

International Macadamia Symposium 2023



MOVING FORWARD TOGETHER

Macadamias South Africa (NPC)
(SAMAC)



Pollination a cornerstone of
macadamia production?

Dr Hannelie Human



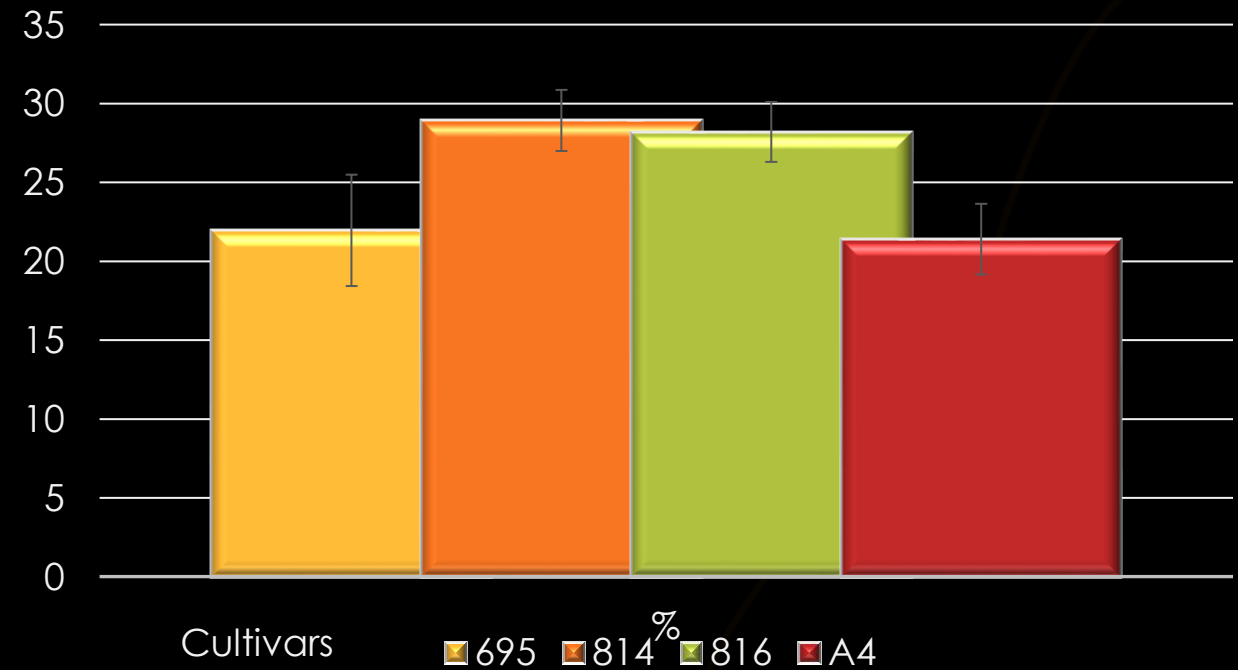
- Idea of monitoring water & fertilizer application needs no discussion
- Many growers do not take steps to measure the quality of hives
- Pollination is an essential though significant expense
- Contribution can be converted into a monetary value justifying pollination fees

