



# *ApisRAM*

Agent based honey bee model for risk assessment

# Background

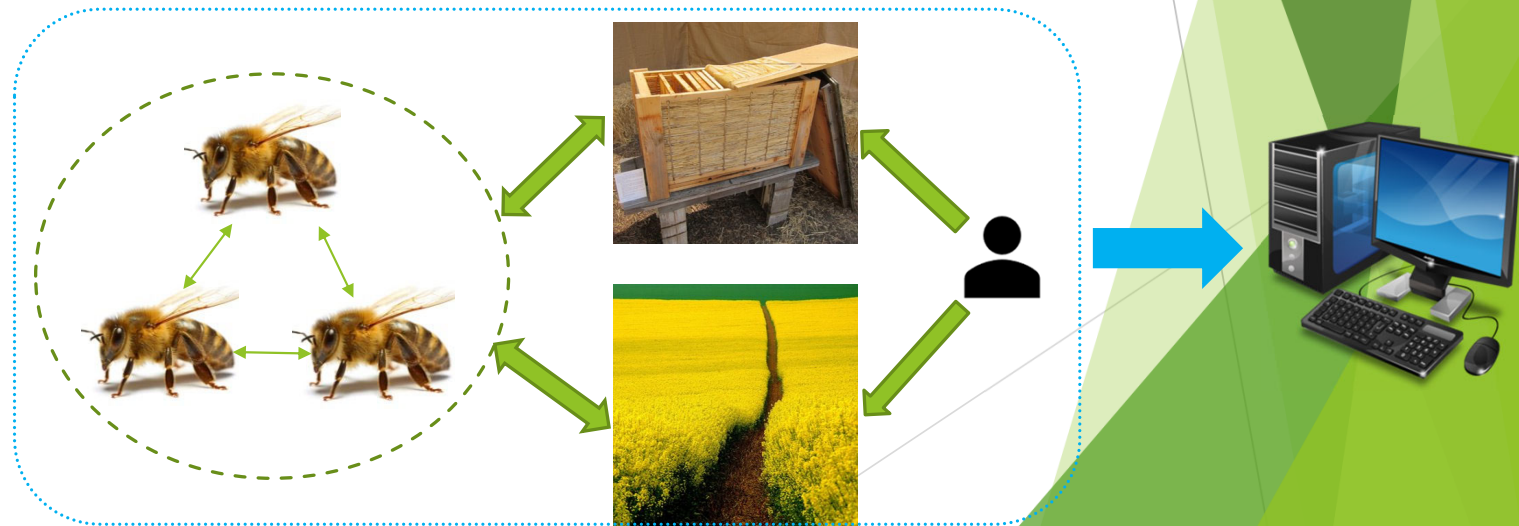


- ▶ A part of EFSA's MUST-B project (EU efforts towards the development of a holistic approach for the risk assessment on Multiple Stressors in Bees)
- ▶ Honeybee colony weakening and losses have been reported due to multiple stressors, including:
  - ▶ Nutritional stress
  - ▶ Thermal stress
  - ▶ Pesticide exposure
  - ▶ Biological agents (diseases and parasites)
- ▶ Model evaluation by field data collected at six study sites



