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Deliverable 2.6

Report on practices and innovations from networks and research

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Abstract	Deliverable 2.6 includes the results of a desk research where we screened for EU Research Programmes potentially generating some useful innovations and practices in beekeeping. The present document describes: the methodology, the results, conclusions and perspectives. The outcome is provided in Excel format, including the EU projects, scientific publications and the list of practices that could be obtained based on the two datasets.

Keywords	EU Research Projects, beekeeping practices, beekeeping innovations, networks, and research.

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1 Executive Summary

Deliverable 2.6 includes the results of our research where we screened for research projects funded by EU R&I framework programmes potentially generating relevant innovations and practices for B-THENET Thematic Network.

For this first screening, we focused on EU research projects, identifying them from CORDIS website. To boost the results already obtained, we extended our search to the wider web, including scientific publications as well as projects where B-THENET partners have been involved. This research yielded a database (Annex 1-3) including project-specific information.

A total of 57 projects were identified and analysed by the partners, as well as 19 scientific publications. Most of the EU research investment did not render practices and innovations relevant to B-THENET objectives (i.e., identify ready-to-use practices and innovations that we can validate and disseminate in B-THENET). Many of them remained at a Proof-of-Concept level. Only one project, namely B-PRACTICES, was focusing on beekeeping practices identifying a list of beekeeping practices and biosecurity measures. All of the above have been included in a dedicated database (Annex 3) and will serve as the basis for the work of prioritisation, validation, and dissemination of GBPs and BMBs, which is the goal of B-THENET.

2 Introduction

The present deliverable includes the work developed during the first months of the project to identify EU projects with potential to generate practices and innovations that can be included in B-THENET for validation and dissemination.

BeeLife, with contribution of all partners and entities specified in the GA, mapped all available EU research project results that could provide useful practices and innovations to B-THENET. The objective of the current task was to identify a list of practices and innovations based on EU research activities.

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3 Methodology

3.1 Identification of relevant research projects

Practices and innovations developed through EU research projects were identified by checking in the CORDIS database, in all programme frameworks, using the following keywords: “bees”, “honey bees”, “beekeeping”, “innovation”, “projects”. Analysis of the relevant projects yielded scarce outputs, so we looked for applicable projects in online search engines using the same keywords.

To boost the results already obtained, we extended our search to the wider web, including scientific publications as well as projects where B-THENET partners have been involved. This research yielded a database (Annex 1-3) including project-specific information.

A common database was proposed to integrate the information obtained, specifying the following project administrative-related information: research programme to which they belong, funding allocated, starting and ending dates and website link. Besides, we evaluated the projects outcomes, mainly the innovation and practices developed by the project with potential to be considered in B-THENET according to the available information.

Apimondia also identified a couple of research projects from abroad (USA) that were included in the database for transparency purposes. However, it must be noted that the consortium has not systematically looked for non-EU research projects dealing with the topic.

3.2 Identification of relevant publications

Scientific publications on beekeeping practices were also identified and included into an additional database (Annex 2). Only peer reviewed papers from Europe or North America focusing on *Apis mellifera* management were included. The evaluation criterium adopted was that the authors of the paper found a significant improvement on a certain trait of the bee colony or on a bee product after the adoption of a practice.

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4 Results

The outcomes of this analysis have been included in Annex 1-3:

1. List of identified Research projects
2. List of identified Scientific Publications
3. List of identified practices

A total of 57 projects related to the topic have been identified. Only a minority of the projects delivered ready-to-use practices, e.g. BPRACTICES project, SmartBees, or BEE DOC (Disease diagnostic tools), and innovations, e.g. BeeHome or Hapi. Other projects' results were aimed at different target groups, e.g., PoshBee, whose recipients were pesticide risk assessors and managers and academia, or STEP, whose recipients were mainly decision-makers, academia, and conservationists.

It must be highlighted that the available information on the projects outcomes is scarce or missing. For a large majority of the identified projects, there are neither final reports, nor publications or datasets available.

A total of 19 publications have been identified during this first period.

Overall, more than 200 individual practices have been identified based on the different projects analysed. They have been categorised and included in the database according to two criteria: (1) if they refer to beekeeping practices, apiary environment or beekeeping products; and if they refer to (2) Animal feeding and watering, Disease management, General apiary management, Hygiene, Record keeping, Training and Veterinary medical products.

B-THENET network identified other sources of funding not related to research, but to practical applications for the beekeeping sector: the National Beekeeping Programmes (First Pillar under Common Agricultural Policy (CAP), Regulation (EU) No 1308/2013). The beekeeping projects linked to the Erasmus+ program (i.e, "Innovative Blended Learning Toolkit for the Safe Pest Management of Honeybees" - blesabee) will be more deeply investigated with the Task activities and will be included in the next Deliverables.

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5 Conclusions

The present work has delivered three databases: (1) a list of EU research projects related to honey bees and/or beekeeping; (2) a list of publications defining practices and innovations relevant to beekeeping management; and (3) a list of practices (GBPs and BMBs) related to beekeeping management. The latter constitutes a candidate list of practices and innovations which end-users (beekeepers, advisors and other stakeholders) will need to prioritise, discuss, develop and harmonise at the EU level, so that B-THENET partners can validate and disseminate the final product: best beekeeping practices.

In most of the research activities screened through research projects and publications related to honey bees the ready-to-use practices and innovations were scarce. Only one project specifically focused on beekeeping management practices provided over 95% of the identified practices. However, B-THENET partners identified other sources of funding, namely National Apiculture Programmes (Measures included within the First Pillar under the CAP, Regulation EU No 1308/2013), as the ones rendering more field-applicable practices.

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6 Appendix

Appendix 1 – List of Research projects dealing with bee and beekeeping research.

Appendix 2 – List of publications identifying beekeeping practices and innovations.

Appendix 3 – List of practices identified in EU research projects.

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7 References

The references to the different projects have been included directly in the Appendixes.

EU Parliament and Council of the EU Communities, Regulation (EU) No 1308/2013 of the EU Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007.

