



**BEEHAVE validation and
resulting insights for the
design of field studies with
bees**

Annika Agatz & Thomas Preuss



Honey bees in the ERA context

What is done?

Lab studies



Semi-field studies



Field studies



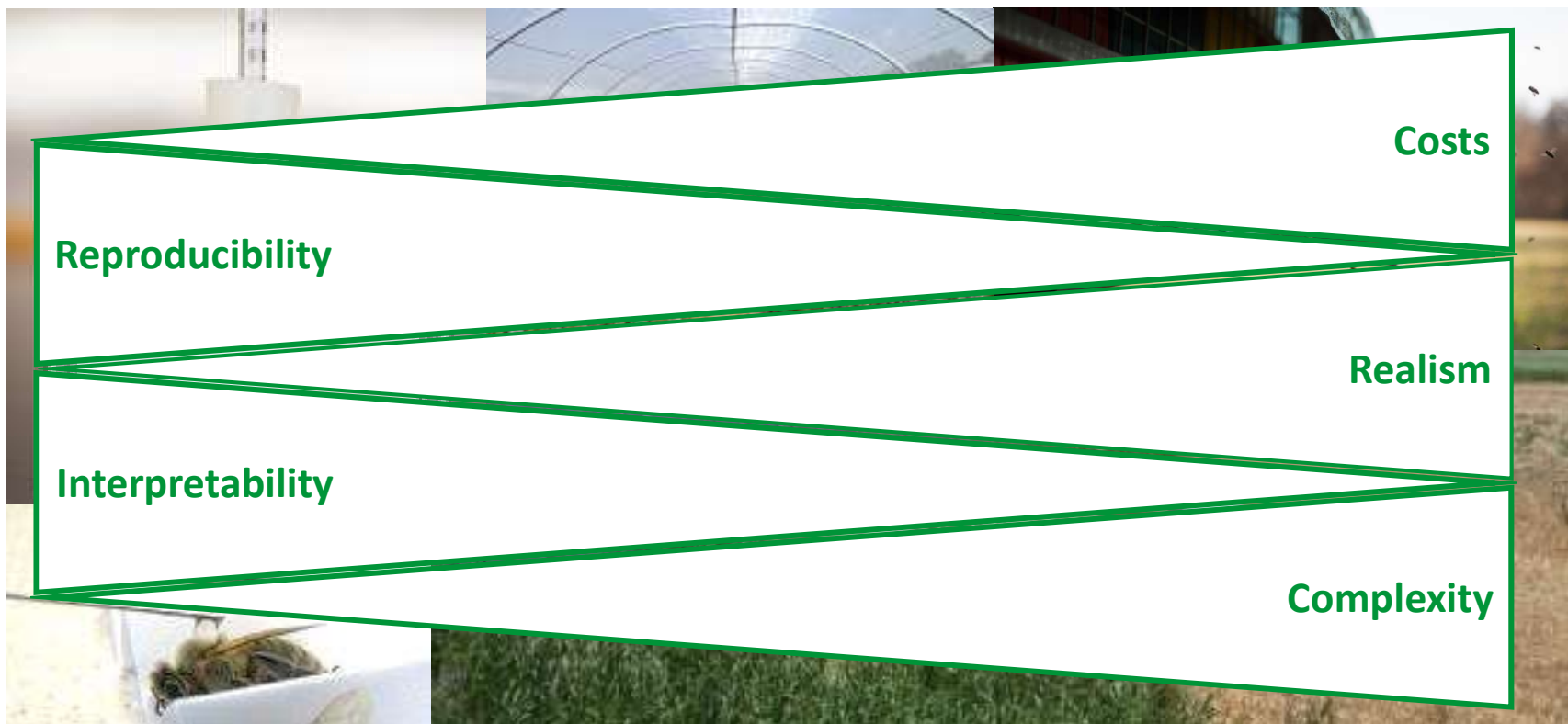
Honey bees in the ERA context

What are the challenges?

