



BeeConnected – Understanding and anticipating mechanisms of honey bee colony mortality with connected beehives



Fabrice Requier

French National Research Institute for Sustainable Development (*IRD*)

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Goal and context

Over the past 20 years → **mortality of honey bee colonies** (*Apis mellifera*)
Alarming due to the critical role of bees for human well-being by producing honey,
sustaining populations of wild plants and supporting production of numerous crops

Abnormal high mortality rates of honey bee colonies have been revealed in several
regions of the world, including Europe where it can reach up to **25–50% every winter**



The goal of the project is to investigate, develop and test **new digital solutions** based on data collection to deliver **early-warning indicators of honey bee colony mortality** and decision-support tools **to help beekeepers limiting colony losses** and related economic deficits

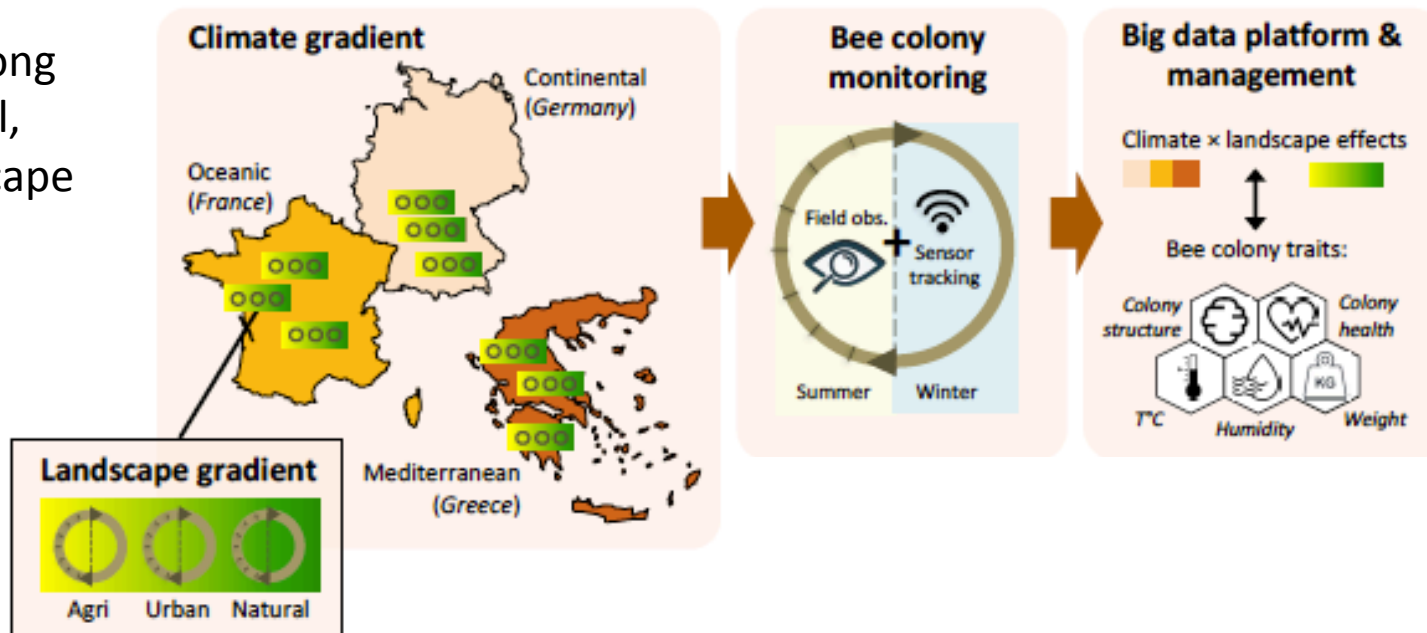
Project duration: 36 months, form 02/2021 to 01/2024



Main project activities

Large-scale monitoring of bee colonies along combined gradients in climate (continental, temperate and Mediterranean) and landscape structure complexity

In close collaboration with beekeepers



Combination of :

- (1) empirical field observations
- (2) **automated systems using multiple low-cost sensors** to track the bee colony in real time and in three dimensions inside the beehives
- (3) **mechanistic models** to assess the risk of colony mortality and to identify early-warning indicators



Research approach & activities

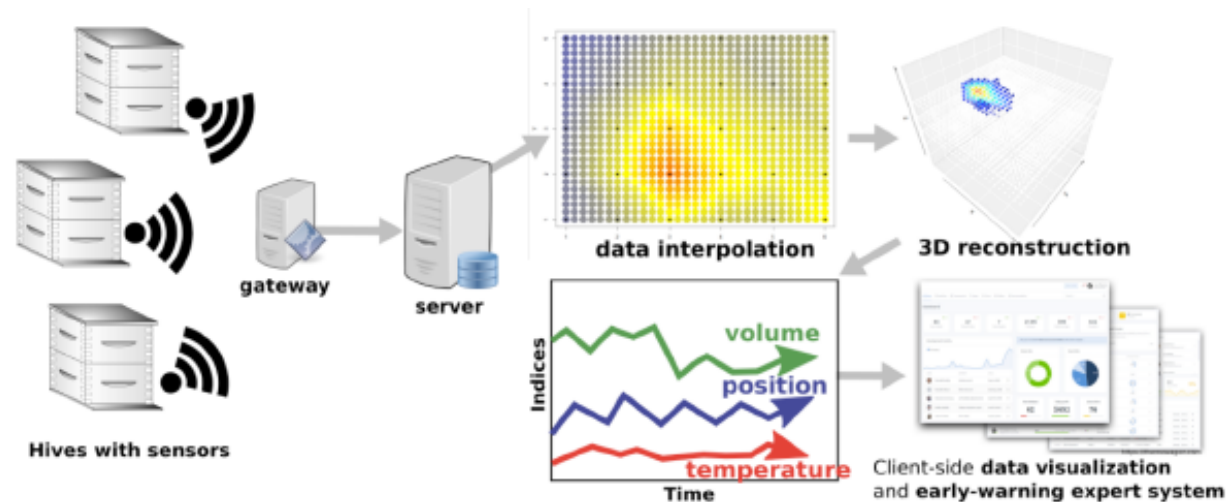
Checking for potential disorders, changes in productivity or to follow their performance in breeding apiaries