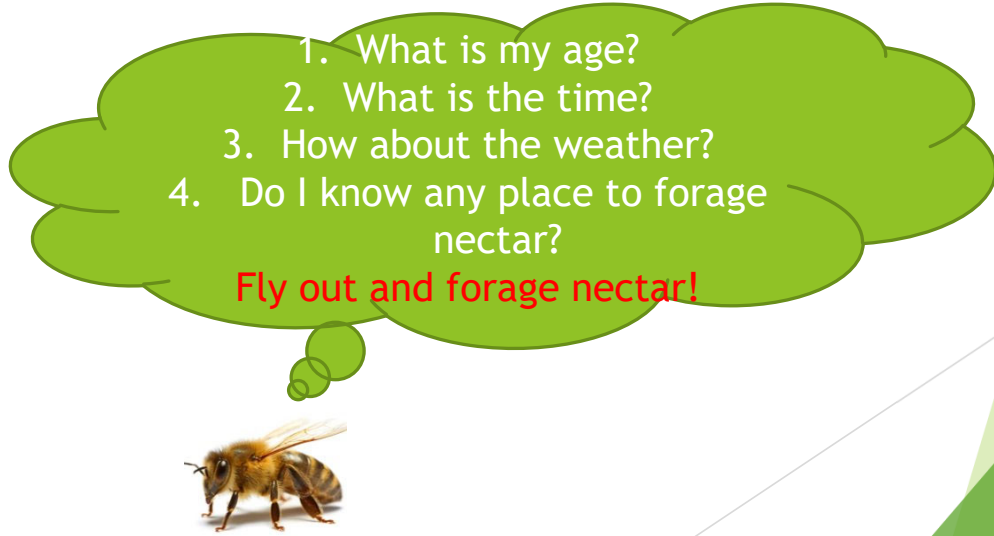
# Introduction

- ▶ ApisRAM: an agent-based model for honey bee which can
  - ▶ Integrate multi-stressor impacts
  - ▶ Simulate feedbacks and interactions between components
  - ▶ Predict complex system-dynamics



# Honey bee agent

- ▶ Behaviour occurs at the individual level
- ▶ Behaviour depends on the individual bee's situation and its contexts
- ▶ Behaviour depends on individual motivation not a systems response