Lab studies

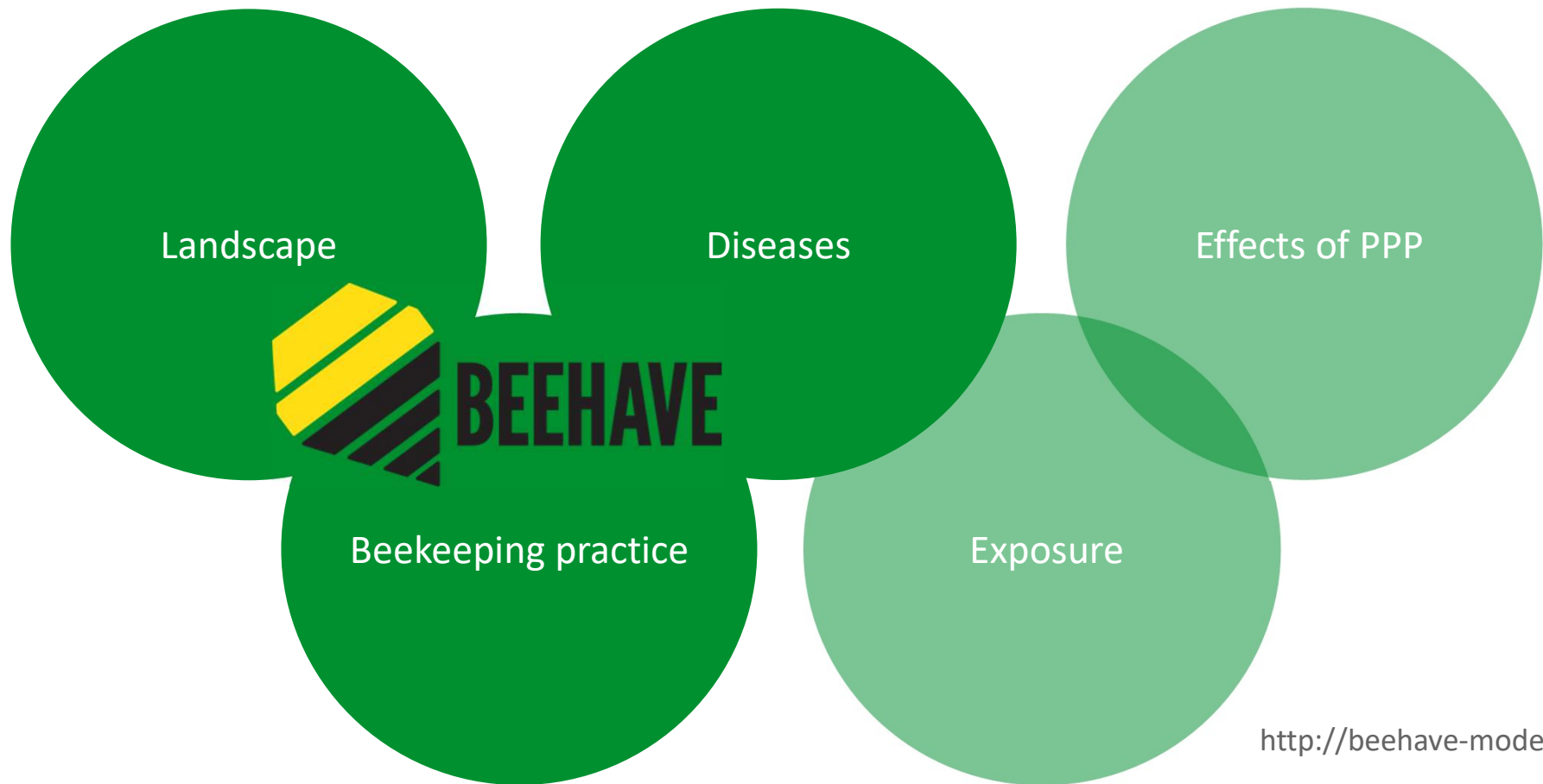
Semi-field studies

Field studies



Honey bees in the ERA context

What is BEEHAVE?



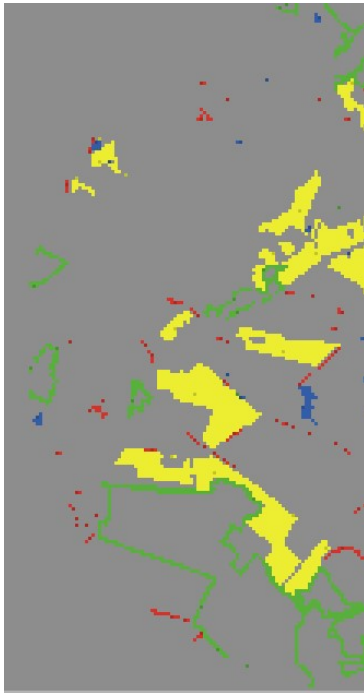
<http://beehave-model.net>

BEEHAVE



How does BEEHAVE work?