Pollination efficiency depends on

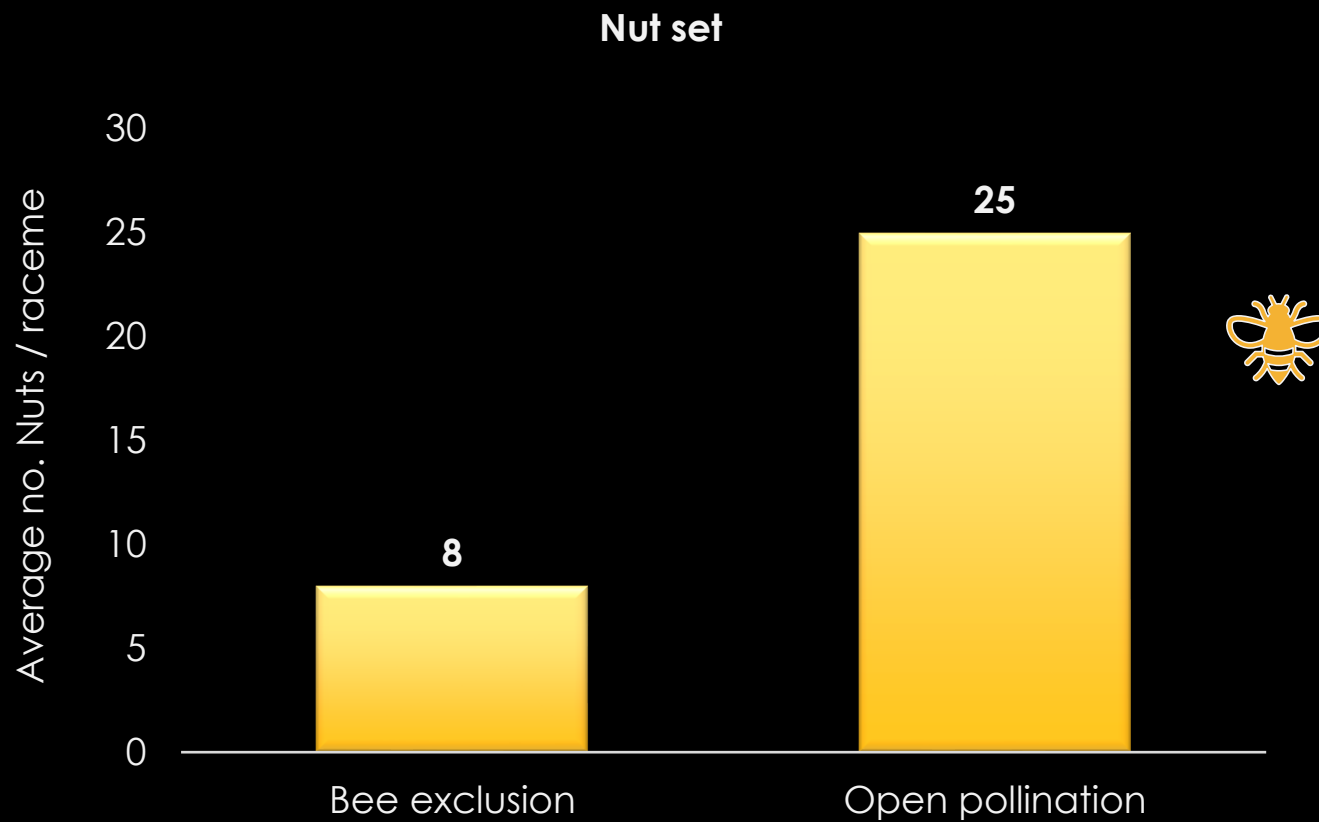
- Nutritional value of floral rewards (pollen & nectar)
- Optimal nectar concentration 20 -35%
- Low pollen protein content => added nutritional stress



Nectar sugar concentration (%)



Pollination contribute to...