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Appendix 1

Type / Programme	Funding	Name of the project	Link to project (other than CORDIS)	Starting	Ending	Description	Innovation	Practices where it COULD be applied
SC2/SME	€50.000,00	3-Bee Hive Tech		2018		An innovative IoT system designed for monitoring beehives - Link to the project HIVE TECH below		
FP7-KBBE	€5.997.963,00	AMIGA	http://www.amiga.enea.it/	2011	2016	Assessing and Monitoring the Impacts of Genetically modified plants on Agro-ecosystems	Effect of Stacked Insecticidal Cry Proteins from Maize Pollen on Nurse Bees (Apis mellifera carnica) and Their Gut Bacteria Authors: Harmen P. Hendriksma, Meike Küting, Stephan Härtel, Astrid Näther, Anja B. Dohrmann, Ingolf Steffan-Dewenter, Christoph C. Tebbe PLOS ONE, 8(3):e59589, 2013 ; Effects of multiple Bt proteins and GNA lectin on in vitro-reared honey bee larvae Authors: Harmen P. Hendriksma, Stephan Härtel, Dirk Babendreier, Werner von der Ohe, Ingolf Steffan-Dewenter Apidologie 43:549–560, 2012	-
FP7-SME	€1.674.127,60	APIFRESH		2010	2013	Developing European standards for bee pollen and royal jelly: quality, safety and authenticity	????	????
National	€512.000,00	Apimona	https://satt-paris-saclay.fr/en/technological-projects-portfolio/apimona/	On going		The APIMONA project aims to develop a dietary supplement for bees, validated by science and the beekeeping industry, based on molybdenum, an essential trace element naturally present in bees.	Molybdenum for honey bees	Feeding practices. The APIMONA dietary supplement is intended for beekeepers, mainly professionals, to maintain their colonies in good health and ensure a better production of honey and beeswax, in addition to encouraging the pollination necessary for agricultural production.
Erasmus+	347.506,00	BeeB	http://beebproject.eu	2019	2022	Foster the beekeeping bridges through innovative and participating training. The "beeB – Foster for beekeeping bridges through innovative and participative training" project will count on with the contribution of six European countries (Portugal, Spain, Italy, Croatia, Norway and Estonia) to develop tools that will allow family beekeepers, or any other non-professional beekeepers, to acquire skills in this area by using innovative and adaptive forms of training that are based on ecological and good beekeeping practices. Thus, it is intended to provide family beekeepers with training, which often does not exist or is scarce and encourage new publics, especially women and unemployed mainly from rural areas, to practice this activity	Using gamification to evaluate and manage the hive. tailored-made training. Adaptative microlearnings	Improving training practices
Erasmus+	257.166,00	BeeGen	http://www.beegen-project.eu	2019	2022	Cooperation for innovation and the exchange of good practices	Developing thematic game related to the theme of beekeeping joining a generation of young and older beekeepers	Improving training practices
H2020	€7.961.170,00	B- Good	https://b-good-project.eu/	2019	2023	GIVING BEEKEEPING GUIDANCE BY COMPUTATIONAL-ASSISTED DECISION MAKING - B-GOOD will develop and test innovative tools to perform risk assessments according to the Health Status Index (HSI)	Creation of an HSI, tools for decision making	Follow up of the health of the honey bees colonies
ERA-NET SUSAN	€3.700.000,00	B-Practices	https://www.izslt.it/bpractices/			Develop new management practices (Good Beekeeping Practices – GBPs) adopting new clinical methods, biomechanical and innovative biomolecular techniques respecting the natural behaviour of bees		
FP7-KBBE	€2.992.577,00	BEE DOC		2010	2013	The BEE DOC filled empirically and experimentally knowledge gaps in honeybee pests and diseases' and quantified the impact of interactions between parasites, pathogens and pesticides on honeybee mortality. Specifically BEE DOC showed for two model parasites (Nosema and Varroa mites), two model viruses (Deformed Wing Virus, Black Queen Cell Virus) and two model pesticides (thiacloprid, τ-fluvalinate) how interactions affect individual honeybees and colonies. The BEE DOC analysed the transcriptome of honeybees to explore host-pathogen-pesticide interactions and identified novel genes for resistance against Nosema.	What was achieved in relation to the objectives of the project • Varroa but not Nosema relevant for major colony losses • Sublethal pesticides (thiacloprid, τ-fluvalinate) little effects at colony level • Genetic underpinning of Nosema resistance (apoptosis and RNAi genes) • BEE DOCTOR tool for virus diagnostics • Secondary plant metabolites in honeys against pathogens • Concept for subsequent EU-call on honeybee health	Food - Hive products; Diagnostic tools; Leave propolis in the hive to ensure its health
USA		Bee Informed Partnership						
SC2/SME	€50.000,00	BEE LABEL	site web not available anymore: http://www.label-abeille.org	2018		Bee Angels is a young French SME, which has developed and commercialised a 1st generation of a new connected beehive system called Bee Label. It allows beekeepers to remotely check their hives and to take proactive steps to keep bees safe and happy, to fight against their disappearance and ensure pollination.	Non-invasive electronic colony monitoring	Rationalisation of migration
FP6-FOOD	€1.865.000,00	BEE-Shop		2006	2009	The prime goal is to reduce potential sources of honey contamination due to both foraging contaminated nectar and chemotherapy of honeybee diseases. The BEE SHOP will therefore deal with the development of biological resistance to pests and pathogens to avoid chemotherapy. Various European honeybee races and populations will be screened for their disease resistance potential to the main pressing pathogens. Differences in foraging patterns among European honeybees and their underlying mechanisms will be studied to identify behavioural traits reducing contamination. Differences in disease susceptibility will be genetically analysed by QTL mapping.	SNPs will be developed to allow for selection of specific target genes in both drones and queens before insemination. New tools for testing honey quality and authenticity will be developed	Selection in breeding

Horizon 2020 - ERC	€1.420.000,00	BeeDance Gap	https://ellileadbeater.wixsite.com/beedancegap	2016	2021	Honeybee communication: animal social learning at the height of social complexity (waggle dance)	NBDA: A Package For Implementing Network-Based Diffusion Analysis. R package version 0.6.1. You can access it via GitHUB here: https://github.com/whoppitt/nbda	-
FP7-PEOPLE-Marie Curie Actions	€100.000,00	BEEFUN		2014	2018	Pollinator responses to global change and its implications for ecosystem function		-
Priority societal challenge	€50.000,00	BeeHome		2019		AI-driven technology has been developped to alert beekeepers	BeeHome, a modular commercial AI-powered-apiary composed of hardware and software that fully automates beekeeping and honey production while optimizing pollination.	Honey bee colonies managment
H2020/SME	€2.201.587,50	BeeHome	https://www.beewise.ag	2020	2022	The Israeli SME Beewise is bringing beekeeping into the digital age with an autonomous beehive that allows beekeepers to remotely treat their hives and care for their bees. Integrating computer vision, AI and robotics, it enables automatic climate and humidity control, pest control, swarm prevention and harvesting and alerts beekeepers when things go awry. The EU-funded BeeHome project will optimise and validate the technology and work towards its commercial availability.	Beewise developed the Beehome platform, which is a modular commercial AI-powered apiary composed of hardware and software that fully automates beekeeping while optimizing pollination and honey production. The technology is not exclusive to honeybees and can support various species of bees that face extinction as well. The platform includes an automated robotic brood box management system, a computer vision-based monitoring system, AI-based decision making, an automated honey harvesting system and systems for pest control, feeding, and thermoregulation. The key objectives of the project are to optimize the software and the AI, to finalize the engineering of the hardware components, to validate the technology in a two-stage in-field testing and to obtain the CE mark for commercialization in Europe.	Honey bee colonies managment
SC2/SME	€50.000,00	BEEOXAL		2017		Treatment against honeybee varroosis based on highly effective application of oxalic acid through sublimation	The ready-for-use mono-dose pellets, sublimation	Honey bee colonies health managment -varroa treatment
Priority societal challenge	€50.000,00	BeeSafe		2020		BeeSafe project is hatching a plan to protect this billion euro industry. It is developing a smart anti-theft system with AI-based service software to protect beehives. This new system is based on a GPS tracker that reports unusual movement (i.e. theft or vandalism). A patent-pending technology enables the anti-theft system to operate in zero energy mode until theft or vandalism starts to take place. Field-tested AI compares unusual movement with past user patterns and mitigates false alarms	AI software coupled with GPS	Protection of apiaries
FP7-PEOPLE-Marie Curie Actions	€184.709,40	BEESPATNET		2013	2014	Mapping spatial interaction networks in honeybee colonies project aimed to track the movements of individual bees within the hive, focusing in particular on the movements of the queen bee.	Individual bee tracking. BEESPATNET modified a tagging system used to track ants for use with bees. This involved attaching an electronic tag to the body of 1 000 newly hatched bees as well as the queen, and tracking those bees for 31 days. This period is the lifespan of an average worker bee	-
MSCA/IF	€240.000,00	BeeSymOverSpace		2016	2019	How to help the hive? Incidence and impact of heritable microbes on bee health	Culture of the *Arsenophonus* from bees was achieved for the first times, alongside the genome sequence and microbiological characerization. Establish geographical patterns of heritable microbe presence in bees, and links to apiculture practice. It will then use state of the art transcriptomic and genomic approaches to establish the links between Arsenophonus, a heritable symbiont known in bees, and bee health	Better training session: combine with professional agencies responsible for bee health to use these results to modify apiculture practice to establish better bee husbandry. Aside the research science completed, the project will train an EU scientist in state of the art genomic technologies and translation from discovery to applied science. It will further transfer the training gained to EU hosts, both in discovery science and application.
ERA-NET SUSAN	€700.000,00	BPRACTICES	https://www.izslt.it/bpractices/	2017	2020	New indicators and on-farm practices to improve honeybee health in the *Aethina tumida* ERA in Europe. Develop new management practices (Good Beekeeping Practices – GBPs) adopting new clinical methods, biomechanical and innovative biomolecular techniques respecting the natural behaviour of bees		FAO, IZSLT, Apimondia and CAAS. 2021. Good beekeeping practices for sustainable apiculture. FAO Animal Production and Health Guidelines No. 25. Rome. https://doi.org/10.4060/cb5353en FAO and IZSLT. 2021. Responsible use of antimicrobials in beekeeping. FAO Animal Production and Health Guidelines No. 26. Rome, FAO. https://doi.org/10.4060/cb6918en FAO,...
FP7-SME	€3.252.193,42	CLEANHIVE		2008	2012	Detecting pathogen. This diagnostic tool will be designed following beekeeper's needs in terms of portability, sensitivity and cost. Objectives:1. To develop a diagnostic method for the detection of microsporidians infecting bees 2. To disseminate the use of this technology among European beekeepers 3. To exploit the results of the project through the partners	Develop a robust fluorescence analyser to detect *Nosema* (LFD)	Monitoring honey bee colonies health
COST Action		COLOSS	http://coloss.org					
MSCA/IF	€180.000,00	DRiveR		2018	2020	How does dopamine link QMP with reproductive repression to mediate colony harmony and productivity in the honeybee?		
FP7-PEOPLE-Marie Curie Actions	€203.333,20	DYVERSE		2011	2014	Vegetation dynamics and ecosystem services provision in a fragmented landscape in response to global change		
FP7-SME	€887.000,00	ECOSYN		2013	2015	Ecofriendly synergists for insecticide formulations		
FP7-PEOPLE-Marie Curie Actions	€45.000,00	FLORDETERSIGNALS		2007	2010	Silene floral and deterrent signals. Alternatives to pesticides and impact on pollinators		
FP7-IDEAS-ERC	€1.395.639,60	FLORSIGNALS		2012	2016	Evolution and consequences of floral signaling in plants		
H2020-EU.3.,H2020-EU.2.3.,H2020-EU.2.1.	€50.000,00	FOG		2019-01-01	2019-06-30	Frequency protector generator for honeybees	The basis of the invention was a chemical-free solution that wouldn't jeopardise our health or that of the bees: certain frequencies can harm living organisms under certain circumstances, and conversely some can help, so we started to experiment with V. destructor	Honey bees colonies health managment- fight against varroa
H2020-EU.3.2.4.,H2020-EU.3.2.1.,H2020-EU.2.3.1.,H2020-EU.3.2.,H2020-EU.3.2.2.	€50.000,00	Hapi	https://www.varroa-controller.com	2017-06-01	2017-11-30	HApi - Hyperthermia in Apculture - A new product against the Deformed Wing Virus of honey bees.	HApi – Hyperthermia in Apiculture focuses on the introduction of a new machine for treating honey bees against the Deformed Wing Virus (DWV) by means of hyperthermia. Since currently no specific treatment exists to deal with the DVW infestation, we believe our company can...	Hyperthermia as varroa treatment