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- A honey bee is shown at the bottom of a large green thought bubble. The bubble contains a list of four questions. Below the list, the text 'Fly out and forage nectar!' is written in red. The background of the slide features abstract green geometric shapes on the right side.
1. What is my age?
  2. What is the time?
  3. How about the weather?
  4. Do I know any place to forage nectar?

Fly out and forage nectar!



# Honey bee agent

## Three castes

- Worker
- Drone
- Queen

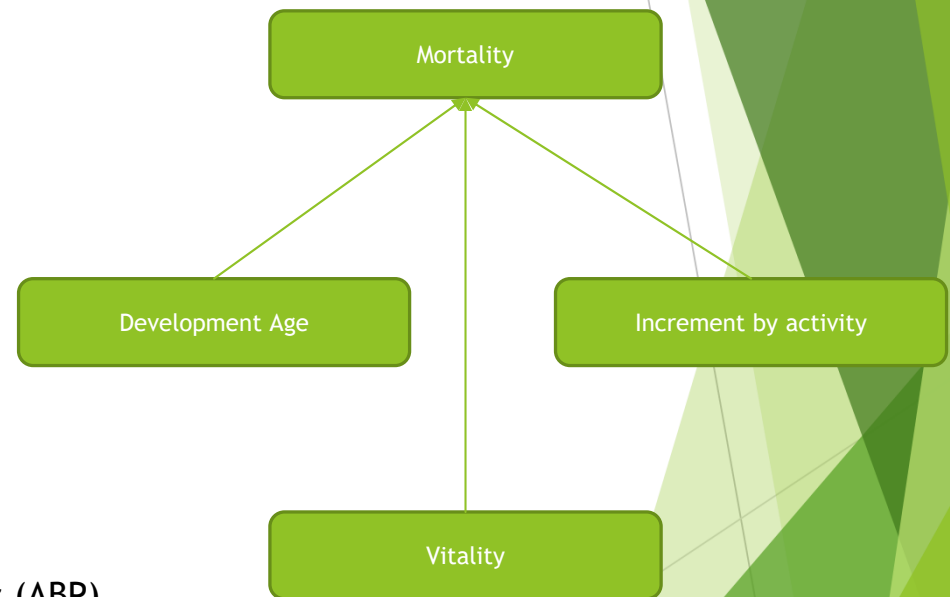
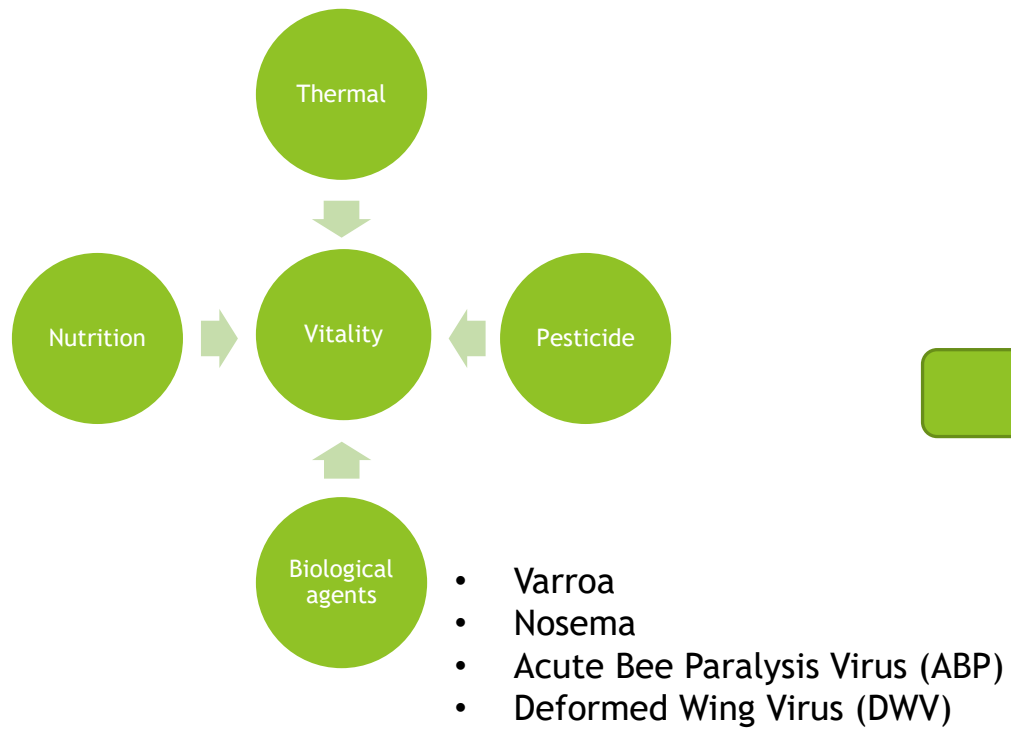


