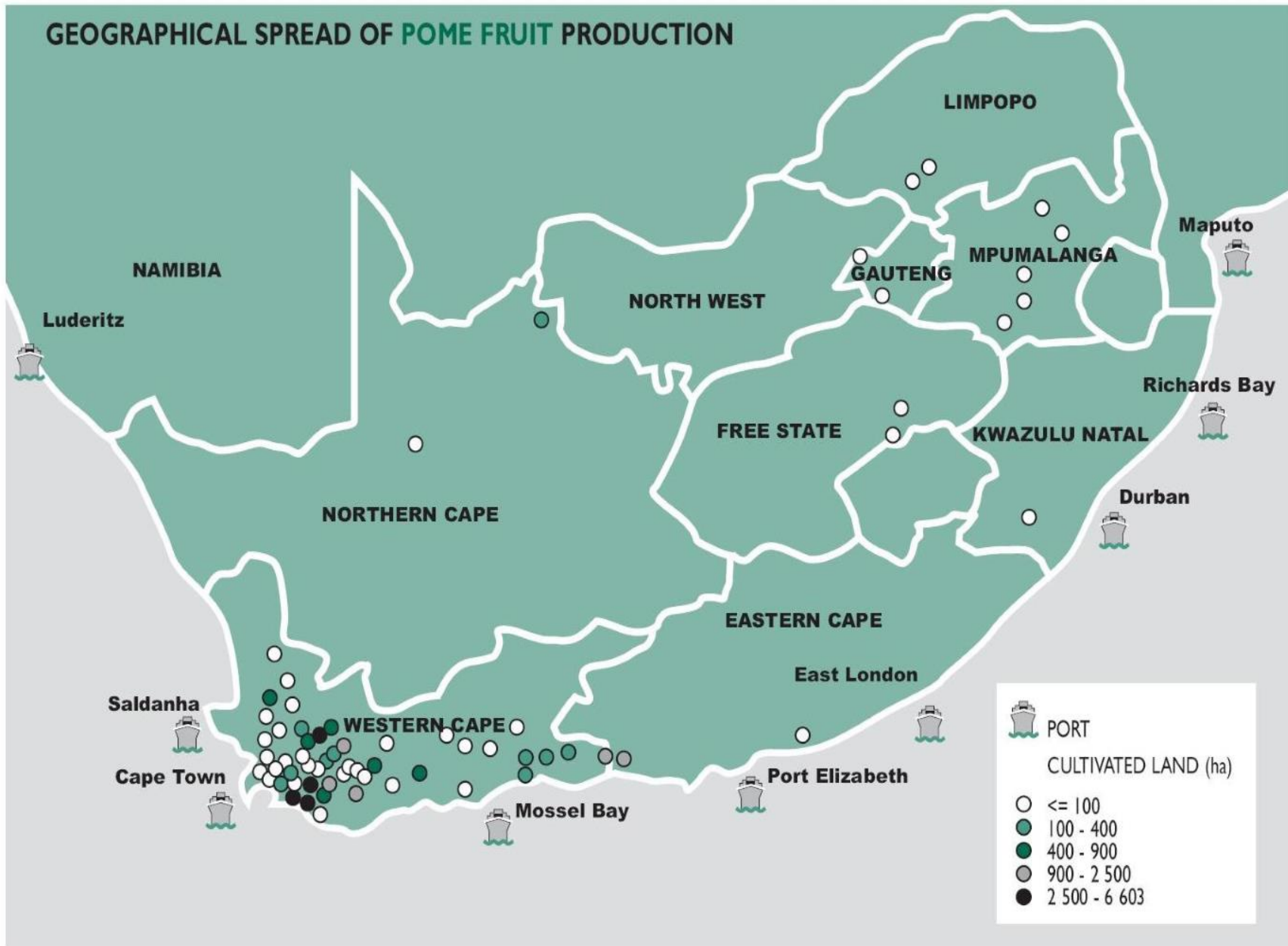
Boland, Koue Bokkeveld & Langkloof apples

- Payment for managed bees
- Valuable export crop
- Attractiveness variable

Biodiversity Hotspot!



