

## The project

Global apiculture is facing an unprecedented crisis of increasing parasite pressure and a loss of honeybee biodiversity. **SmartBees** unites a team of experts with the necessary skills to develop tools and strategies for sustainable beekeeping in Europe.

We are identifying crucial facets of honeybee resistance to colony losses, varroa and viruses and the interaction between them. We are aiming to provide a step-change in the current mechanistic understanding of these traits and the characterization of the genetic background of the resistance mechanisms in honeybees.

We have started to implement breeding strategies to increase the frequencies of these valuable traits in local honeybee populations, considering the variable needs of both common and endangered subspecies and local beekeeping practises. Breeding efforts concentrating on very few races may endanger genetic diversity. To avoid this, **SmartBees** is promoting multiple local breeding efforts that aim to conserve local resilient populations. Moreover, we will develop molecular tools for describing and safeguarding future populations. **SmartBees** recognizes the responsibility to protect our natural honeybee heritage.

**SmartBees** is commissioning extension science, working in cooperation with stakeholders to attain conservation by utilisation. The project has established a network of apiaries for performance testing, to encourage local uptake of resistant traits. These are run mainly by beekeepers, thereby improving the local acceptability and dissemination, and will support the long-term sustainability of the apicultural sector.

**SmartBees** recognises the need to horizon scan for new threats, and the consortium includes the current EU reference laboratory to that end. We see our project as an opportunity to make a lasting difference to the health, resilience and genetic diversity of our honeybees.



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## The consortium

**SmartBees** is a collaborative research project between 16 partners from universities, research institutions and companies across Europe.

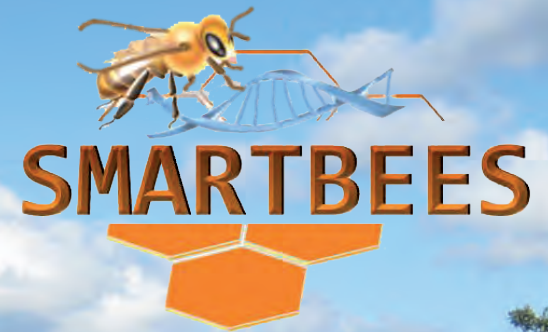
The coordinating institution is the Institute for Bee Research Hohen Neuendorf e.V. located north of Berlin/Germany.

The project commenced on November 1st, 2014



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Sustainable  
Management of  
*Resilient Bee*  
Populations

# SMARTBEES - Contributing to Bee Health

**Dissemination of project** results to stakeholders is an essential part of SmartBees. One of our communication channels is the publication of articles in beekeeper journals. We will produce popularized articles in English that can be translated to other languages to be used in a wide range of beekeeping journals. Those who would like to translate these articles to their national language for their beekeeper journals are welcome to do so after agreement with Björn Dahle (coordinator of dissemination from the project).  
[bjorn@norbi.no](mailto:bjorn@norbi.no)



During the project, 20 theoretical and on-field training events for performance testing of honey bee colonies have been carried out for a total of 320 beekeepers from 21 European countries. A protocol for the assessment of colony performance was developed, translated into 16 European languages and published online.  
[www.smartbees.eu/extension](http://www.smartbees.eu/extension)

## Development of new extension methods - field testing and selection of local bee populations

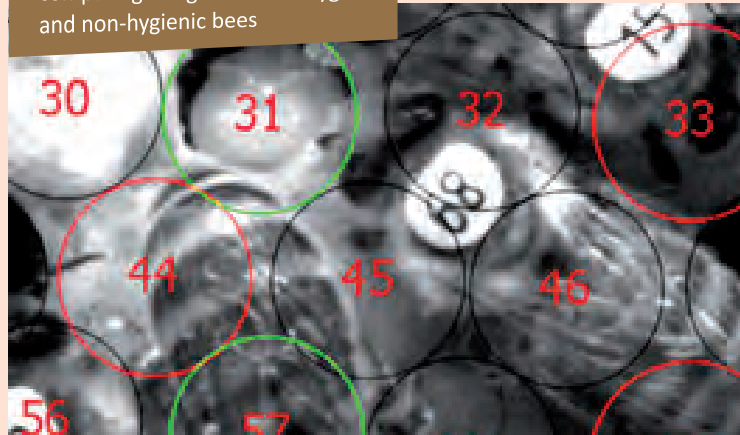
To enhance the communication and knowledge of the breeders participating in the project, a Smartphone and tablet application was developed and released as a Beta version ([www.testbees.eu](http://www.testbees.eu)). In addition, a workshop for the introduction of contemporary breeding concepts, standardization and harmonization of the methodology and enhancement of communication was organized with participation of 19 national coordinators, responsible for breeding activities in different countries and regions. As a result, more than 120 testing stations were established in 2015 as a first test generation of populations from 9 different honey bee subspecies. Four additional test stations were established at institutes in Germany, Poland, Romania and Moldova for assessment of Varroa Sensitive Hygiene (VSH) traits in populations of particular interest. The work has continued in 2016 with further training events for performance testing and the establishment of more testing stations.