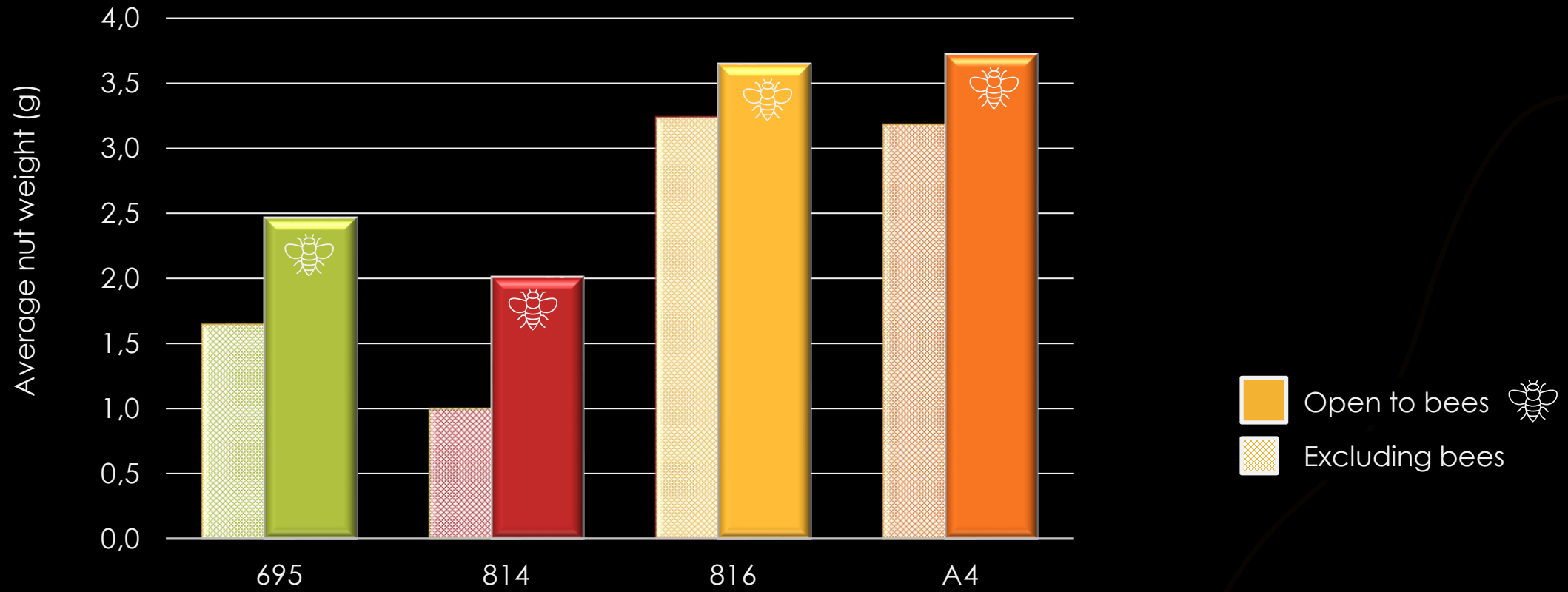


 Excluding bees  Open to bees



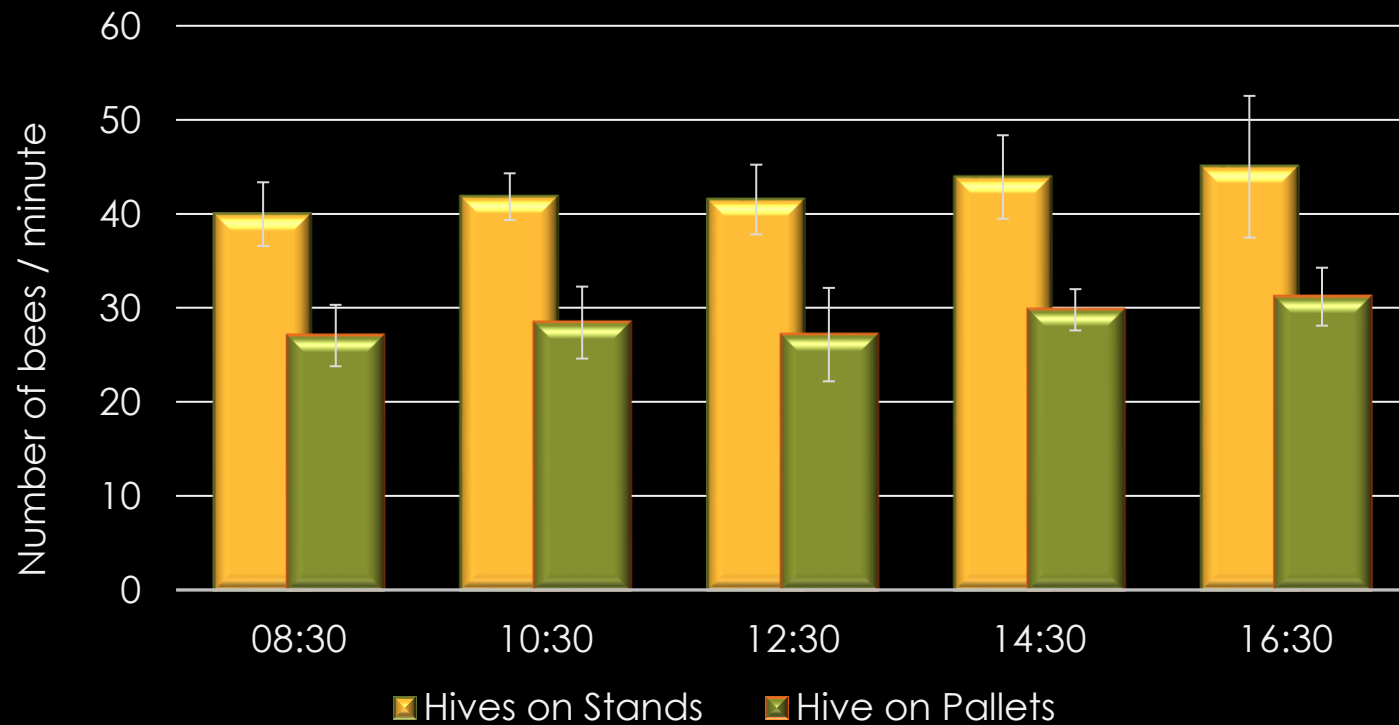


Kernel weight



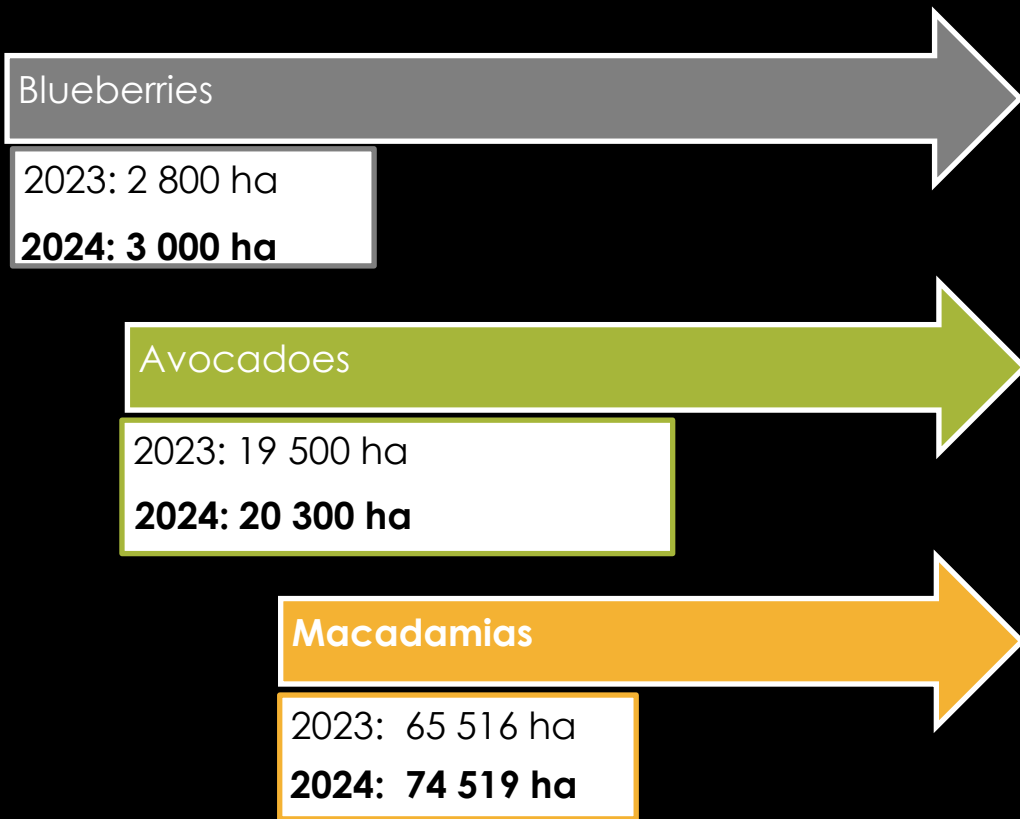
Hive placement