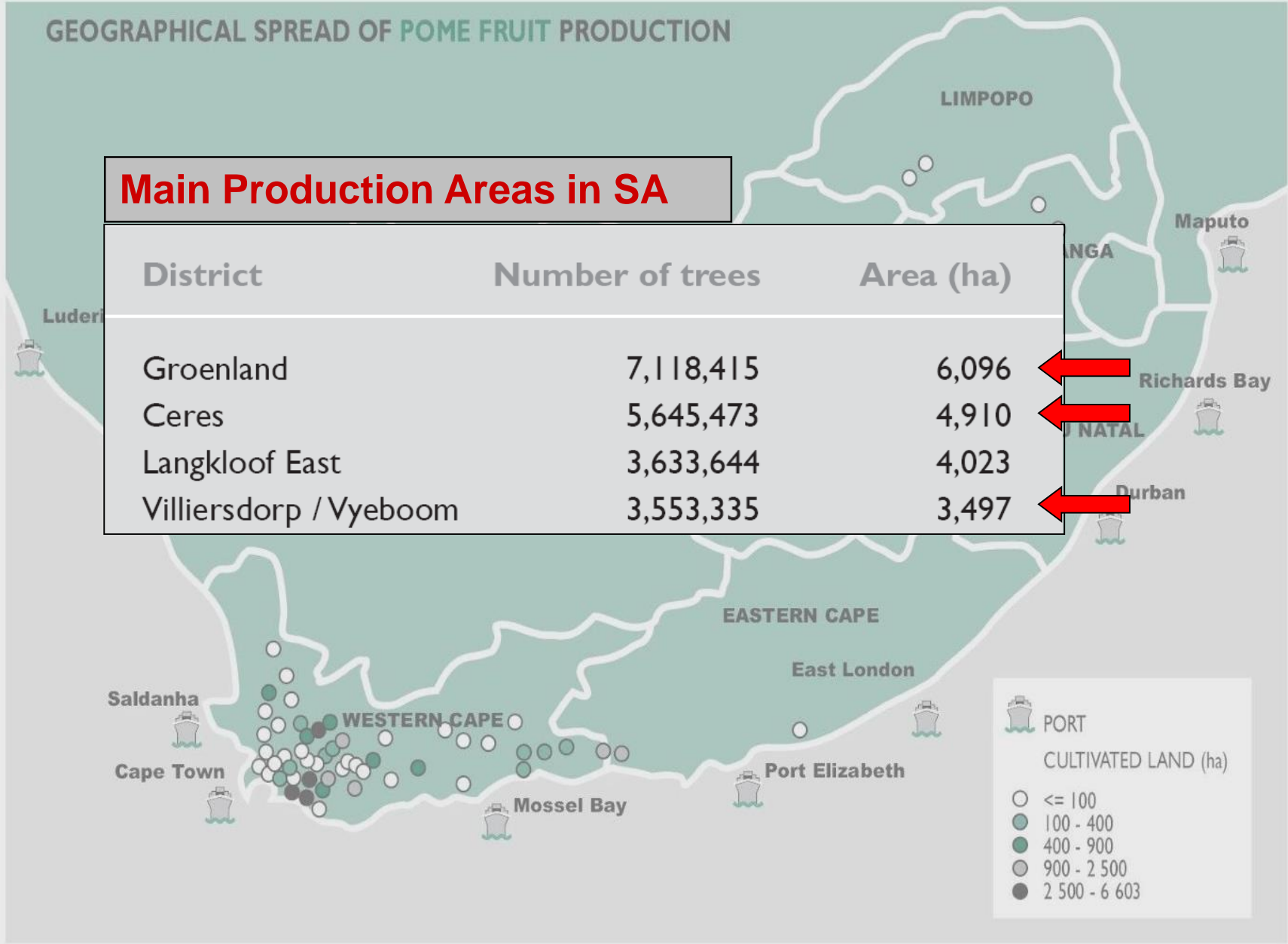
GEOGRAPHICAL SPREAD OF POME FRUIT PRODUCTION




GEOGRAPHICAL SPREAD OF POME FRUIT PRODUCTION






Main Production Areas in SA

District	Number of trees	Area (ha)
Groenland	7,118,415	6,096
Ceres	5,645,473	4,910
Langkloof East	3,633,644	4,023
Villiersdorp / Vyeboom	3,553,335	3,497



 PORT

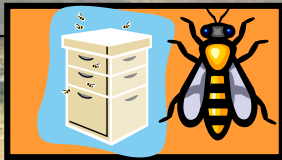
CULTIVATED LAND (ha)