Priority societal challenge	€988.750,00	HIVE-TECH	https://www.3bee.com/en/technology/	2019	2021	Artificial intelligence revolution in beekeeping sector	using artificial intelligence (AI) algorithms to optimise beekeeping management. It developed an IoT data-driven decision support system that can analyse a colony's main life parameters, such as honey production and amount of feed stock during winter. The system's predictive algorithms can identify anomalous conditions such as lack of feed stock, and suggest what actions to take.	Non-invasive monitoring of honey bee colonies
Horizon 2020 - FET	€6.999.508,75	HIVEOPOLIS	https://www.hiveopolis.eu	2019	2024	FUTURISTIC BEEHIVES FOR A SMART METROPOLIS	This project will generate integrated technologies that enable the building of the first smart beehive system.	
INDUSTRIAL LEADERSHIP - Innovation In SME	€50.000,00	hivepoll		2019-06-01	2019-11-30	Polling beehives to monitor parasitic infestations and gather pollination information	Using Big Data and deep learning, researchers of the EU-funded hivepoll project will work on the real-time detection of threats to beehives as well as the quantification of the pollination performance of an apiary. Using the gathered data, the project will set out to establish a novel data exchange platform between beekeepers and other stakeholders in the agriculture market. The data will also be used for crop yield prediction as well as the development of improved models for the management of crop failure risks.	Honey bees colonies managment
USA		Honey Bee Health Coalition						
Preparatory Action		INSIGNIA-Bee	https://www.insignia-bee.eu	2018	2021	Precursor of Insignia-Europe (see below)	Development of a guideline with protocols that were developed and tested in nine countries for the citizen-science-based monitoring of pesticides using honey bee colonies. a non-invasive sampler, the "APIStrip" (Absorbing Pesticides In-hive Strips), which is a plastic strip with a pollutant adsorbent which is hung between the combs inside a bee hive for non-invasive sampling	Improving sampling methods. Health investigations
Preparatory Action		INSIGNIA-Europe	https://www.insignia-bee.eu	2021	on going	INSIGNIA-EU is an international collaborative project led by scientists from 11 organisations in 10 countries, which aims to design and test an innovative, non-invasive, scientifically proven citizen science environmental monitoring protocol using honey bee colonies for the detection of pesticides, microplastics, heavy metals, and air pollutants.	Present a comprehensive pan-European environmental pollution monitoring study with honey bees.. INSIGNIA-EU thus goes far beyond the original INSIGNIA-bee guideline to cover additional pollutants (heavy metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, airborne particulate matter, and microplastics) using novel techniques and sampling media which are being tested during 2022.	
Priority societal challenge	€1.430.000,00	IoBees		2017	2020	BeeHive health IoT application to fight HoneyBee Colony Mortality	PoC of the Bee Hub, PoC of bee counter	Non-invasive monitoring of honey bee colonies
FP7-KBBE	€2.997.630,00	LIBERATION		2013	2017	LInking farmland Biodiversity to Ecosystem seRvices for effective ecofunctional intensificATION		
Programme Life	€1.364.254,00	LIFE STOPVESPA		2015	2019	The main objective of LIFE STOPVESPA was to contain the spread of the Asian hornet (*Vespa velutina*) in Italy. The project aimed to develop a prototype for early location of nest positions, and to establish a monitoring and control system limiting the spread and impacts in those areas already affected in Liguria and Piedmont. Specifically, the project aimed to: develop a harmonic radar system to track flying wasps when returning to their nests, particularly to locate hidden nests early in the season so they can be destroyed before new queens are created; remove all colonial nests present in the invaded area (western Liguria and southern Piedmont) and those that may be established during the project; implement an Early Warning and Rapid Response System at the regional and national level to prevent further invasions; and create a coordinated coalition of trained volunteers among beekeepers to detect and destroy colonial nests.	The project team developed new tools for the management of the species, namely two harmonic radar prototypes able to track the hornets and detect nest locations, even those concealed by vegetation. These prototypes allow for real-time tracking of the flight of the hornets in complex environments, with a maximum detection range of 500 m from the radar. The two prototypes were efficient both in invaded areas and for new outbreaks.	Monitoring *Vespa velutina*
MSCA/IF	€150.000,00	MeeLiH		2018	2020	Measure of the Ecological influence in Epigenetic-mediated Learning and memory formation in the Honey bee		
FTIPilot	€50.000,00	MICRO4BEE		2016	2016	A sustainable organic solution for bees decline	MICRO4BEE, an eco-innovative product representing a sustainable solution to decline of bees caused by bacteriological diseases.MICRO4BEE represents an innovative product composed of a mix of symbiotic bacteria, naturally present in the gut of bees, harmless to humans and with probiotic activities towards honeybees.	Honey bees colonies health managment
Horizon 2020 - ERC	€1.499.462,00	MicroBeeOme		2017	2022	Evolution of honey bee gut microbiome through bacterial diversification		