Returning foragers

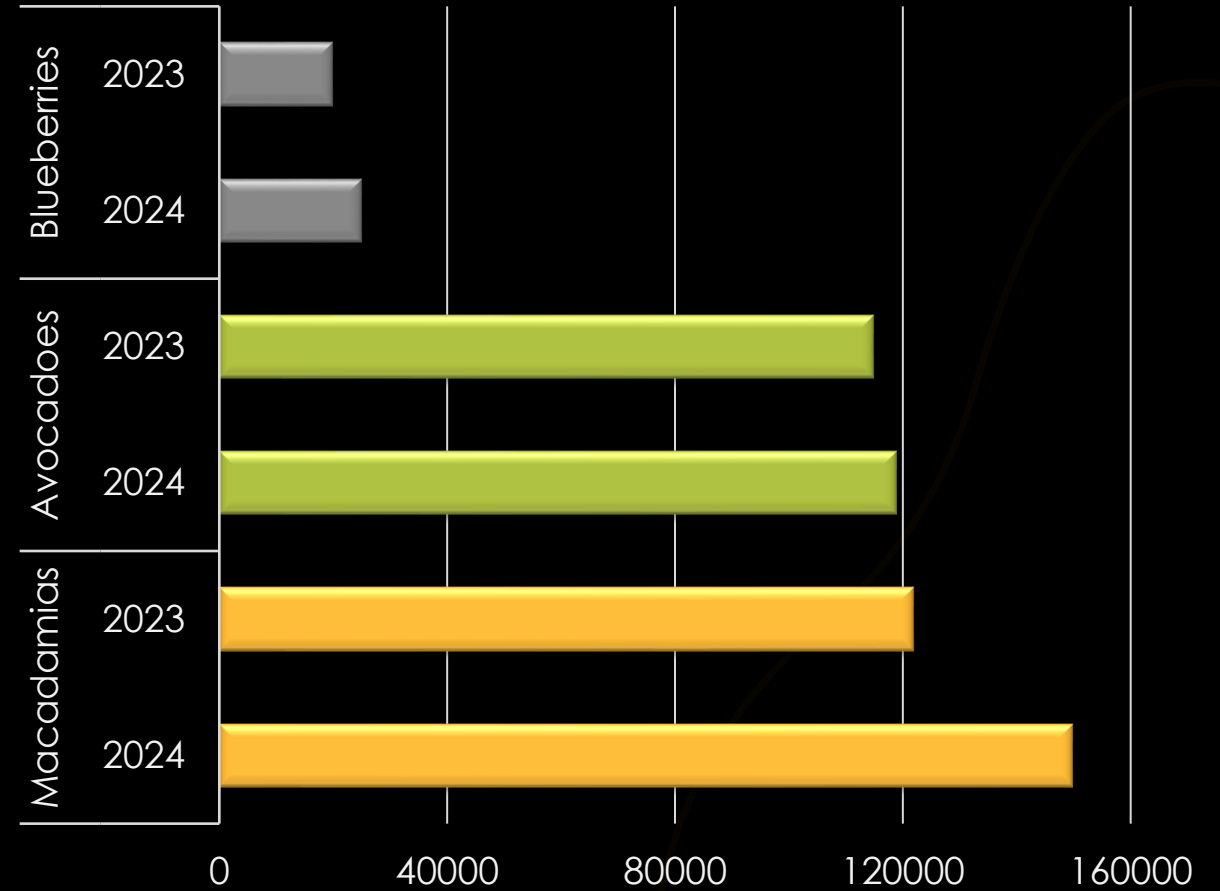


Insufficient pollination= lower yield & quality

Ever-increasing demand



Estimated number of hives needed



Threats



Human actions

Vandalism, veldfires & theft



Pollination stress

- Operational stress
 - confinement, vibration & noise
- New locations
- New environmental conditions
- Crop specific challenges