## Four life stages

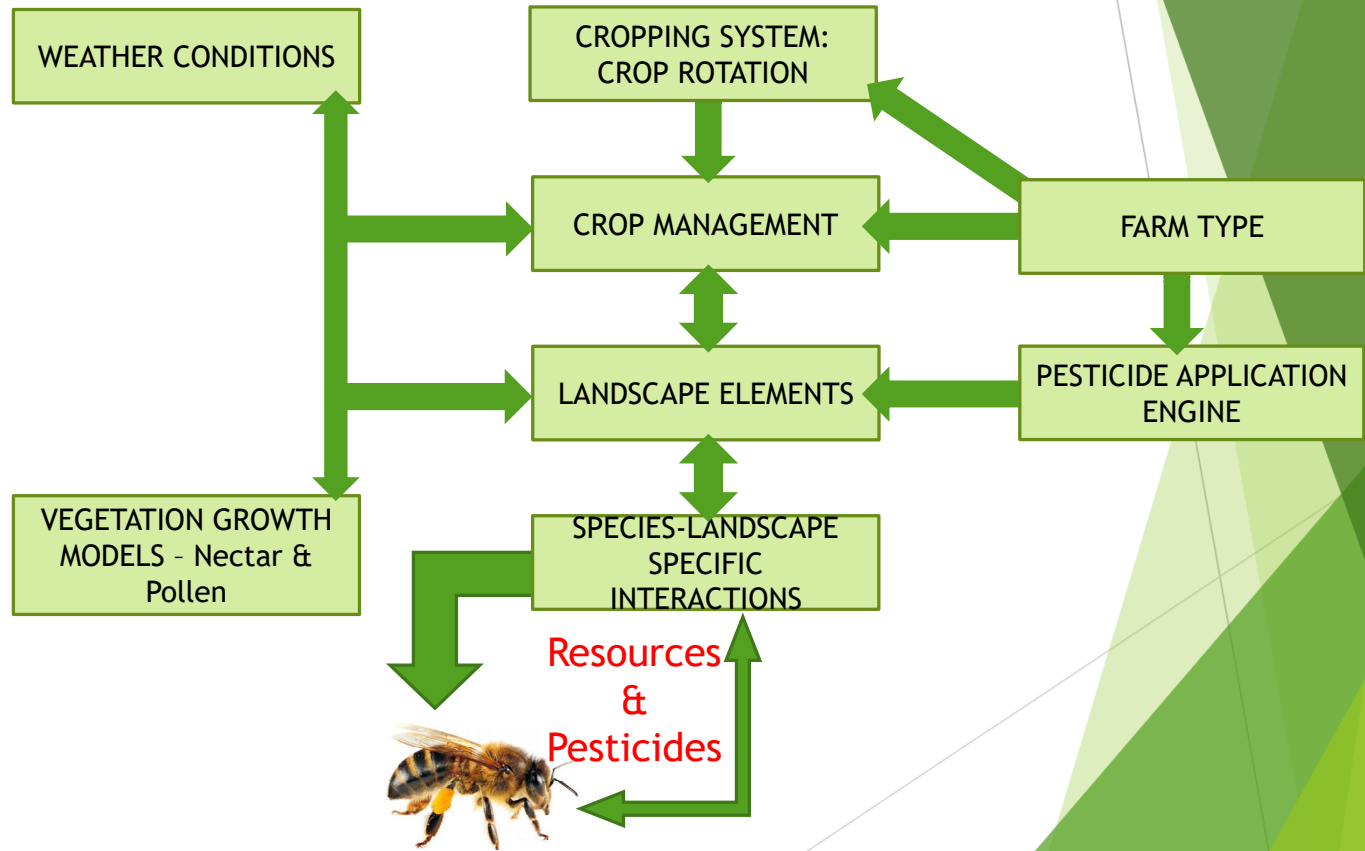
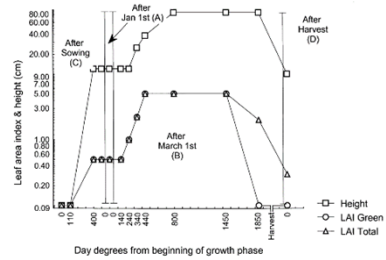
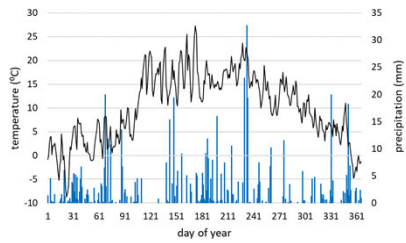
Egg → Larva → Pupa → Adult