FP7-PEOPLE-Marie Curie Actions	€299.558,40	NEUROBEECOG2012		2014	2016	Metacognition is monitoring one's own thoughts and using that knowledge to guide decision-making, which is only known to be exhibited by humans. It is not known whether honey bees and other non-human species possess this ability. The EU-funded NEUROBEECOG2012 (Smart foraging: Neuronal complexity, cognition and foraging in honey bees) initiative investigated how honey bees solve choice tasks when available information is limited. Project researchers examined how bees recognise and communicate uncertainty about floral resources to other colony members. They rewarded free-flying bees for making correct choices and punished incorrect choices during experiments. The project aimed to determine how natural and manipulated changes in neuronal complexity relate to bees' ability to solve cognitively demanding tasks. The researchers studied this by examining changes that occur in key regions of the honey bee brain. The research team found that honey bees are able to selectively avoid making choices when information is limited. NEUROBEECOG2012 also discovered that bees change their foraging performance over their lifetime. NEUROBEECOG2012 found that more synaptic connections in the visual region of the bee brain improved learning speed and information recall. This research will ultimately help scientists to better understand how human brains work.	-	-
MSCA/RISE	€340.000,00	NO PROBleMS		2018	2023	Nourishing PRObiotics to Bees to mitigate stressors. Research institutions will do the experimental work on bees aimed at the definition of a strategy based on the use of beneficial bacteria and plant extracts and at the evaluation of the impact on the bee gut of the developed formulation		Honey bee colonies health managment
INDUSTRIAL LEADERSHIP - Innovation In SMEs	€50.000,00	Pollenity	https://www.eitfood.eu/community/startups/bee-smart-technologies-ad	2020		Introducing the Internet of Bees: A Smart Beehive System. Pollenity sets off to fix this fundamental disconnect between plants and pollinators. We are offering a smart beehive monitoring system that allows beekeepers to remotely monitor their honeybee colonies, measure their productivity, identify threats and react accordingly and on time. Our product portfolio consists of three products – Beebot, HiHive and the BBoard. The in-hive sensor device, called the Beebot is complimented by a robust weight scale – the HiHive.	We follow a two-tier revenue model with assets sales of the Beebot sensor and the HiHive scale, and a SaaS subscription model for the access to the software at a small fee per month.	Honey bee colonies managment. Pollination managment
SC2	€9.000.000,00	Posh-Bee	https://poshbee.eu	2018	2023	PoshBee aims to address the impact of agrochemicals on bee health. Our objectives are to (i) assess the exposure hazard of bees in Europe, (ii) understand the toxicity and dynamics of key chemicals in bees, (iii) acquire an understanding of how agrochemicals and their interactions with nutrition and parasites impact bee health, (iv) develop models to help us assess and manage risks to bees, (v) produce tools that can be used to monitor bee health, and (vi) drive forward policy and practice in the EU to produce healthy bees and sustainable pollination.	We have developed a database to underpin definitions of bee health, produced landscape data to support realistic models for bee risk assessments, and created a functional bumblebee simulation model	• Toxicokinetics/dynamics of focal chemicals • LD nutrition, 50 for bees chemicals for chemicals, x pathogens chemicals x • Broader impacts of chemicals and combinations from lab to field • New model solitary bee species for assessing health impacts • New protocols for risk assessment for bees • New model systems for ecotoxicology • Air sensors for chemical exposure • Proteomics-based health card for bees • Landscape-level risk- assessment models • Exposure profile for bees across Europe in apple orchard and oilseed rape agroecosystems • Health data for indicator bee colonies/populations in these agroecosystems • Correlations between exposure and health to identify drivers
FP7-PEOPLE-Marie Curie Actions	€278.807,40	PyNaMite		2012	2014	An EU-funded project has elucidated the mechanism of resistance to pyrethroids in the bee mite, Varroa destructor, and has developed a test for a rapid and accurate identification of resistant mites in populations across Europe. Objective: Describe the mode of action and selectivity of pyrethroids on economically important mites and ticks. 1. To characterize the interactions of pyrethroids with tick/mite sodium channels at the molecular level. 2. To identify novel resistance mutations in field populations of ticks/mites. 3. To develop rapid, high throughput DNA-based assays for diagnosing the presence/absence of resistance mutations in field populations of ticks/mites.	Resistance to pyrethroids in Varroa is target-site based • Evolved independently in Europe and the US • Robust methodology for accurate detection of mutations • Mutations in high frequency only after recent treatment with pyrethroids • Effective management: Proactive monitoring / acaricides rotation	Honey bee colonies health managment
FP7-KBBE	€2.998.006,00	QUESSA		2013	2017	The project aims to identify the key semi-natural habitats (SNH), outside and within crops, providing essential ecological services (ES).		
Ind Leadership/ICT	€1.999.869,25	SAMS	https://sams-project.eu	2018	2020	International Partnership on Innovation in Smart Apiculture Management Services		Honey bee colonies management
FP7-KBBE	€6.000.000,00	SMARTBEES	https://www.smartbees-fp7.eu/	2014	2018	Objectives • to identify crucial facets of honeybee resistance to colony losses, Varroa and viruses; • to characterise the genetic background of the resistance mechanisms in honeybees; • to develop breeding strategies to increase the frequencies of these valuable traits in local honeybee populations; • to promote multiple local breeding efforts, to conserve local resilient populations and will develop molecular tools for describing and safeguarding future populations; • to protect European natural honeybee heritage.		Performance testing protocol: https://www.smartbees-fp7.eu/Extension/Performance/

FP7-IDEAS-ERC	€3.438.922,00	SPACERADARPOLLINATOR		2014	2019	Here we propose ground-breaking technology advances to make insect telemetry fit for the 21st century, to answer multiple fundamental questions in pollinator space use and its implications for the plants they pollinate.		
FP7-ENVIRONMENT	€3.499.994,50	STEP	http://www.step-project.net	2010	2015	Status and Trends of European Pollinators. Pollinators form a key component of European biodiversity, and provide vital ecosystem services to crops and wild plants. There is growing evidence of declines in both wild and domesticated pollinators, and parallel declines in plants relying upon them.	STEP produced the first ever European Red List for bees which identified those species most threatened and reported the main causes to be climate change and agriculture intensification. The Red List is an essential tool to inform policy decisions on conservation	-
COST Action	€161.380,00	SUPER-B	http://superb-project.eu/	2014	2018	Network building around the topic of bee conservation		
FP7-SME	€1.424.922,40	SWARMONITOR		2015	2018	Produce a prototype for a product which will offer hope to Europe's besieged beekeepers.	Researchers aim to monitor and decode the buzzing of bees in the hive and pass vital information to beekeepers via wireless technology. The goal is to develop a hi-tech method of using accelerometers – devices sensitive to tiny vibrations – to detect and translate the vibrations caused by bees during their activities. The Swarmonitor consortium has extensively explored using accelerometers to monitor honeybee colony status. • Three apiaries have been set up with fully automated monitoring of vibrations one of them also benefitted from regular detailed visual inspections. Some hives were monitored with solar-powered electronics. • Vibrational signals from multiple primary and secondary swarms have been captured. Healthy hives and colonies exhibiting a broad range of health disorders have been successfully monitored over > 2 years, evidenced by thoroughly detailed 'ColEval' log books (each side of each frame was visually assessed each month). • Inexpensive hardware has been developed, tested and installed on apiaries to fulfil the required vibrational measurements. Ultra-high-performance hardware was also used to acquire ultimate-quality data. The Swarmonitor consortium has extensively explored using accelerometers to monitor honeybee colony status. • Extensive software was developed to (i) correlate the vibrational measurements to the colony status and (ii) have inexpensive microcontrollers to 1- record, 2- analyse the vibrational data, and 3- wirelessly send diagnostic information, at the hive. • An algorithm was developed to sense the colony's intention to swarm, several days before the primary swarm and the method used to generate the alarm was the subject of a patent application. • A vibrational feature, characteristic of a colony's abnormal deterioration in the winter, was discovered. • A vibrational feature, characteristic of the brood cycle status on the frame under investigation, was discovered and published.	Follow up of the colony. Preventing swarm during spring
INDUSTRIAL LEADERSHIP - Innovation In SME	€50.000,00	V-Eliminator		2019		Laser technique offers safe and efficient varroa removal from bees	The use of a V-laser to fight against varroa inside the hive. The technology of the laser and optical vision are not novelties per se, the novelties are sophisticated AI computer vision algorithm, miniaturization of the hardware and effective synchronization of optical vision and laser system	Disease managment - fight against varroa
FP7-IDEAS-ERC	€150.000,00	VIBES		2014	2016	To increase yields per arable surfaces, pesticides are heavily used for crop protection, including against insect pests. However the ubiquitous use of chemical insecticides raise issues ranging from human health concerns to links with pollinating bee population decline. Upon societal demand, recent EU legislation changes now impose reductions in chemical inputs and the market share of organic food is increasing. However pests still continue to reduce crop yields. Altogether this is driving renewed interests for the development of alternative pesticides. Insect viruses have long been recognized as safe bio-insecticides, but their commercial development was held back by their relatively slow mode of action (typically 5 days) compared to chemical insecticides.		-
INDUSTRIAL LEADERSHIP - Innovation In SMEs	€50.000,00	WarmHive	https://eeagrants.org/archive/2014-2021/projects/PL-INNOVATION-0037	2019-01-01	2019-06-30	SMART thermotherapy solution for varroa mite treatment.	A solution that fits on the roof of a beehive and automatically applies heat without overheating the bees or affecting the structure of the comb or the consistency of the honey.	Disease managment - fight against varroa