Food availability



Search and communication



Colony development

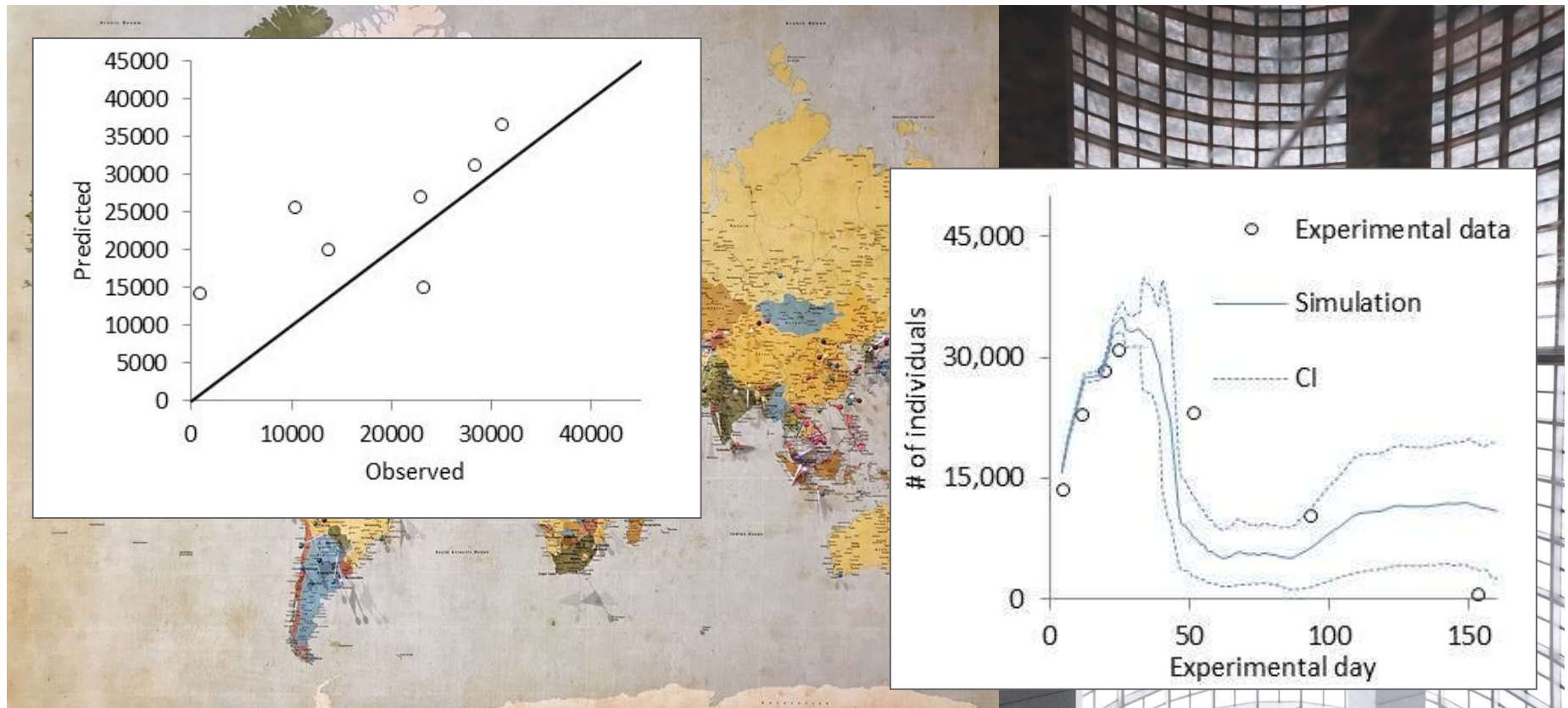


Beekeeping



BEEHAVE validation

Why and how do we validate BEEHAVE?



BEEHAVE validation



How do typical honey bee field studies look like?

Spring Summer Autumn Winter Spring →

Overall field study design



Overall intensity of hive observation in the field study



Overall intensity of landscape observation in the field study



Overall beekeeper activity

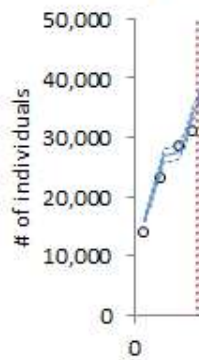


BEEHAVE validation

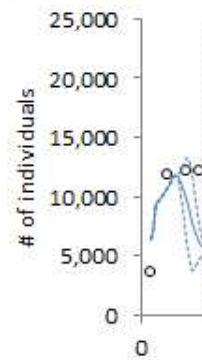


How well does BEEHAVE simulate what happens in the field?