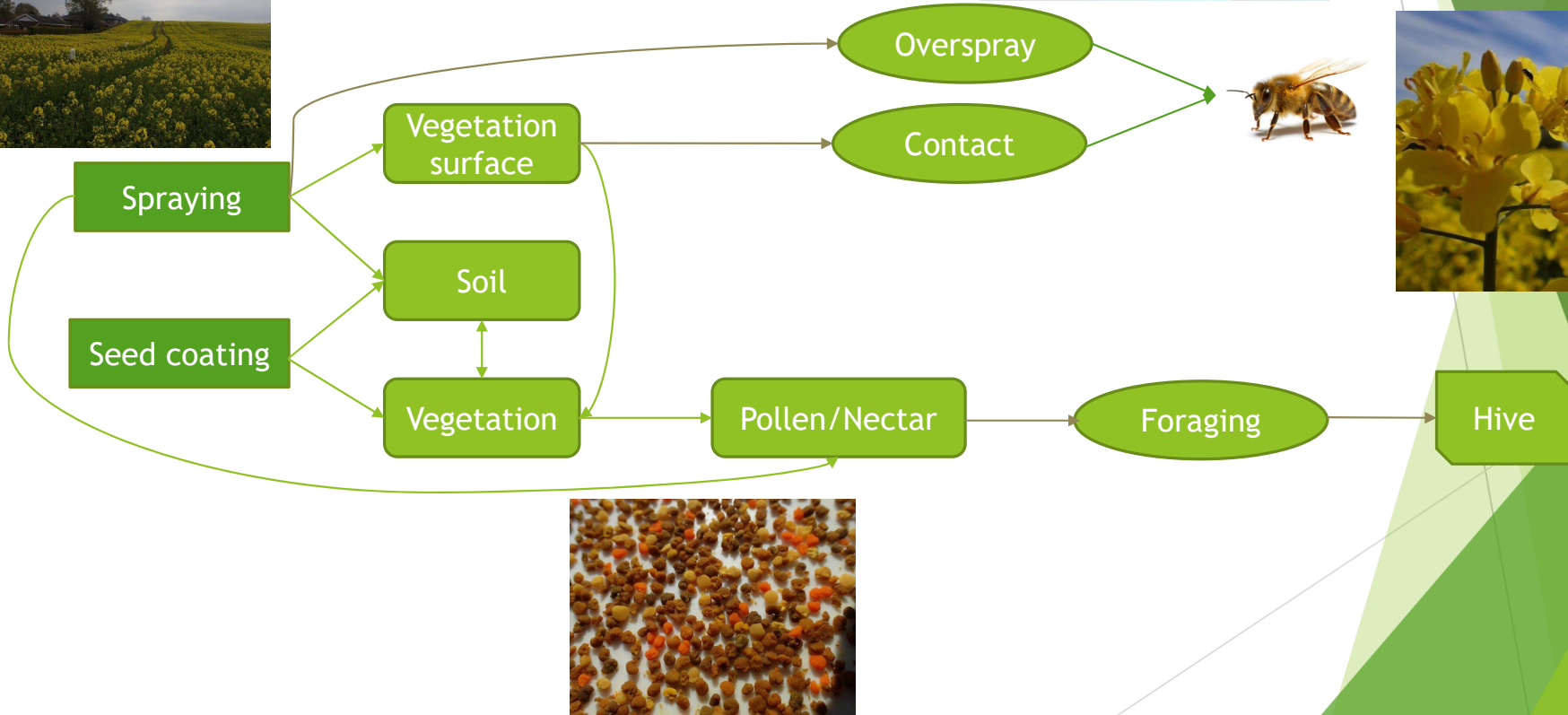
# Multi-stressors and mortality



# Landscape



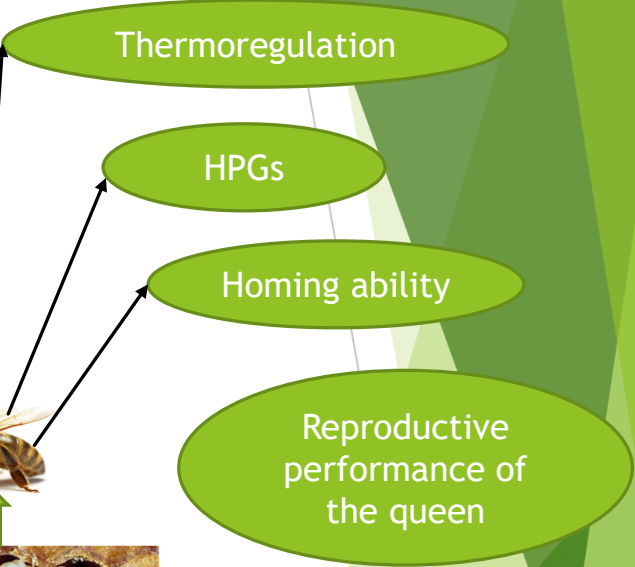
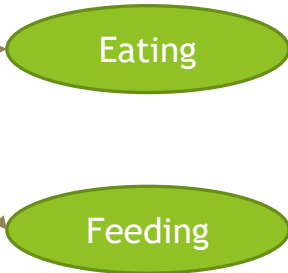
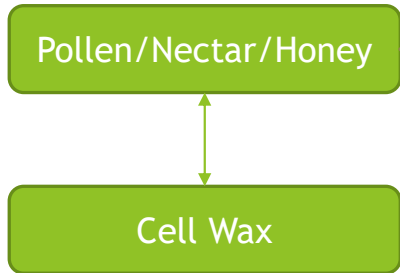
# Pesticide - landscape






# Pesticide - hive

Pesticide is tracked in cell level.





Thanks for your attention!  
If you have any questions, please feel free to contact  
Xiaodong Duan  
[xd@bios.au.dk](mailto:xd@bios.au.dk)