- **Common practice** in beekeeping and research → **opening the hives** for routine monitoring of colonies. Nevertheless, only possible from spring to autumn since (cold temperatures put the colony survival at risk by failure in thermoregulation)
- **Beehives are considered as black boxes by beekeepers during winter**, although the colony mortality mainly occurs during this critical period



Research approach & activities

- 1) BeeConnected aims to develop **low-cost tools** for ICT connected beehives in order to help a broad range of beekeepers to sustain their professional activity (i.e. avoiding colony loss)
- 2) BeeConnected will develop a rapid and robust method to **track inside size and behaviour of the honey bee colonies** during summer AND winter periods



- 3) Assessing the **effects of climate and landscape structure complexity** on colony dynamics and winter behaviour

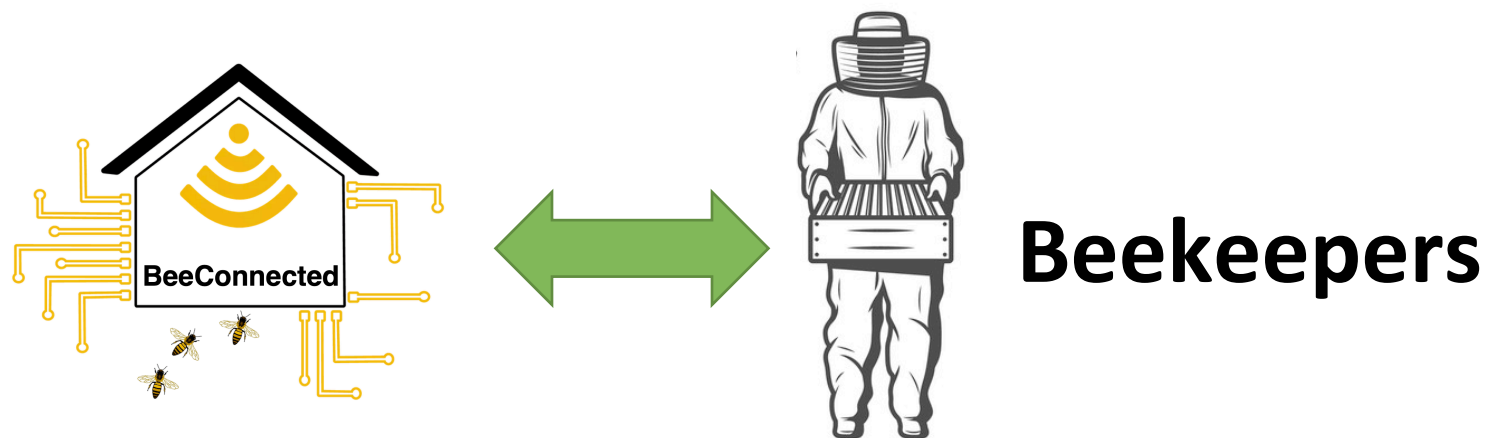


Cooperation with Stakeholders

BeeConnected will promote **direct exchanges among scientists and beekeepers**, aiming to bridge the gap between research and action

Close **collaboration with beekeepers:**

- Monitoring of the colonies (empirical field observations)
- Acceptability analysis of the ICT use in their practices (citizen science study)
- Use of the developed multiple low-cost sensors



Potential impact

The results could help beekeepers limiting colony losses and related economic deficits



Support farmers managing their increasing demand in pollination services

Small companies producing ICT tools will also benefit from the advanced results and technology development, creating or enhancing market opportunities



Dissemination and outreach

BeeConnected will foster the establishment of a **multi actor collaborative web platform**, ensuring sustainable beekeeping, educating beekeepers in the use of new technology

Project results will lead to (available on the web platform):

- Protocols and guidelines
- Handy disease detection cards and
- Management recommendations
- Short and comprehensive video outputs

Scientific results will be published as open access in scientific journals and local beekeeping magazines

Results will be also presented in conferences (for e.g. 47th Apimondia 2022, EurBee10 Congress 2022)



Partners

France (UMR EGCE; IRD, CNRS, Univ. Paris-Saclay)



Fabrice Requier
(project coordinator)

+

François Rebaudo
Lionel Garnery
Etienne Minaud



Germany (University of Würzburg, Department of Animal Ecology and Tropical Biology)



Ingolf Steffan-Dewenter

+

Andreas Hotho



Greece (Hellenic Agricultural Organization "DEMETER"- Dept. of Apiculture)



Fani Hatjina

+

Leonidas Charistos
Maria Bouga





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TWITTER - LINKEDIN

@ictagrifood - <https://www.linkedin.com/in/ict-agri-food-1225041b9/>

WEBSITE

www.ictagrifood.eu

EMAIL

fabrice.requier@egce.cnrs-gif.fr



Thank you for your attention!