-  ≤ 100
-  100 - 400
-  400 - 900
-  900 - 2 500
-  2 500 - 6 603

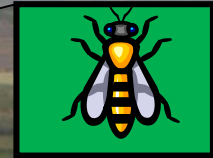
Typical Site

Natural Vegetation

2



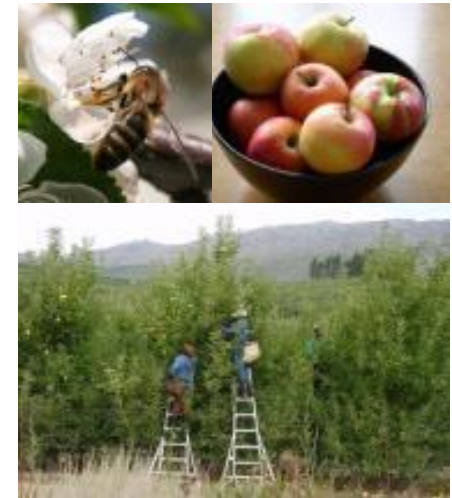
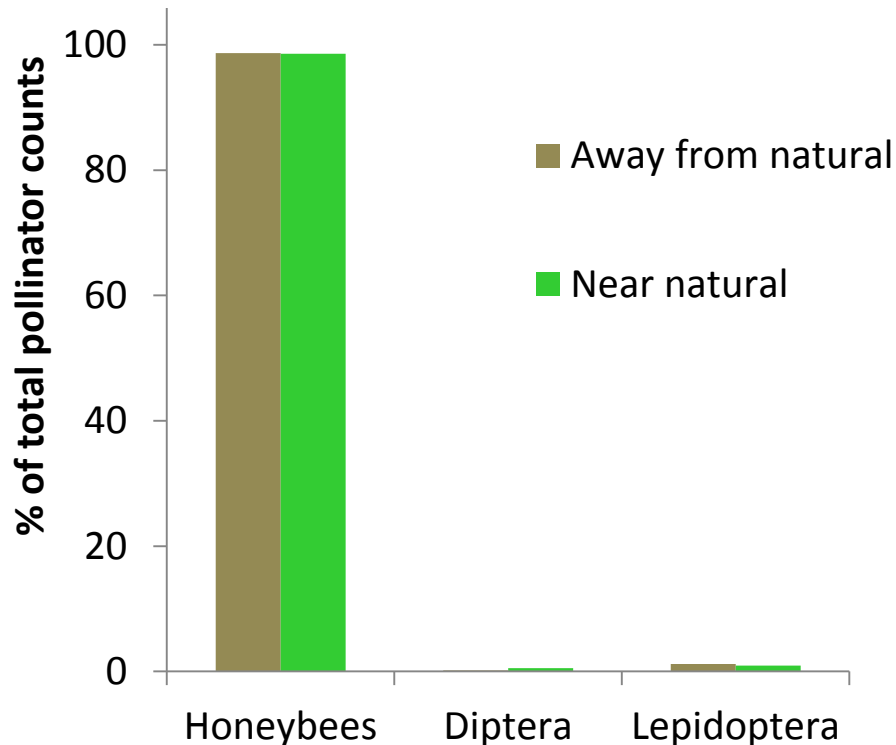
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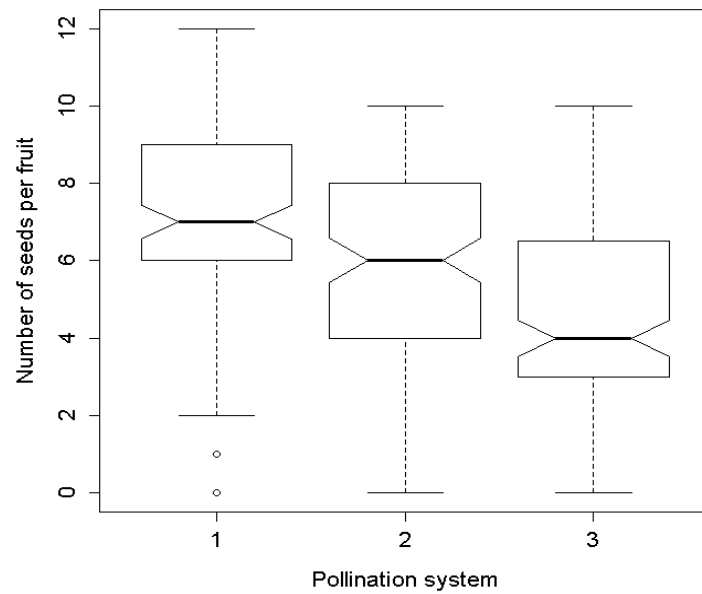
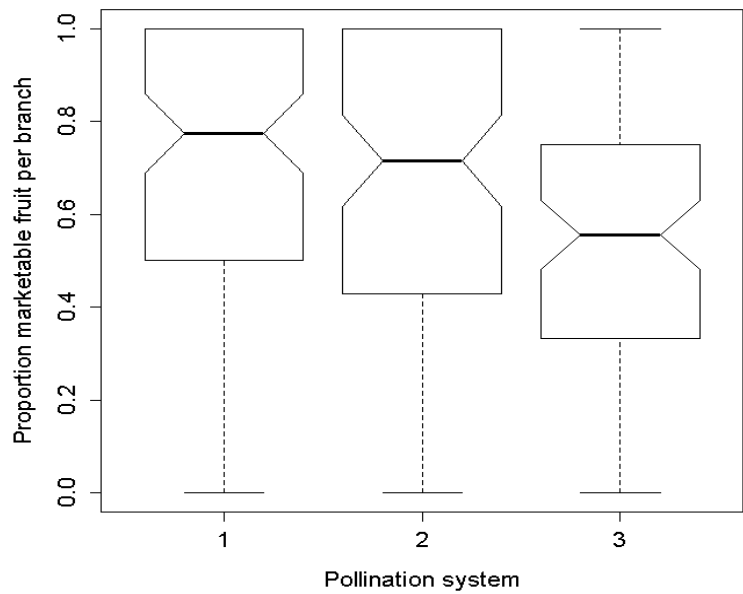
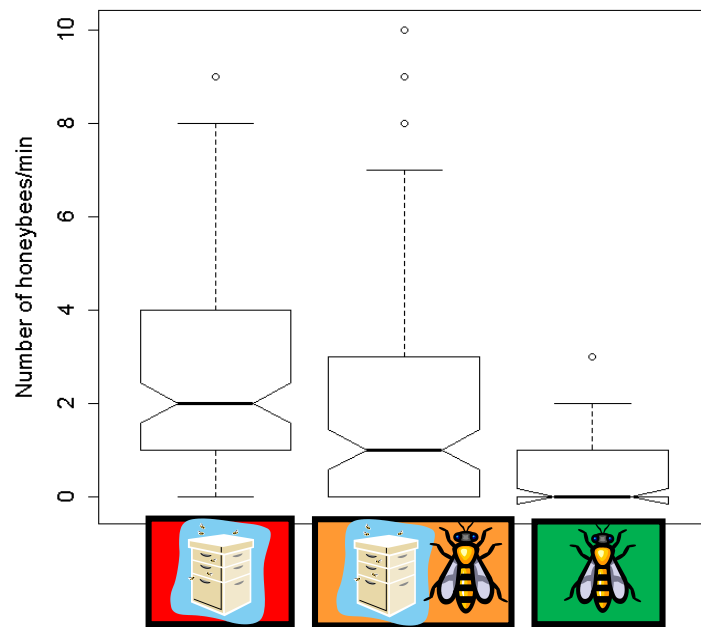
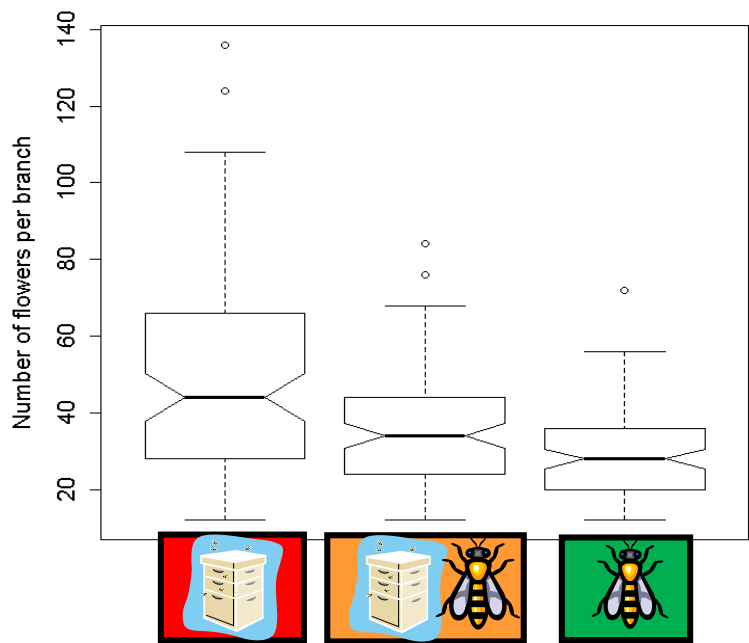
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Pollinator counts in apple orchards near and far from natural vegetation