Bee health

Pests, parasites, diseases

Essential to get most out of pollination

Good pollination/bad pollination = Loss in income

Optimal pollination quality

- Pollination management

- Bee activity in orchard

- Hive quality/ strength coming into orchards

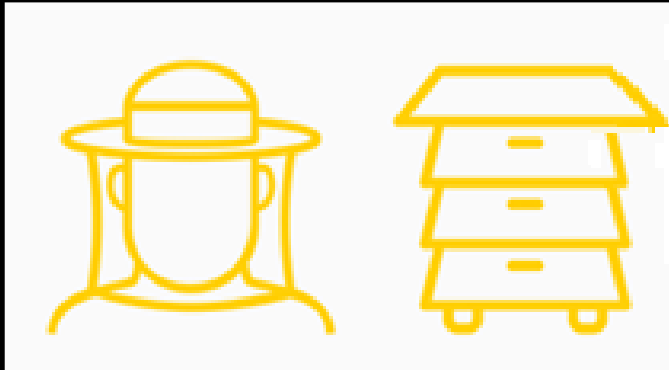
Quality monitoring to protect grower who pays for pollination- not a box

- You are paying for quality bees — be sure you receive them

- Even the best beekeeper can have a bad year



Quality control benefits



The Beekeeper delivers 100 hives at R200 each and 10 are below standard



The grower would owe R20 000
But if he graded hives he would only owe R18,000 (90 hives x R200).



If hives are graded, he would only owe R18,000 (90 hives x R200).

Timely grading allow for beekeeper to replace weak hives with new, stronger hives & weak bee colonies can be built up