Appendix 2

Publication Reference (format Chicago Manual Style)	Link	Innovation	Practices where it COULD be applied
Lodesani, M., Franceschetti, S. & Dall'Ollio, R. Evaluation of early spring bio-technical management techniques to control varroosis in Apis mellifera. Apidologie 50, 131–140 (2019). https://doi.org/10.1007/s13592-018-0621-z	https://link.springer.com/article/10.1007/s13592-018-0621-z#citeas		Early brood interruption (through queen caging) to control varroosis
Lodesani, M., Franceschetti, S. & Dall'Ollio, R. Evaluation of early spring bio-technical management techniques to control varroosis in Apis mellifera. Apidologie 50, 131–140 (2019). https://doi.org/10.1007/s13592-018-0621-z	https://link.springer.com/article/10.1007/s13592-018-0621-z#citeas		Early use of a single trapping comb to control varroosis
Mosca, M., Bubnic, J., Giannetti, L., Fortugno, L., Pietropaoli, M., Manara, V., ... & Formato, G. (2023). Adoption of Partial Shook Swarm in the Integrated Control of American and European Foulbrood of Honey Bee (Apis mellifera L.). Agriculture, 13(2), 363.	https://www.mdpi.com/2077-0472/13/2/363		Partial shook swarm combined with oxytetracycline treatment to control AFB and EFB
Woodford, L., Sharp, G., Highet, F., & Evans, D. J. All together now: geographically coordinated miticide treatment benefits honey bee health. Journal of Applied Ecology.	https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.14367		Coordinated miticide programme (Amitraz in summer, oxalic acid dribble in winter)
Kulhanek K, Steinhauer N, Wilkes J, Wilson M, Spivak M, Sagili RR, et al. (2021) Survey-derived best management practices for backyard beekeepers improve colony health and reduce mortality. PLoS ONE 16(1): e0245490. https://doi.org/10.1371/journal.pone.0245486	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245486		Reuse equipment immediately after deadouts by adding to living colonies or using for a split
Kulhanek K, Steinhauer N, Wilkes J, Wilson M, Spivak M, Sagili RR, et al. (2021) Survey-derived best management practices for backyard beekeepers improve colony health and reduce mortality. PLoS ONE 16(1): e0245490. https://doi.org/10.1371/journal.pone.0245487	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245487		Monitor varroa monthly and apply miticides when above 3.0 mites/100 bees
Kulhanek K, Steinhauer N, Wilkes J, Wilson M, Spivak M, Sagili RR, et al. (2021) Survey-derived best management practices for backyard beekeepers improve colony health and reduce mortality. PLoS ONE 16(1): e0245490. https://doi.org/10.1371/journal.pone.0245488	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245488		Start new colonies from making splits when possible and buy nucleus colonies if splits impossible
Kulhanek K, Steinhauer N, Wilkes J, Wilson M, Spivak M, Sagili RR, et al. (2021) Survey-derived best management practices for backyard beekeepers improve colony health and reduce mortality. PLoS ONE 16(1): e0245490. https://doi.org/10.1371/journal.pone.0245489	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245489		Comb culling technique: freeze old brood comb before reuse
Gray, A., Adjlane, N., Arab, A., Ballis, A., Brusbardis, V., Charrière, J. D., ... & Brodschneider, R. (2020). Honey bee colony winter loss rates for 35 countries participating in the COLOSS survey for winter 2018–2019, and the effects of a new queen on the risk of colony winter loss. Journal of Apicultural Research, 59(5), 744-751.	https://www.tandfonline.com/doi/full/10.1080/00218839.2020.1797272		Higher percentages of young queens corresponded to lower colony losses
Oberreiter, Hannes, and Robert Brodschneider. 2020. "Austrian COLOSS Survey of Honey Bee Colony Winter Losses 2018/19 and Analysis of Hive Management Practices" Diversity 12, no. 3: 99. https://doi.org/10.3390/d12030099	https://www.mdpi.com/1424-2818/12/3/99		Do not purchase wax from outside the own operation
Komasilova, O., Komasilovs, V., Kviesis, A., Bumanis, N., Mellmann, H., and Zacepins, A. Model for the Bee Apiary Location Evaluation. Agronomy Research 18(S2), pp.1350-1358, 2020.	https://dspace.emu.ee/xmlui/handle/10492/5686		Optimisation of apiary location
Komasilova, O., Komasilovs, V., Kviesis, A., Zacepins, A. Model for finding the number of honey bee colonies needed for the optimal foraging process in a specific geographical location. PeerJ Life & Environment 9:e12178. 2021	https://doi.org/10.7717/peerj.12178		Optimisation of pollination
Smith, M. L., Davidson, J. D., Wild, B., Dormagen, D. M., Landgraf, T., & Couzin, I. D. (2022). Behavioral variation across the days and lives of honey bees. Iscience, 25(9), 104842	https://doi.org/10.3389/frobt.2022.791921		Honey bee colonies management
Pietropaoli, M., & Formato, G. (2021). Formic acid combined with oxalic acid to boost the acaricide efficacy against Varroa destructor in Apis mellifera. Journal of Apicultural Research, 1-9	http://dx.doi.org/10.1080/00218839.2021.1972634		Combination of soft acaricides to optimize efficacy
Pietropaoli, M., Tlak Gajger, I., Costa, C., Gerula, D., Wilde, J., Adjlane, N., … & Formato, G. (2021). Evaluation of Two Commonly Used Field Tests to Assess Varroa destructor Infestation on Honey Bee (Apis mellifera) Colonies. Applied Sciences, 11(10), 4458	https://doi.org/10.3390/app11104458		Monitor varroa infestation level with the proper methods
Büchler, R., Uzunov, A., Kovačić, M., Prešern, J., Pietropaoli, M., Hatjina, F., … & Nanetti, A. (2020). Summer brood interruption as integrated management strategy for effective Varroa control in Europe. Journal of Apicultural Research, 59(5), 764-773	http://dx.doi.org/10.1080/00218839.2020.1793278		Use of biotechnical methods to improve efficacy of soft acaricides
Giacomelli, A., Pietropaoli, M., Carvelli, A., Iacoponi, F., & Formato, G. (2015). Combination of thymol treatment (Apiguard®) and caging the queen technique to fight Varroa destructor. Apidologie, 47: 606. doi:10.1007/s13592-015-0408-4.	http://dx.doi.org/10.1007/s13592-015-0408-4		Combination of a soft acaricide with queen caging to optimize efficacy
Pietropaoli M., Giacomelli A., Milito M., Gobbi C., Scholl F., Formato G. (2012). Integrated pest management strategies against Varroa destructor: the use of oxalic acid combined with innovative cages to obtain the absence of brood. European Journal of Integrative Medicine Vol. 4, Supplement 1: 93. Available at: http://www.sciencedirect.com/science/article/pii/S1876382012007809	http://dx.doi.org/10.1016/j.eujim.2012.07.691		Queen caging technique to improve efficacy of soft acaricides
Zacepins, A., Ozols, N., Kviesis, A., Gailis, J., Komasilovs, V., Komasilova, O., & Zagorska, V. (2022). Evaluation of the honey bee colonies weight gain during the intensive foraging	https://doi.org/10.15159/ar.22.017		Honey bee colonies management -Swarming prevention