99% of apple farms make use of managed honeybees, irrespective of proximity to natural vegetation – represents only 1% of the production costs.

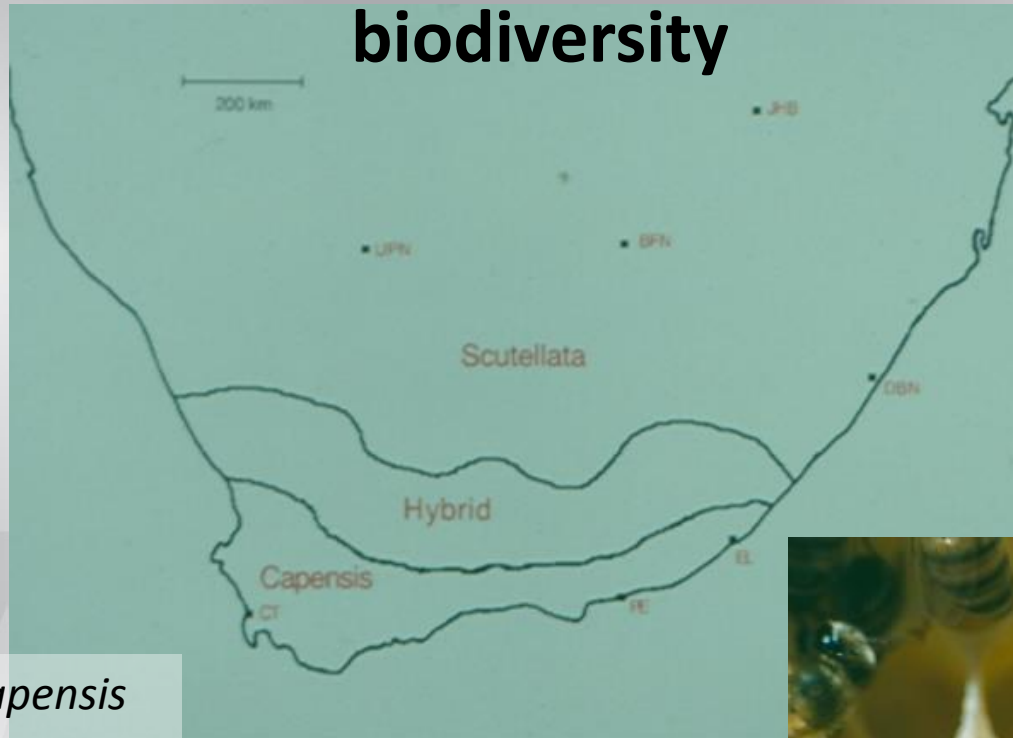


But why do we find these types of results?





