



PARMA SUMMER SCHOOL

28 – 30 SEPTEMBER 2021, Parma

Food Safety Aspects of Integrated Food Systems

Holistic ERA - landscape modelling and monitoring: the case of bees

Agnes Rortais, EFSA



Overview

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

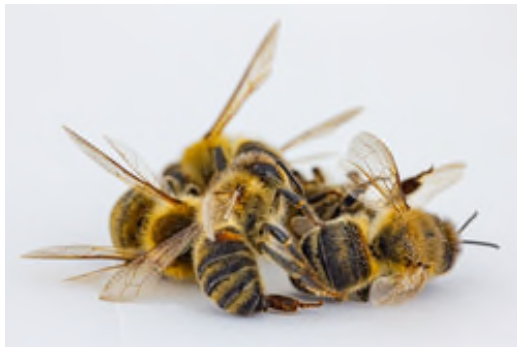
- 1 Importance of bees and issues
- 2 MUST-B framework and outcomes
- 3 Holistic and integrated ERA in honey bees
- 4 Stakeholders' involvement & partnership
- 5 Next steps
- 6 References

Importance of bees



84% of crop species cultivated in EU depends on **insect pollinators, especially bees**¹

The economic value of insect pollination in EU equals to 14.2 billion €²



Global pollinator declines³ and worldwide honey bee colony losses (up to 30%)^{4, 5} impact ecosystem functioning and human well-being

¹[Williams, 1994](#); ²[Gallai et al., 2009](#); ³[Potts et al., 2010](#); ⁴[Laurent et al., 2016](#); ⁵[Steinhauer et al., 2014](#)

Issues

Multiple stressors affecting bees



- Biological agents
- Chemicals
- Modulating factors

- Several applications per crop and over time
- Bees foraging in the landscape (over several crops) are exposed to multiple pesticide residues over time

Complexity of the landscape



Advancing the environmental risk assessment of pesticides

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

[Regulation EC 1107/2009](#) (EU-level approval and national-level authorisation) & [Directive 2009/128/EC](#) (sustainable Use Directive)

EFSA Guidance Documents on [risk assessment of PPPs in bees](#) (currently under revision), on [combined exposure to multiple chemicals](#) and [combined exposure to multiple stressors](#)

[EU Green Deal](#) calls for :

addressing combined effects from multiple pollutants;
reducing the use and risk of chemical pesticides



