

BEECONNECTED



UNDERSTANDING AND ANTICIPATING MECHANISMS OF HONEY BEE COLONY MORTALITY WITH CONNECTED BEEHIVES

BeeConnected aims to monitor honey bee colonies along gradients in climate and landscape structure using a combination of empirical field monitoring and automated winter surveys with low-cost connected sensors. The goal of the project is to understand mechanism underlying winter bee colony mortality and to identify early-warning indicators. The results could help beekeepers limiting colony losses and related economic deficits. Moreover, BeeConnected will bring together beekeepers, researchers, electronic engineers, and outreach designers (for transparent communication) in a transdisciplinary, multi-actor approach, to enable digital technology solutions for a transition towards sustainable and resilient beekeeping. BeeConnected aims also 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.

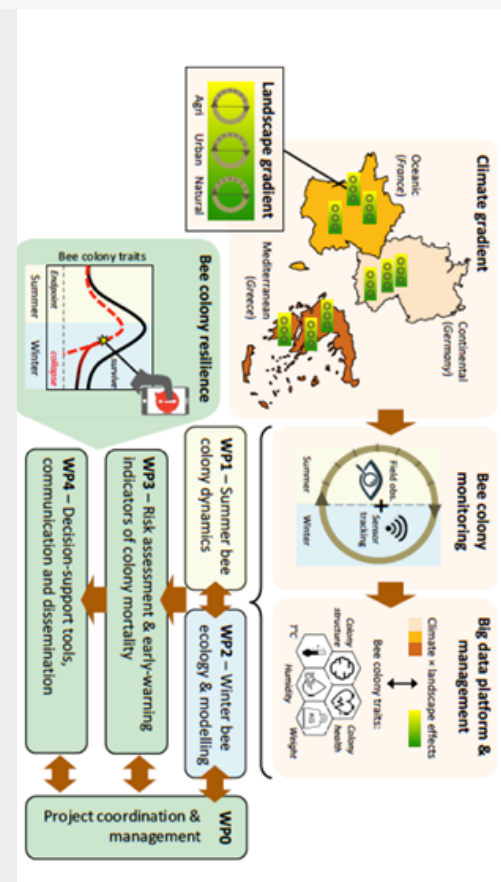
BACKGROUND

Over the past 20 years, the substantial and global decline of bees has been alarming as they provide critical pollination services. In particular, the mortality of honey bee colonies (*Apis mellifera*) has attracted a lot of attention due to its important role for human well-being by producing honey, sustaining populations of wild plants and supporting production of major crops. Unfortunately, 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. These mortality rates have strong impacts on beekeeper economy and sustainability, and consequences for associated services. Routine monitoring of colonies is nowadays a common practice of beekeepers to check for potential disorders, changes in productivity or to follow their performance in breeding apiaries.

Such techniques are also used in research as monitoring to predict and anticipate disorders' occurrence. Nevertheless, routine monitoring is only possible from spring to autumn since opening the hives when temperatures are cold put the colony survival at risk by failure in thermoregulation. Beehives are therefore considered as black boxes by beekeepers during winter, although the colony mortality mainly occurs during this critical period.

MAIN PROJECT ACTIVITIES

BeeConnected combines expertise in various scientific fields, including behavioural ecology, molecular biology, engineering, computer science, and modelling. In close collaboration with beekeepers, the project will carry out a large-scale monitoring of bee colonies along combined gradients in climate (continental, temperate and Mediterranean) and landscape structure complexity. The monitoring will combine empirical field observations with automated systems using multiple low-cost sensors to track the bee colony in real time and in three dimensions inside the beehives. Data will be associated with mechanistic models to assess the risk of colony mortality and to identify early-warning indicators.



EXPECTED SOCIAL IMPACT

BeeConnected will produce direct and strong outcomes for beekeeping through the monitoring in real time of the colonies with detection of abnormal behaviours and diseases, and the production of early warning indicators of mortality. These related decision-support tools will help beekeepers minimizing colony losses in winter to enhance beekeeping economy and sustainability. BeeConnected aims to develop low-cost tools in order to help a broad range of beekeepers to sustain their professional activity (i.e. avoiding colony loss).

BeeConnected will foster the establishment of a multi actor collaborative platform, ensuring sustainable beekeeping, educating beekeepers and farmers in the use of new technology. This project will also promote direct exchanges among scientists, beekeepers and farmers, aiming to bridge the gap between research and action. Moreover, BeeConnected will benefit people and science related to the new knowledge the project will provide on the winter ecology of honey bees that is an important, fascinating, hidden side of the species.

Keywords

- Beekeeping
- Citizen Science
- Early-warning indicators
- Field monitoring
- Honey bee colony loss
- Mechanistic modelling
- Multiple in-hive connected sensors

Duration

01/02/2021 - 31/01/2024

TRL

Technology Readiness Level 4

Consortium

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Funded by

- ANR, France
- GSRT, Greece
- BMEL, Germany