However honey bees are part of South Africa's biodiversity



Apis mellifera capensis
Cape honeybee

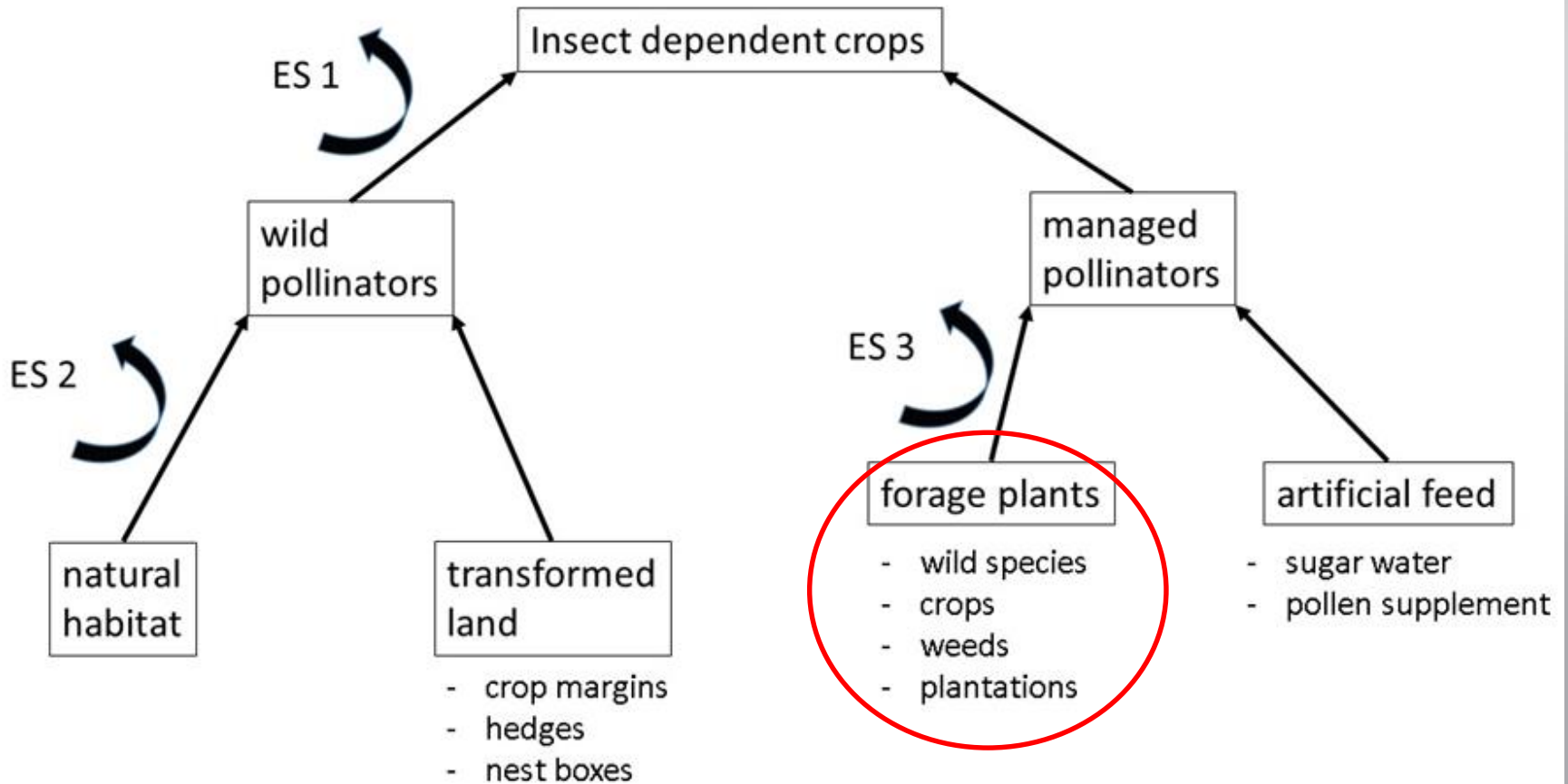


Apis mellifera scutellata
African (Savanna) honeybee

Managed honey bees in South Africa

- Beekeepers use the sub-species found in their region
- Colonies are trapped and housed in hive boxes and some of them swarm-off and become wild
- Thus NO genetic difference between managed and wild populations – robust to change
- Most importantly, if honey bees cannot be sourced beekeepers can't offer a pollination service
- The number of colonies that can be kept, maintained and caught depends on forage plants