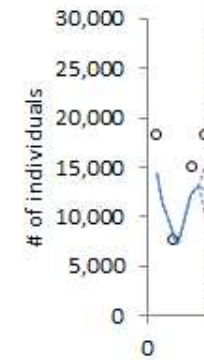
Adult honey bees



Worker brood (open)

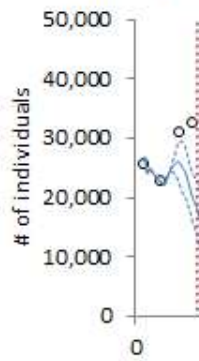


Worker brood (capped)

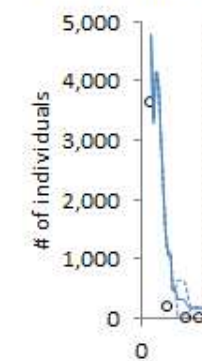


○ Experimental data
— Simulation
--- 95% CI
--- Honey extraction
--- Hive relocation

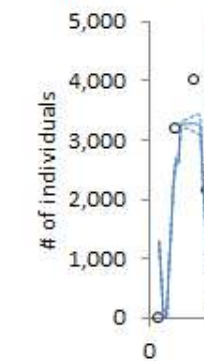
Bee offspring (total)



Drone brood (open)



Drone brood (capped)