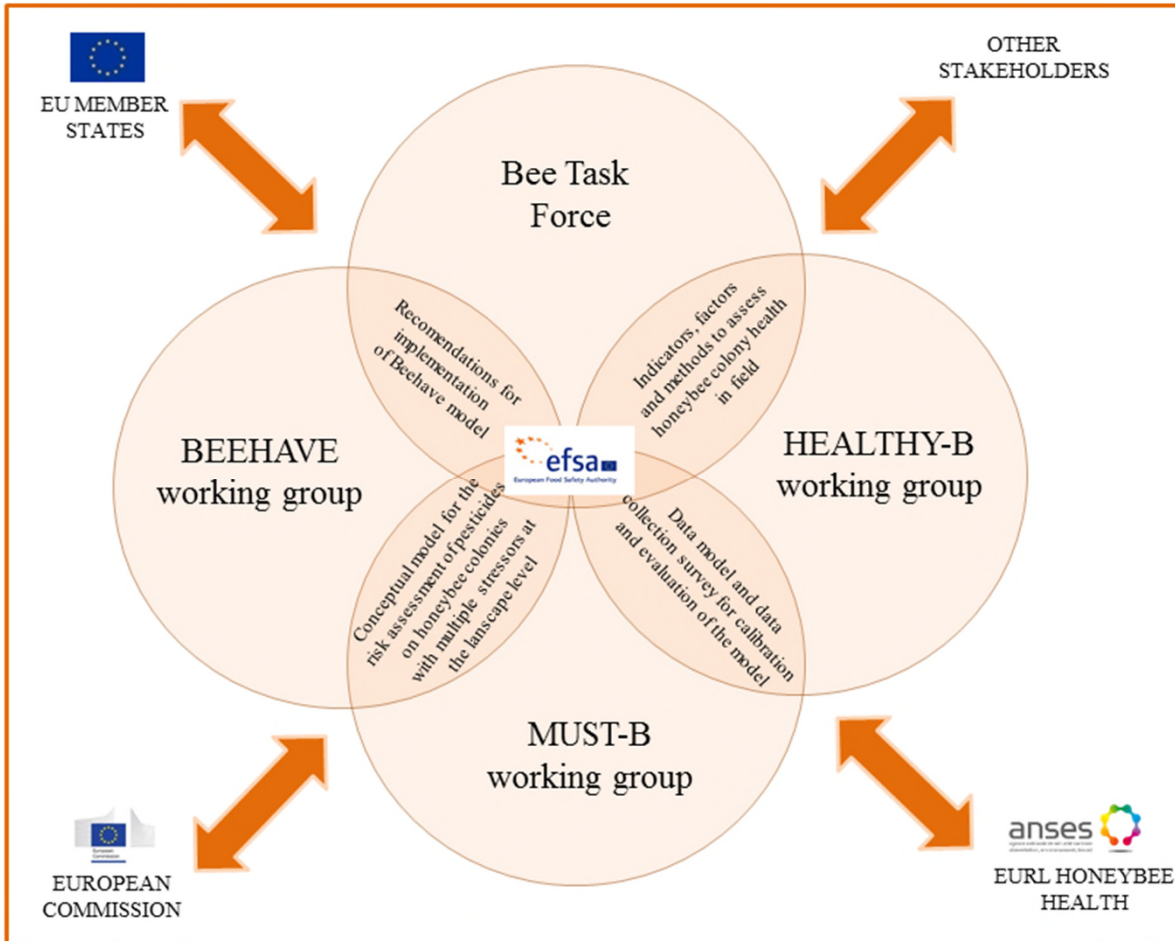
MUST-B

EU efforts towards a holistic and integrated risk assessment approach of multiple stressors in bees

- 2015: internal EFSA mandate
- 2018: European Parliament mandate and scientific opinion on “A systems-based approach to the environmental risk assessment of multiple stressors in honey bees”¹
- Terms of reference:
 - Develop a methodology for honey bees on cumulative and synergistic (+ acute, chronic and sublethal) effects of pesticides in combination with other stressors
 - Provide guidance to stakeholders for harmonised data collection and evidence-based risk assessments

¹ [EFSA Scientific Committee et al., 2021](#)

MUST-B framework




- Multi-disciplinary task force of **EFSA staff** across scientific units/dpts
- Several working group of **external experts** across sectors
- Stakeholders' engagement
- Collaborations with MS, EC, EP

BEEHAVE & MUST-B

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems


European Food Safety Authority EFSA Journal 2015;13(6):4125

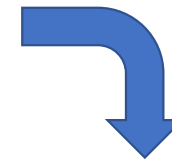
SCIENTIFIC OPINION

Statement on the suitability of the BEEHAVE model for its potential use in a regulatory context and for the risk assessment of multiple stressors in honeybees at the landscape level¹

EFSA Panel on Plant Protection Products and their Residues (PPR)^{2,3}

European Food Safety Authority (EFSA), Parma, Italy

This scientific output, published on 03 November 2015, replaces the earlier version published on 25 June 2015*



TECHNICAL REPORT 

APPROVED: 18 July 2016 PUBLISHED: 28 July 2016

A mechanistic model to assess risks to honeybee colonies from exposure to pesticides under different scenarios of combined stressors and factors

Chemical mixtures & bees

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

EXTERNAL SCIENTIFIC REPORT

CEH Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

APPROVED: 29 February 2016

2016

Chronic oral lethal and sub-lethal toxicities of different binary mixtures of pesticides and contaminants in bees (*Apis mellifera*, *Osmia bicornis* and *Bombus terrestris*)

Centre for Ecology & Hydrology

GUIDANCE

ej EFSA Journal

ADOPTED: 20 February 2019

doi: 10.2903/j.efsa.2019.5634

2019

Guidance on harmonised methodologies for human health, animal health and ecological risk assessment of combined exposure to multiple chemicals

EFSA Scientific Committee,
Simon John More, Vasileios Bampidis, Diane Benford, Susanne Hougaard Bennekou, Claude Bragard, Thorhallur Ingi Halldorsson, Antonio F Hernández-Jerez, Konstantinos Koutsoumanis, Hanspeter Naegeli, Josef R Schlatter, Vittorio Silano, Søren Saxmose Nielsen, Dieter Schrenk, Dominique Turck, Maged Younes, Emilio Benfenati, Laurence Castle, Nina Cedergreen, Anthony Hardy, Ryszard Laskowski, Jean Charles Leblanc, Andreas Kortenkamp, Ad Ragas, Leo Posthuma, Claus Svendsen, Roland Solecki, Emanuela Testai, Bruno Dujardin, George EN Kass, Paola Manini, Maryam Zare Jeddi, Jean-Lou CM Dorne and Christer Hogstrand

More to be presented by JL Dorne on 29 Sept....