## Gene discovery of resistance traits

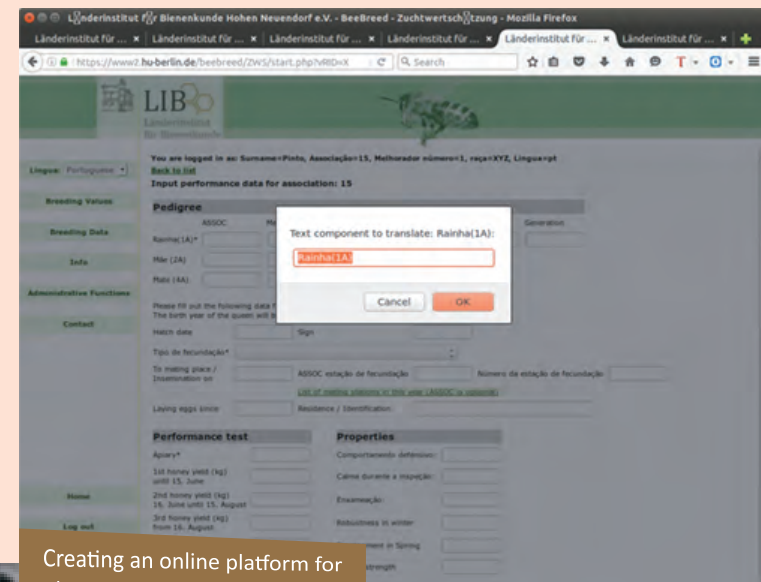
Another aim within SmartBees is the identification of resistance genes in different European subspecies of *Apis mellifera*. One approach used by partners LIB (Länderinstitut für Bienenkunde e.V.) and AU (Aarhus University) is illustrated here: the behaviour of individually-marked worker bees on infested brood is observed by an infra-red camera in order to identify closely-related animals that either demonstrate or do not demonstrate the trait. These are then analysed by whole genome-sequencing.

Research on resistance genes – comparing the genomes of hygienic and non-hygienic bees



## Best practice in extension – what is your experience?

Work Package 5 of SmartBees aims to support the development of best practice in extension and advisory services in beekeeping across Europe. This involves different educational tools, learning and communication activities. We are now starting to prepare a database of best practice in extension. In different regions of Europe we have different traditions and methods and we can certainly learn a lot from each other. Therefore, we would like to learn more about examples of effective and successful extension and advisory services that you might have been involved in. These examples will be an important part of a “tool box” in extension which will be one deliverable from the SmartBees project. Please send your experiences, relevant information, ideas, descriptions or your contact information to Magnus Ljung, principal extension officer at the Swedish University of Agricultural Sciences.  
[magnus.ljung@slu.se](mailto:magnus.ljung@slu.se)



Creating an online platform for planning genetic progress in all subspecies

## Tools and strategies for sustainable bee breeding

Breeders of *A. m. carnica* and *A. m. mellifera* in several European countries have long been using the online platform [www.beebreed.eu](http://www.beebreed.eu) for calculation of breeding values based on performance and pedigree information and to plan genetic progress. This platform has now been enlarged to encompass all European subspecies and offers user interfaces in most languages. We have developed an online translation tool (see picture above) and are still looking for translators! If you are interested, please contact [info@beebreed.eu](mailto:info@beebreed.eu).