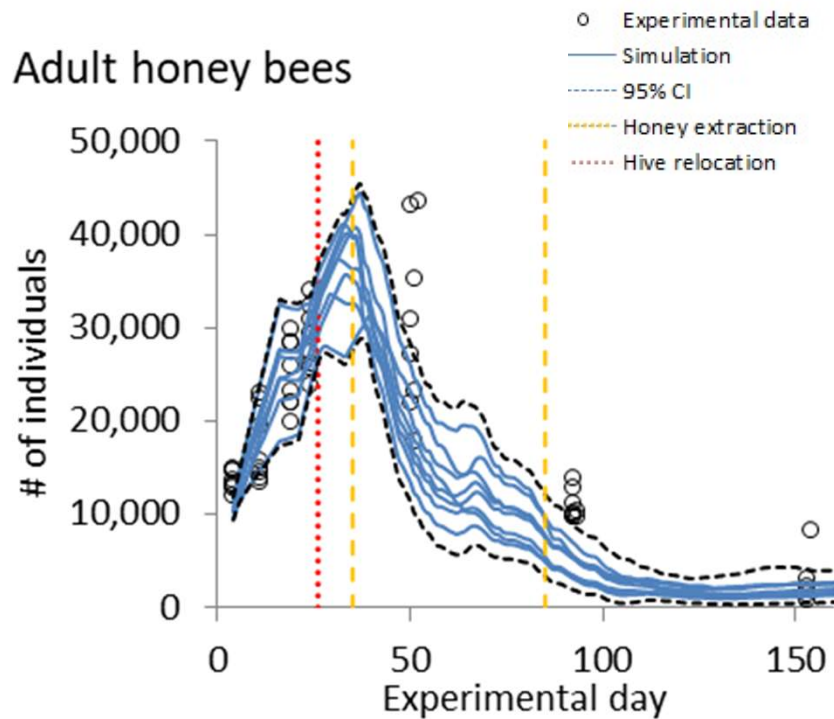
Experimental day

Experimental day

Experimental day

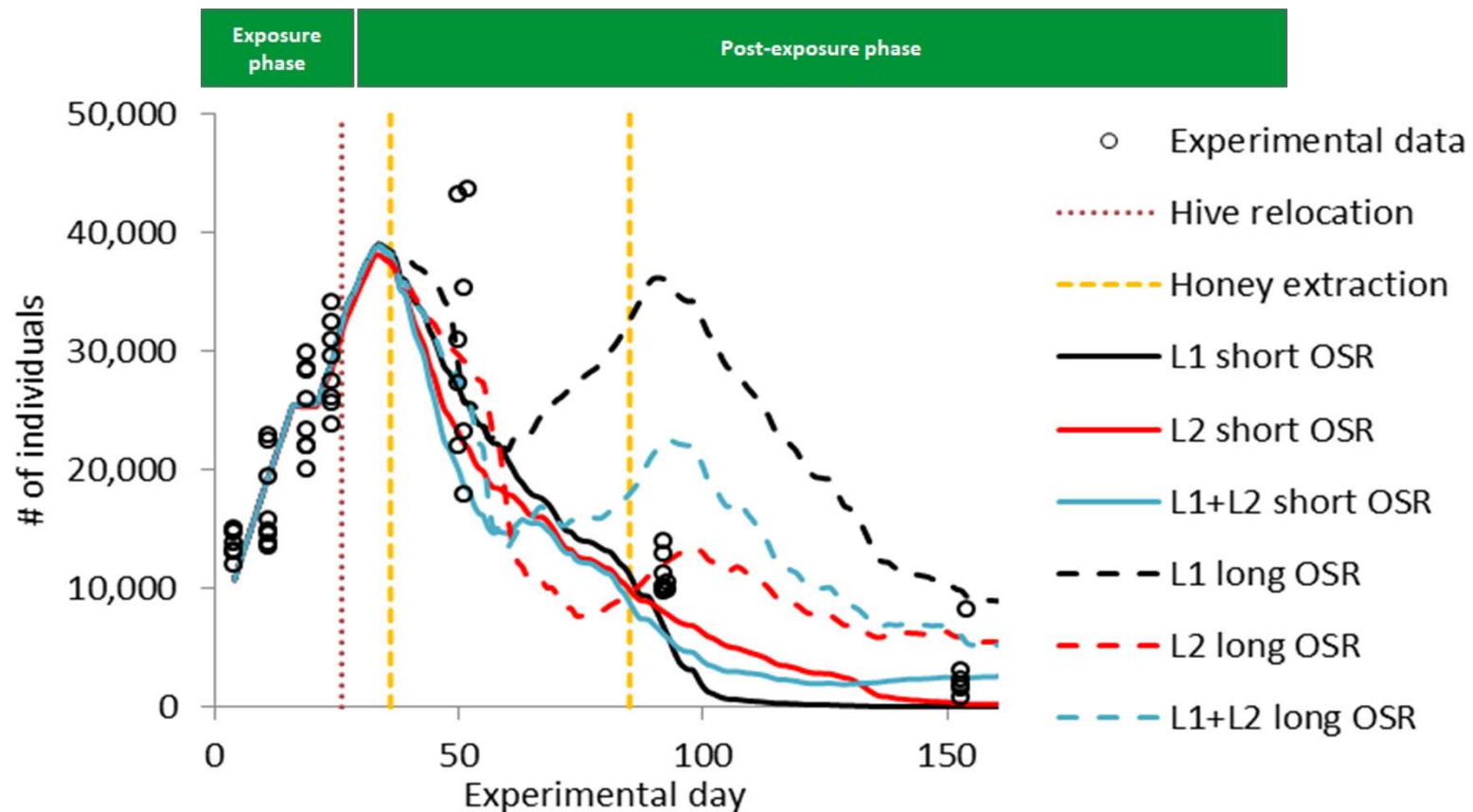
BEEHAVE validation

How well does BEEHAVE simulate what happens in the field?



BEEHAVE validation

How important is information from the landscape?



BEEHAVE validation



What is done and what is needed to validate BEEHAVE?

Spring Summer Autumn Winter Spring →

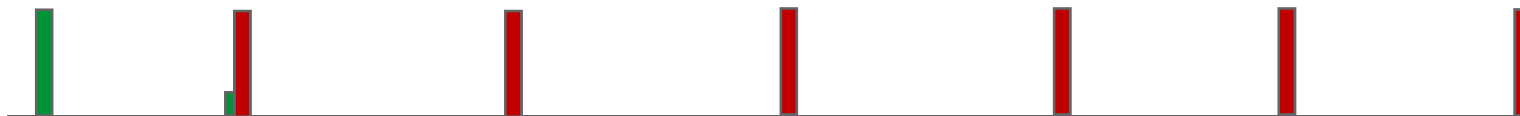
Overall field study design



Overall intensity of hive observation in the field study



Overall intensity of landscape observation in the field study



Overall beekeeper activity



Insights for field study design



What does that mean for future field studies?

- Starting conditions of the colony just before the experiment starts
- Colony specific and not treatment specific documentation
- „Standard beekeeping practice“ is not detailed enough
- Redistribute efforts across the entire experimental phase

Thanks



Roland Kuhl
Mark Miles
Thorsten Schad