HEALTHY-B & MUST-B

PARMA SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

SCIENTIFIC OPINION



ADOPTED: 13 September 2016

doi: 10.2903/j.efsa.2016.4578

Assessing the health status of managed honeybee colonies (HEALTHY-B): a toolbox to facilitate harmonised data collection

EFSA Panel on Animal Health and Welfare (AHAW)



TECHNICAL REPORT



APPROVED: 17 May 2017

doi:10.2903/sp.efsa.2017.EN-1214

Specifications for field data collection contributing to honey bee model corroboration and verification

European Food Safety Authority



EXTERNAL SCIENTIFIC REPORT



APPROVED: 24 June 2021

doi:10.2903/sp.efsa.2021.EN-6695

Research project on field data collection for honey bee colony model evaluation

Dupont Yoko L¹, Capela Nuno², Kryger Per¹, Alves Joana², Axelsen Jørgen A¹, Balslev Mette G¹, Bruus Marianne¹, Castro Silvia², Frederiksen Julie¹, Groom Geoff B¹, Jeppesen Annika S¹, Lichtenberg-Kraag Birgit⁴, Lopes Sara², Pinto M. Alice³, Alves da Silva Antonio², Strandberg Beate¹, Sørensen Peter Borgen¹, Sousa José Paulo²

¹ Aarhus University, Denmark, ² Instituto do Ambiente Tecnologia e Vida at University of Coimbra, Portugal, ³ Centro de Investigação de Montanha, Instituto Politécnico de Bragança, Portugal, ⁴ Länderinstitut für Bienenkunde, Germany

ADVANCED
ON
TRITION



UNIVERSITÀ
DI PARMA

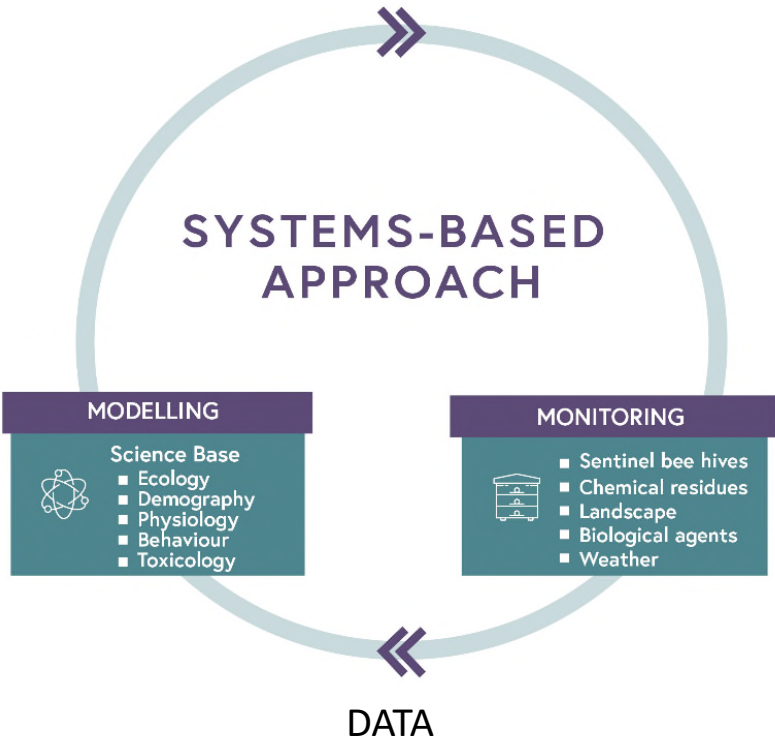


UNIVERSITÀ
CATTOLICA
del Sacro Cuore

Holistic and integrated ERA for honey bees

- Stakeholders involvement
- Scientific literature
- Research data

ApisRAM model calibrated with field data



For predictive and post-authorisation risk assessments of pesticides



Field data collection to calibrate ApisRAM



PARMA SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems



Field operations



© Yoko Dupont



©Nuno Capela

European Food Safety Authority

DI PARMA

1. Observation hive

Waggle dance

1. Distance (1 sec wagging = 1 km)
2. Direction

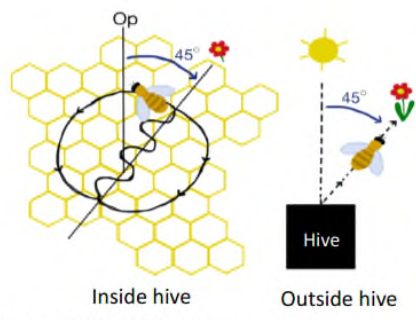


Figure: Annika Skarðsá Jeppesen



Photos: Yoko L. Dupont

Dance decoding
Landscape flower mapping
Pollen analysis

- Observation hive
- May 7, 2018
- May 8, 2018



© Yoko Dupont



Applications & benefits

Applications/benefits



- Beekeeping and farming
- Research development
- Risk assessment & risk management
- Citizens