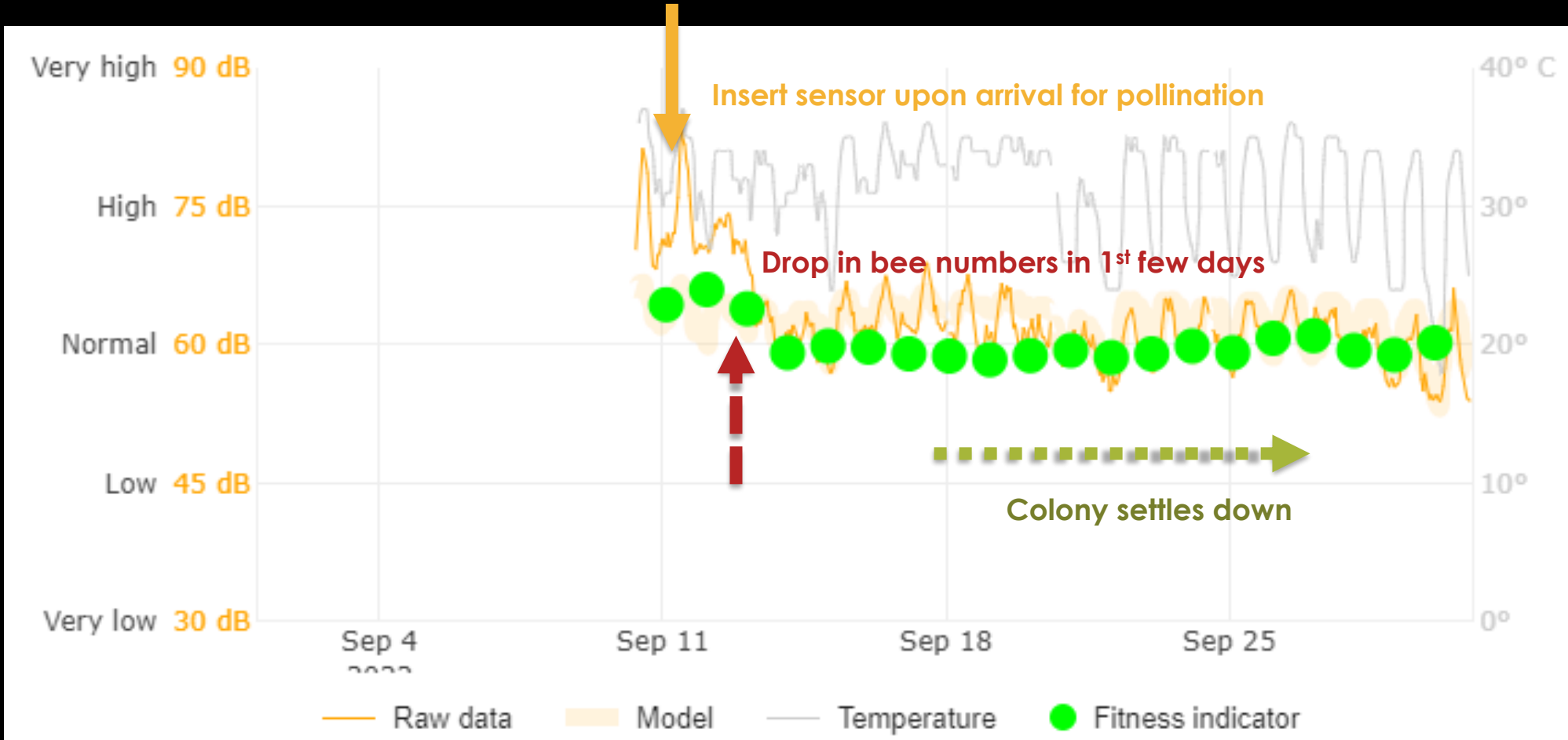
Technology for quality control

1. Acoustic sensors

- Sensors continuously monitors the noise intensity of the hive
- A healthy colony produces a daily noise curve; reflects bee population of the hive
- Algorithms is used to calculate a beehive's fitness >
- Simplified indicator provides information on the bee population of the hive
- Physical inspections validated sensor data



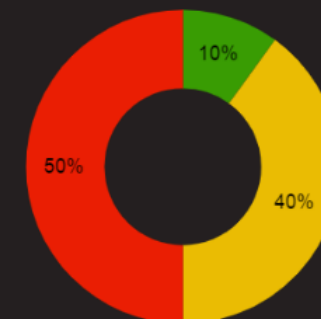
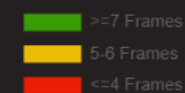
Proper standard hives can endure macadamia pollination stress



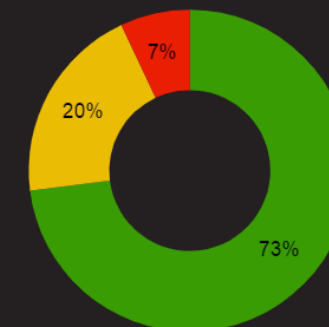
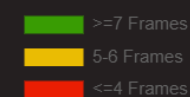
2. Infrared (IR) imaging

- Infrared (IR) imaging of the hive surfaces captures heat signature of bee colonies
- Using physics, hive strength are calculated by modelling the actual number of bees capable of generating the thermal signature
- Images are converted into hive strength data accounting for weather conditions at the time & location of each image
- Non-invasive quality tool, allows for large sampling
- Grading report within 24 hours

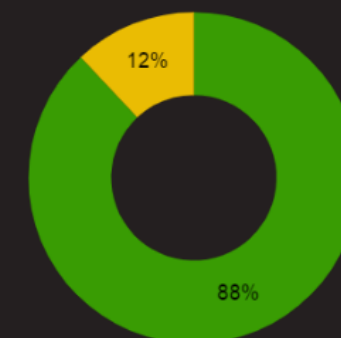
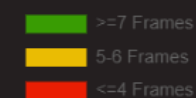
FRAME DISTRIBUTION



FRAME DISTRIBUTION



FRAME DISTRIBUTION



Conclusion

- Precision farming = looking after the basics = reacting to changes
- Quality control technology add value:
 - beekeepers maximize pollination revenue per hive
 - help growers reduce cost
 - optimize pollination quality

“You can’t affect today but you can affect tomorrow!”



QUESTIONS ?