Crop pollination and wild vs managed pollination -associated dependencies



The Honeybee Forage Project

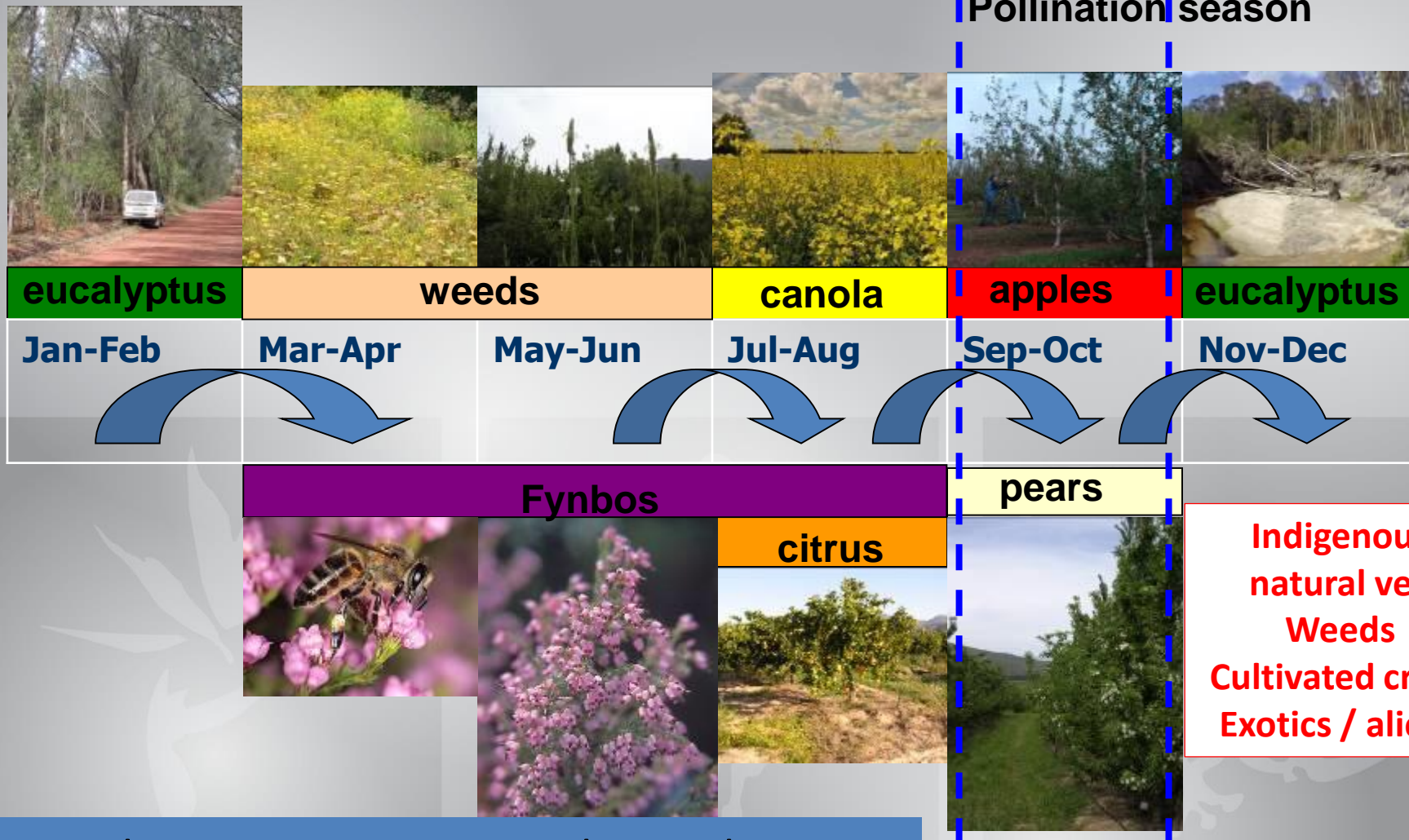


Working for Water funding; 2011-2014

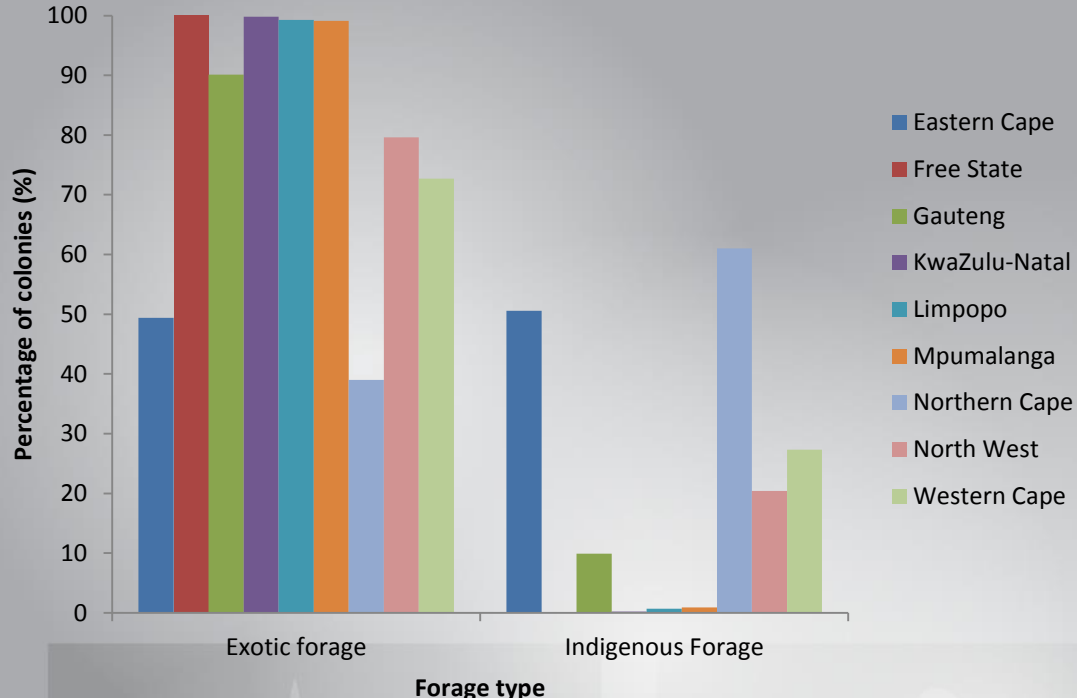
- Relative importance of forage resources
- Spatial data of forage resources
- Alternative forage resources
- Optimal forage management
- Supply and demand of honeybees in SA