Appendix 3

Topic	Subtopic	Sub-subtopic	Practices	Project in which it was developed
Environment	GENERAL APIARY MANAGEMENT	Legal aspects	Comply with legal obligations concerning restrictions on animal movements in case of notifiable diseases	BPractices
Beekeeping practices	HYGIENE	(-)	For nuclei use only bees and brood combs from healthy colonies only (negatively inspected for bee diseases)	BPractices
Beekeeping practices	HYGIENE	(-)	Respect hygiene rules (e.g. periodically cleaning of suits, gloves, etc.)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Transport/move only healthy colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Practice good hygienics when dealing with dead colonies (combs, food stores, boxes, etc.)	BPractices
Beekeeping practices	HYGIENE	(-)	Disinfect levers and other potentially contaminated equipment (e.g. gloves) after inspection of hives affected by transmissible diseases	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Balance colony strength among colonies transferring frames only in case of healthy hives	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Transport hives avoiding the warmer hours of the day, providing adequate openings for air ventilation in the hives	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Practice hive management according to region, season, strength of colony	BPractices
Beekeeping practices	HYGIENE	(-)	Do not place honey supers directly on the ground (avoid contamination with *C. botulinum*)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Buy new bee colonies only after thorough inspection against bee diseases, preferably with a health certificate from a veterinarian	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Replace the queens at least every two or three years except for those of high genetic value	BPractices
Beekeeping practices	HYGIENE	(-)	Avoid the contact with dust during the transport of the supers from the apiary to the honey house	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Keep only healthy strong colonies in the apiary	BPractices
Beekeeping practices	HYGIENE	(-)	Do not place beehives directly on the ground	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Evaluate the melliferous and pollen capacity of the area and the availability of water resources	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Use disposable gloves when handling diseased hives	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Have the support of an expert (e.g. veterinarian, technician, etc.) to provide assistance in case of need	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Avoid areas with environmental pollutants (e.g. pesticides, heavy metals, etc.) to place apiaries	BPractices
Beekeeping practices	HYGIENE	(-)	Do not have beekeeping material abandoned in the apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Do not imbalance the proportion between nurse bees and brood while equalising the hives; use preferably combs with hatching bees to fortify weak colonies	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Keep a good proportion between the number of hives and the amount of melliferous plants/pollen sources in the area where the apiary is located	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by insertion of new wax foundations	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Avoid windy areas to place apiaries	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Perform genetic selection in order to have queens that are more resistant to diseases and adapted to local climatic conditions	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Place apiary in an accessible area	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Comply with the planned schedule for beehives inspection	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by colony splitting	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Before winter, reduce the empty space in the hive	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Adjust the number of hives in the apiary according to season, pollen, nectar, honeydew resources	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Adjust the number of hives within a flight range according to season, pollen, nectar, honeydew resources	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: reduce the size of the hive entrance	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Keep newly introduced colonies separate from the existing stock for an appropriate period (at least 1 month) in order to monitor them against diseases to prevent transmission	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Avoid, as far as possible, the introduction of swarms from unknown origin, colonies or queens from other apiaries	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Place apiary in a firm area	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Reduce the opening of the hive entrance during robbing and cold periods and increase the opening of the hive entrance during the hot season	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Use personal protective clothing and equipment when visiting honey bee colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Keep purchased or weak colonies in a quarantine apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by placing of supers	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by taking off the entrance reducer	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by adopting genetic selection of the queens	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Use a queen excluder	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: perform bee hive box maintenance (replace parts or painting, verify the integrity of hive boxes, if needed)	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Place apiary in an area accessible to vehicles	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent drift occurrence: avoid keeping too many colonies in a single row	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Mark the queen bee according to the date of birth	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Avoid having broken hives with openings or not well maintained to prevent robbing	BPractices

Environment	GENERAL APIARY MANAGEMENT	(-)	Avoid areas where toxic (e.g. with pyrrolizidine alkaloids) plants (e.g. Echium spp., Eupatorium spp. and Senecio spp.) can be found in a significant quantity	BPractices
Environment	GENERAL APIARY MANAGEMENT	(-)	Orientate hive entrance in a way that sun can reach them since the early morning hours.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: Verify the external position of the frames with stores in the hive.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Keep during apiary inspections corticosteroids or other proper medicines ready to use to guarantee health of operators (for example, in case of anaphylaxis)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Limit the weight lift (e.g. when harvesting supers or when moving hives) and, if needed, use back protector devices	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: reduce the number of frames in the hive box.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: insert a divider board to reduce the volume for the hive nest.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent drift occurrence: paint/draw numbers or identification signs on the front and entrance of the hive.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by insertion of drawn combs	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Avoid areas where allergenic plants (e.g. *Ambrosia trifida* and *Artemisia vulgaris*) can be found in a significant quantity.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Indicate the age of the combs on the top bar of the frame (e.g. the year of placing of the frame with foundation)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Reduce bee stress (e.g. avoiding unnecessary winter inspections of the hives; limiting the use of the smoker; properly feeding the bees etc.)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Wintering: wrap the hive in black tar paper, if needed.	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Prevent swarming by removal of the beehive's bottom board	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	(-)	Provide adequate openings in the hive for air circulation, if needed	BPractices
Beekeeping practices	VETERINARY MEDICINS	Legal aspects	Use only veterinary medicines for honey bees registered in your country or medicines legally imported	BPractices
Beekeeping practices	VETERINARY MEDICINS	(-)	Ensure that all treatments or procedures are carried out correctly as described in the instructions (respecting dosage and method of application)	BPractices
Beekeeping practices	VETERINARY MEDICINS	Legal aspects	Do not carry out illegal treatments	BPractices
Beekeeping practices	VETERINARY MEDICINS	Legal aspects	Use only pharmacological products registered for beekeeping use, following the use instructions and record the treatments	BPractices
Beekeeping practices	VETERINARY MEDICINS	Legal aspects	Observe the withdrawal time of veterinary products and ensure that products from treated hives are not used for human consumption until the withdrawal periods have elapsed	BPractices
Beekeeping practices	VETERINARY MEDICINS	(-)	In case of using instruments for the application (formic acid dispenser, sublimators for oxalic acid treatment) ensure that they are appropriate and correctly calibrated for the administration	BPractices
Beekeeping practices	VETERINARY MEDICINS	(-)	Respect the required storage conditions for veterinary medicines and feeds	BPractices
Beekeeping practices	VETERINARY MEDICINS	(-)	Dispose of used instruments and devices in a biosecure manner	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Legal aspects	In case of notifiable diseases follow the instructions from the veterinary regulations and competent authorities	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	In case of infectious diseases clean all beekeeping material between uses (e.g. hive bodies, hive bottom boards, feeders, hive tools)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Clean or disinfect (in case of infectious diseases) the hive box before installing new colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Carry out thorough inspections for clinical symptoms of bee diseases and presence of the queen in spring	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Carry out thorough inspections for clinical symptoms of bee diseases and presence of the queen at the end of the beekeeping season	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Quickly remove beehives with dead colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Sampling	Take samples for laboratory analyses when sick or dead bees are found, if needed	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Clean equipment, scrape off wax and propolis, on regular basis	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Remove and process wax of all combs from dead, affected colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Record the health status of the colonies: diseased/infected colonies (dates, diagnoses, ID of colonies affected, treatments and results)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Renew 30% of the hive combs every year	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record the health status of the colonies: mortality (dates, diagnoses, ID of colonies affected)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Verify promptly any symptom of disease, asking a veterinarian (or a specialist)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Do not move frames or any kind of biological material (for example, to balance hives) from one hive to another in case their health status is not well known	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Inspect diseased hives only after healthy hives inspections are ended	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Select best performance stocks of honey bees	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Burn dead colonies	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Remove queens from colonies with clinical history of American Foulbrood disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Remove queens from colonies with clinical history of European Foulbrood disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Try to select and breed colonies that are more disease tolerant/resistant	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record the origin and use of all disinfectants and consumable items used, keep all the records relating to the cleaning and disinfection procedures used on equipment or honey house (including data sheets for each detergent or disinfectant used) as well as all the records showing that these procedures have been effecti- vely implemented (task sheets, self-inspection checks on the effectiveness of the operations)	BPractices
Beekeeping practices	HYGIENE	(-)	Disinfect equipment (for example, with NaOH, hypochlorite) on regular basis	BPractices