Forage use for managed honeybees in Western Cape

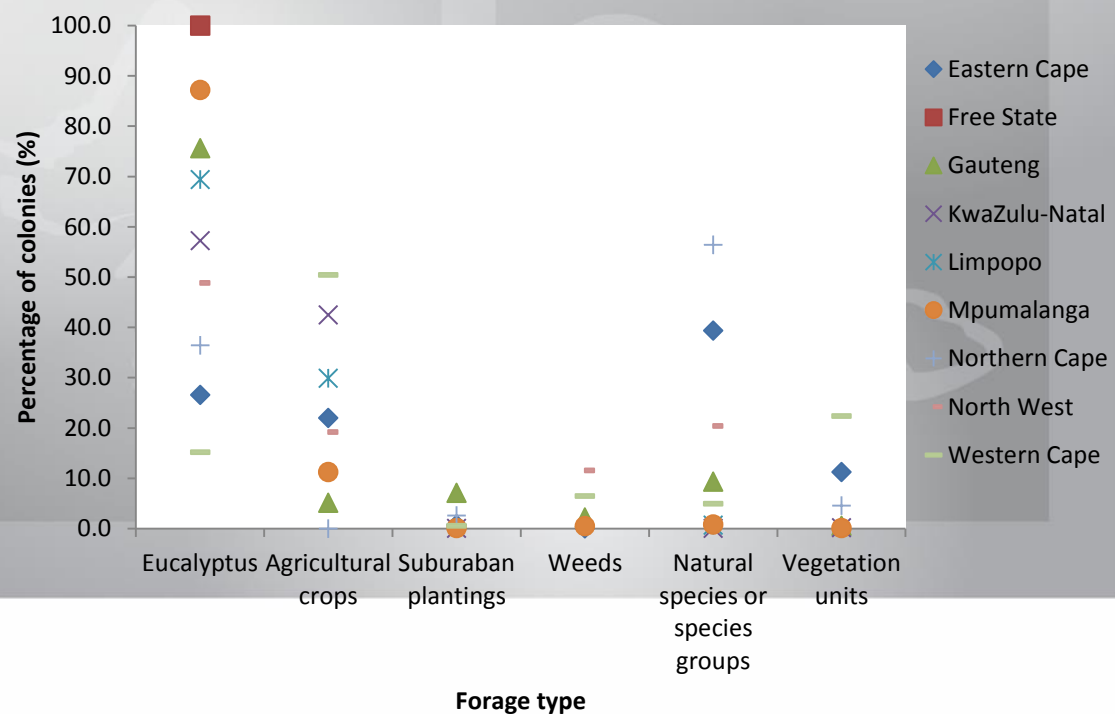
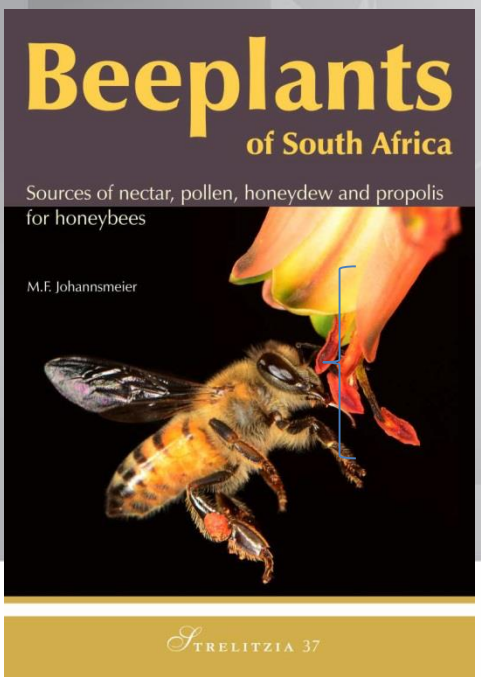


Honeybee Forage Project: what is the **ECOLOGICAL INFRASTRUCTURE** that supports this managed pollination service?



Tlou Masehela's PhD research

Forage type contribution to colony maintenance



The Washington Post

Morning Mix

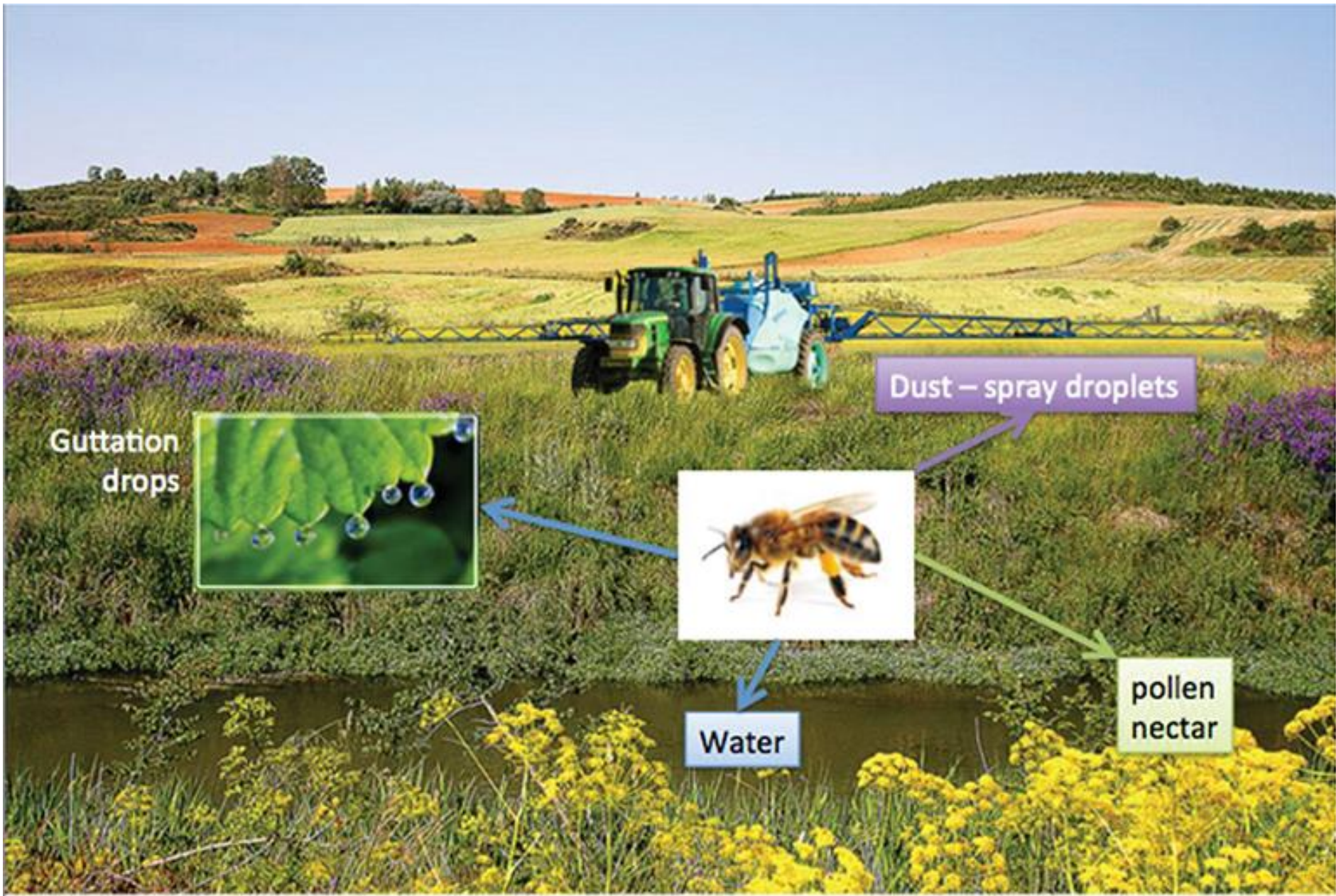
‘Like it’s been nuked’: Millions of bees dead after South Carolina sprays for Zika mosquitoes

By Ben Guarino September 1



Flowertown Bee Farm and Supplies
ongeveer 3 weke gelede





Ecosystem service – disservice = societal benefit

\$7,500,000 - \$348,148 = \$ 7,151,852 per year

or \$20,500,000

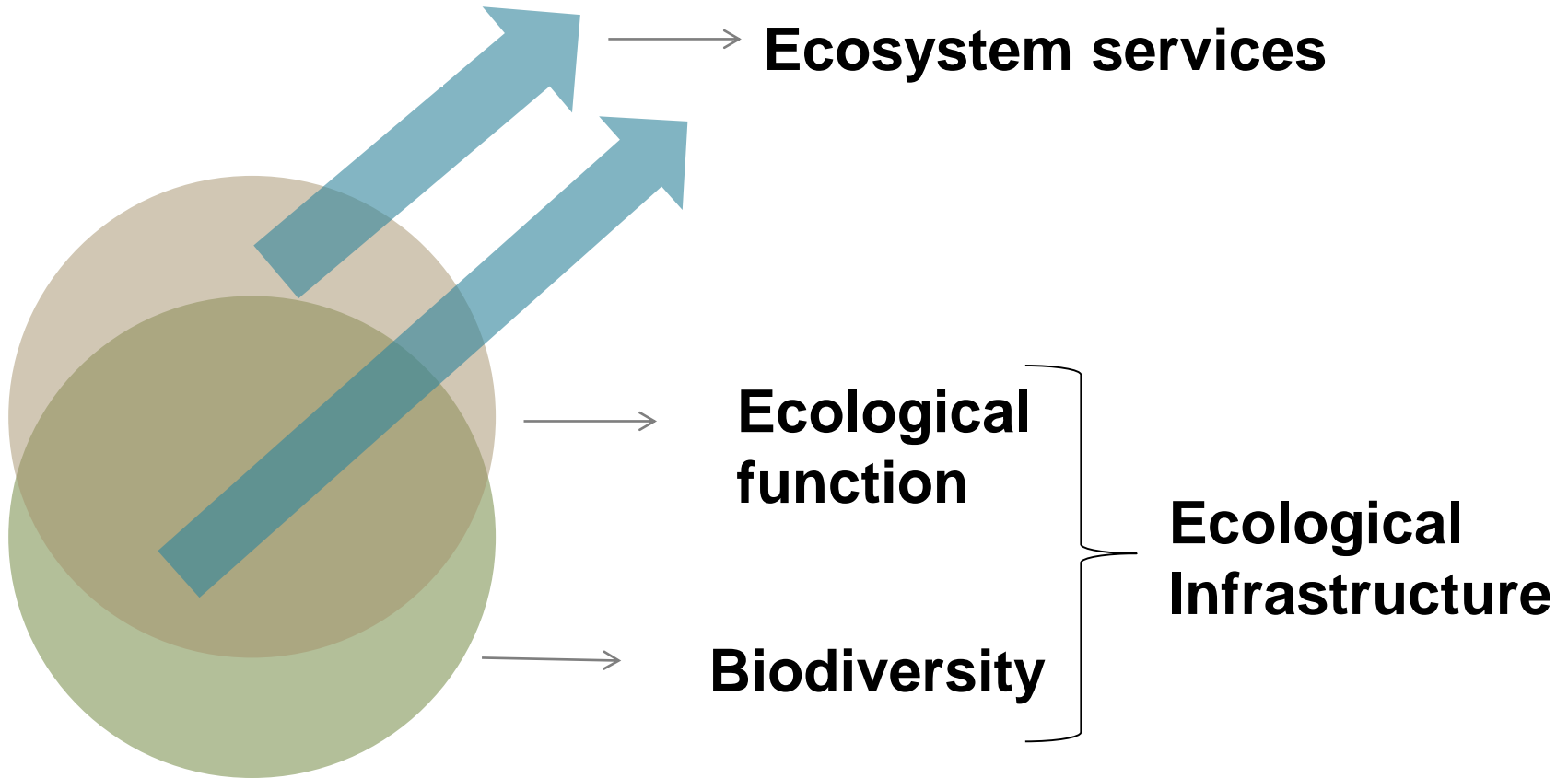
de Lange, Veldtman & Allsopp 2013

Valuation of pollinator forage services provided by *Eucalyptus cladocalyx*.
Journal of Environmental Management 125, 12-18.



Gums represent valuable forage in the landscape

SANBI EI committee: “So how do we sell biodiversity to agriculture sector, given we know wild honey bee swarms are trapped, and managed honey bees use plant forage as ecological infrastructure and supporting infrastructure?”





Fruitways: “**Bee Sanctuaries** - initiative that we as the Groenlandberg Conservancy would like to get off the ground. We feel the idea of **Bee Sanctuaries** resonates with all our members and it’s a common objective that we can all aim to contribute towards.” Stephen Rabe (Director – Fruitways Agri Services, Elgin, Grabouw)

Acknowledgments



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