Beekeeping practices	DISEASE MANAGEMENT	(-)	Carry out thorough inspections for clinical symptoms of bee diseases and presence of the queen before supering the hives	BPractices
Beekeeping practices	HYGIENE	(-)	Torching (blue flame) as a disinfection method used in hives and beekeeping tools in case of transmissible diseases	BPractices
Beekeeping practices	HYGIENE	(-)	Bleaching (soda, NaOH, etc.) as a disinfection method used in hives and beekeeping tools in case of tran- smissible diseases	BPractices
Beekeeping practices	HYGIENE	(-)	Incineration of affected colony, if needed in case of transmissible diseases	BPractices
Beekeeping practices	HYGIENE	(-)	Always incinerate affected colony in case of transmissible diseases	BPractices
Beekeeping practices	HYGIENE	(-)	Water under high pressure and heated (90°C) as a disinfection method in hives and beekeeping tools in case of transmissible diseases.	BPractices
Beekeeping practices	HYGIENE	(-)	Autoclaving as a method of disinfection of hives and beekeeping tools in case of transmissible diseases.	BPractices
Beekeeping practices	HYGIENE	(-)	Gamma-irradiation as a method of disinfection of beekeeping tools in case of transmissible diseases.	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	Do not feed the bees with honey, pollen or supplements, unless the absence of pathogens (spores of AFB, chalkbrood, Nosema, EFB, etc.) is certified	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	Provide with artificial feeding during times of shortage or to build up winter stores, when needed	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	Wintering: verify that there is a sufficient amount of stores in the hive	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	Provide nucleus and swarms with adequate food supply when needed	BPractices
Environment	ANIMAL FEEDING AND WATERING	(-)	Ensure the bees access to safe water sources	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	Do not feed your bees openly in the field to prevent robbing and spread of diseases	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	(-)	During transport provide adequate watering if needed	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep records of veterinary medicine treatments	BPractices
Beekeeping practices	RECORD KEEPING	Legal aspects	Registration of the beekeeper in the National Beekeeping Registry	BPractices
Beekeeping practices	RECORD KEEPING	Legal aspects	Record the exact position of the bee yards	BPractices
Beekeeping practices	RECORD KEEPING	Legal aspects	Identify with numbers/letters all the hives in each apiary	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep records of honey bee diseases and colony mortality or depopulation	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Set up a data-recording system that can be used to trace exactly which batches of commercial feed the colonies were fed with	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep all documents/certificates about the commercial feed used	BPractices
Beekeeping practices	RECORD KEEPING	(-)	For each colony or group of colonies, require and keep all commercial and health documents enabling their exact itinerary to be traced from their farm or establishment of origin to their final destination	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record all reared colonies	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record all colonies arrivals, origin and date of arrival, to ensure that movements of incoming colonies are traceable to their source	BPractices
Beekeeping practices	RECORD KEEPING	Legal aspects	Keep records of movements of hives, swarms, queen bees	BPractices
Bee products	RECORD KEEPING	(-)	Record period of collection of hive products from each apiary	BPractices
Beekeeping practices	RECORD KEEPING	Legal aspects	Keep detailed records of the origin and use of all medicines, including batch numbers, dates of administration, doses, treated hives and withdrawal times. Treated hives or apiaries should be clearly identified	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep all documents/certificates that indicate the raw materials used in feed manufactured by the beekeeper and given to the colonies	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Create a unique identification number for the apiary to easily trace the location of the hive (for stationary apiaries)	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep records of breeding activities (e.g. all breeding stock, queens birth dates, their origin and arrival, the breeding dates in case of instrumental insemination and outcomes, etc.);	BPractices
Bee products	RECORD KEEPING	(-)	Establish a data-recording system to ascertain the exact origin (batch) of bee products produced	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep all the documents regarding self-check and official controls on the proper management of the colonies and the sanitary and hygienic quality of the bee products	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep all documents proving that the bacteriological and physico-chemical quality of the water used in the honey house, given to the colonies or used in feed preparation meets official tap water national standards	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record the origin and use of all feeds used, keep all records of any feed manufacturing procedures and records for each batch of feed	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep a list of certified suppliers	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record any other management changes that may occur	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Record any change in feeding	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep all laboratory reports, including bacteriological tests and sensitivity tests	BPractices
Beekeeping practices	RECORD KEEPING	(-)	Keep reference samples (-20°C) of all feeds administered to the bees	BPractices
Beekeeping practices	TRAINING	(-)	Training/knowledge on honey bee diseases and symptoms	BPractices
Beekeeping practices	TRAINING	(-)	Follow a training programme in beekeeping and honey bee diseases	BPractices
Beekeeping practices	TRAINING	(-)	Attend a personal training on beekeeping	BPractices
Beekeeping practices	TRAINING	(-)	Record datasheets for each detergent/disinfectant used	BPractices
Beekeeping practices	TRAINING	(-)	Record disinfection procedures used	BPractices
Beekeeping practices	TRAINING	(-)	Record that disinfection procedures have been implemented	BPractices
Beekeeping practices	TRAINING	(-)	Keep the documents certifying qualification and training of persons working with bees	BPractices
Beekeeping practices	DISEASE MANAGEMENT	(-)	Treat the varroosis always according to the national legislation and registration	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Adopt/provide hives with screened bottom boards	BPractices

Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Nuclei and swarms should originate from colonies with no clinical signs of diseases Varroa-related (ABPV, DWV, IAPV, KBV, etc.)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Treat according to an integrated pest management concept taking Varroa thresholds into account	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Maintain the number of Varroa below the harmful threshold in each colony	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Adopt diagnostic tools for measuring Varroa infestation levels (for example, icing sugar method, CO2 test, mite fall, etc.) after treatments and during the year (for example, in spring at the beginning of beekeeping season or before harvesting)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Treat simultaneously all colonies of the apiary and in the same area	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Prepare your colonies (e.g. absence of brood) before treatment to get the highest possible efficacy, depen- ding on type of treatment and product	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Monitor efficacy of acaricide treatments: verifying Varroa fall after treatment	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Have good knowledge of the symptoms and of the transmission ways of varroosis and virosis	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Perform at least 2 treatments per year	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Monitor efficacy of acaricide treatments: verifying the absence of varroosis symptoms in the colony (for example, presence of Varroa mites on adult honey bees) after treatment	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Rotate veterinary medicines active principles to avoid Varroa resistance	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Check the health status of drones producing colonies, especially for viruses	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Use preferably medicines allowed in organic farming to control Varroa	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Provide sufficient number of healthy spare bee colonies at the right time depending on climate and vegeta- tion conditions	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Try to select and breed colonies that are Varroa tolerant/resistant	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Varroosis	Treat nuclei and swarms (no brood) with oxalic or lactic acid	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Perform the ropiness test to confirm clinical outbreak of AFB in the apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Quick management of affected hives	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Check for *P. larvae* in asymptomatic colonies by laboratory tests (e.g. stored honey in combs, hive debris) to control the disease. Take samples of colonies (hive debris/adult nurse bees/powder sugar/stores of honey in combs), in winter season, to detect P. larvae (by PCR method or microbial isolation) to control the disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Perform laboratory analysis (isolation and/or PCR) to confirm a clinical outbreak of AFB in the apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Melt down the combs of all colonies (with and without clinical symptoms) of the affected apiary and process wax safely in order to control the disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Verify presence of AFB typical scales (not removable, firmly adherent to the cell wall) to confirm clinical outbreak of AFB	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Destroy only hives that show AFB clinical symptoms	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Disinfection/incineration of all beekeeping equipment (beehives, nucs, mating boxes, boards, frames, queen excluders, etc.) of symptomatic hives. Disinfect all beekeeping equipment of asymptomatic hives located in AFB outbreaks.	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Disinfection/incineration of all beekeeping equipment (beehives, nucs, mating boxes, boards, frames, queen excluders, etc.) of asymptomatic hives. Disinfect all beekeeping equipment of asymptomatic hives located in AFB outbreaks.	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Make shook swarms of hives that show AFB clinical symptoms	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Increase frequency of hive inspections in asymptomatic colonies (and in other apiaries of the same beekee- per) in case of lab positivity to spores of P. larvae or in case of symptoms of the disease in other hives of the same apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Apply an AFB-test (field kit) to confirm clinical outbreak of AFB in apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	In case of AFB outbreak, make shook swarm of all colonies (with and without AFB symptoms)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	AFB	Stamping out (destruction) of all colonies in the apiary (with and without AFB symptoms), only if you can already reach the eradication	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Manage quickly affected hives to control the disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Search for the presence of removable scales, yellow and contorting larvae to diagnose a suspect of EFB clinical outbreak	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Perform laboratory analysis (isolation and/or PCR) to confirm clinical suspect of EFB	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Perform laboratory analysis (isolation and/or PCR) to confirm clinical suspect of EFB	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Disinfect/incinerate the infected beekeeping equipment (beehives, nucs, mating boxes, boards, frames, queen excluders, etc.) of EFB symptomatic colonies in case of clinical outbreak	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Increase hive inspections in symptomless colonies in case of lab positivity to M. plutonius or in case of symptoms of the disease in other hives of the same apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Take samples (hive debris/adult nurse bees/powder sugar/stores of honey in combs) from asymptomatic colonies for the laboratory in winter season or in case of outbreaks, to detect presence of M. plutonius (by PCR method or microbial isolation)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Apply on-field EFB kit to confirm clinical outbreak of EFB on symptomatic hives	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Make a partial (take off only brood combs, leaving store combs) shook swarm on colonies that show EFB clinical symptoms	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Disinfect/incinerate all beekeeping equipment (beehives, nuc-boxes, mating boxes, boards, frames, queen excluders, etc.) of EFB asymptomatic colonies in case of clinical outbreak	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Be aware of the odour opening the hive - typically sour smell to suspect clinical form of EFB	BPractices

Beekeeping practices	DISEASE MANAGEMENT	EFB	Make a shook swarm of all colonies of whole the apiary (with and without EFB symptoms) in case of EFB outbreak, if you want to reach eradication	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Make a partial (take off only brood combs, leaving store combs) shook swarm of all colonies of the apiary (with and without EFB symptoms) in case you want to control the disease	BPractices
Beekeeping practices	DISEASE MANAGEMENT	EFB	Destroy affected colonies of the apiary if you want to reach eradication	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Do not reuse combs (neither if empty or with stores of honey and/or pollen) originating from depopulated (few workers and the queen) or collapsed hives	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Prevent pollution of artificial water sources from faeces or drowned or dead bees	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Select queen breeders with Nosema spp. free stocks	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Select and breed Nosema spp. resistant honey bees, if possible	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Remove combs with signs of dysentery	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Take samples of forager honey bees (or powder sugar or debris) early in autumn or spring to diagnose nosemosis (PCR and microscopic methods)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Adopt a proper pathogen (e.g. V. destructor) control, to ensure a proper balance (nurse-forager bees) in the composition of the bee colony	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Nosemosis	Treat (if there are available any registered/permitted products in your country) against Nosema spp. the colony when percentages of infected bees are high (>40%)	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	Nosemosis	Strengthen and stimulate the colonies in autumn and spring with the administration of stimulant integrators or feed supplements	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Take care that the bees cover all frames in the hive (no empty space)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Do not leave outside of beehives frames, combs or other material that could be attractive and edible for A. tumida	BPractices
Beekeeping practices	HYGIENE	Aethinosis	Carry out periodically hive inspections to detect and eliminate the parasite (adults and larvae)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Trace meticulously movement of hives (identify hives, dates of movements, exact position)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Control the transport conditions adopting a proper isolation of beekeeping equipment avoiding spread of SHB during transport	BPractices
Beekeeping practices	HYGIENE	Aethinosis	Stock combs in order to prevent survival of SHB eggs and larval development in a cold chamber at a tempe- rature below 10°C	BPractices
Beekeeping practices	ANIMAL FEEDING AND WATERING	Aethinosis	Give artificial nutrition each time at low amounts so the bees can consume it in a short time (pollen/proteic feed/supplements are a good substrate for SHB reproduction)	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Have only healthy strong colonies in the apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Trace meticulously movement of supers and wax	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	Use traps to monitor and control SHB presence in the apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	Stock combs in order to prevent survival of SHB eggs and larval development in a chamber at less than 34% relative humidity	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	Have only young queens with hygienic behaviour	BPractices
Beekeeping practices	HYGIENE	Aethinosis	Use queen bee excluder in order to avoid the presence of brood in the supers	BPractices
Beekeeping practices	TRAINING	Aethinosis	In case of SHB is not being present in your area, have good knowledge of SHB morphology of eggs, larvae and adults	BPractices
Beekeeping practices	TRAINING	Aethinosis	In case of SHB is not being present in your area, have good knowledge on hive inspection methods to detect SHB	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, do not leave outside of beehives frames, combs or other material that could be attractive and edible for Aethina tumida	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, have only healthy strong colonies in the apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area,, have only young queens with hygienic behaviour	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, do not transport live material at risk (hives, queens, nucs, etc.) from areas where SHB is present into your apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, take care that the bees cover all frames in the hive (no empty space)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, do not transport material at risk (supers, wax, pollen, etc.) from areas where SHB is present into your apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, adopt specific traps for quick visual detection of SHB	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, monitor periodically the presence of SHB by sampling debris or honey)	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	In case of SHB is not being present in your area,, do not transport live material at risk (hives, queens, nucs, etc.) from areas where SHB could be present into your apiary	BPractices
Beekeeping practices	DISEASE MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, do not transport material at risk (supers, wax, pollen, etc.) from areas where SHB could be present into your apiary	BPractices
Beekeeping practices	GENERAL APIARY MANAGEMENT	Aethinosis	In case of SHB is not being present in your area, use queen bee excluder in order to avoid the presence of brood in the supers	BPractices
Bee products	GENERAL APIARY MANAGEMENT	(-)	Protocols for queen selection	SmartBees