Interacting Stakeholders



- Beekeepers & farmers
- NGOs
- Industry,
- Practitioners associations
- Academia
- EU citizens, EC, EP, MS...

e.g. EU Bee Partnership

The EU Bee Partnership (EUBP)

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems



2017: Scientific conference on “collecting and sharing data on bee health: towards and European Bee Partnership¹”

2018: Terms of reference of the EUBP, a stakeholders’ partnership to enhance harmonised data collection and sharing on bee health²



2021: design of a prototype platform^{3, 4} with a user Tutorial⁵

¹ [EFSA et al., 2017](#); ² [EFSA, 2018](#); ³ [Simon Delso et al., 2021](#); ⁴ [bee-ppp.eu](#); ⁵ [Youtube link](#)

H2020

PARMA SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

The screenshot shows the PoshBee website header with navigation links: Home, About, Partners, News, Events, Technical Innovations, Media Center, Library, Contact, and Login. Below the header is a large banner image of a bee's head with a search bar and the text "PAN-EUROPEAN ASSESSMENT, MONITORING, AND MITIGATION OF STRESSORS ON THE HEALTH OF BEES".

B-GOOD

Home About Partners Insider News Events Media Center Library Initiatives Contact Login

A close-up image of a bee's head with the text "GIVING BEEKEEPING GUIDANCE BY COMPUTATIONAL-ASSISTED DECISION MAKING" overlaid in white.



Next steps: ApisRAM development

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

Version 4

Version 1

Version 2

Version 3



JAN
2022

Colony and in-
hive products
modules



DEC
2022

Biological
agents and
thermal
modules



MAY
2023

Additional
landscapes and
data on multiple
stressor
interactions



2025
...

Cumulative risk
assessment,
effects from
invasive
species

See <https://www.efsa.europa.eu/sites/default/files/2021-03/timeline-ApisRAM-development-final.pdf>

And more...

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

❖ [EU Pollinator Week Conference](#) 27-30 September 2021



© <https://www.pollinatorweek.eu/resources#presentations>

❖ Revised EFSA bee guidance

❖ New ERA approach for insect pollinators at EFSA



Publications on EFSA's website

Check [here](#) for all the latest news, milestones, MUSTB project and publications related to this area

Bee health



Beekeeping is an ancient tradition, and honey bees have been kept in Europe for several millennia. Bees are critically important in the environment, sustaining *biodiversity* by providing essential pollination for a wide range of crops and wild plants. They contribute to human wealth and wellbeing directly through the production of honey and other food and feed supplies such as: pollen, wax for food processing, propolis in food technology, and royal jelly as a dietary supplement and *ingredient* in food.

The Food and Agriculture Organization of the United Nations (FAO) estimates that of the 100 crop *species* that provide 90% of food worldwide, 71 are pollinated by bees. The majority of crops grown in the European Union depend on insect pollination. Beyond the essential value of pollination to maintaining biodiversity, the global annual monetary value of pollination has been estimated at hundreds of billions of euros.

In view of the important ecological and economic value of bees, there is a need to monitor and maintain healthy bee stocks, not just locally or nationally, but globally.

Over the past 10 to 15 years, beekeepers have been reporting unusual weakening of bee numbers and colony losses, particularly in Western European countries including France, Belgium, Switzerland, Germany, the UK, the Netherlands, Italy and Spain.

No single cause of declining bee numbers has been identified. However, several possible contributing factors have been suggested, acting in combination or separately. These include the effects of intensive agriculture and *pesticide* use, starvation and poor bee *nutrition*, viruses, attacks by pathogens and *invasive species* – such as the Varroa mite (*Varroa destructor*), the Asian hornet (*Vespa velutina*), and the small hive beetle *Aethina tumida* and environmental changes (e.g. habitat fragmentation and loss).

Contents

- | Latest
- | Milestones
- | EFSA's role
- | EU framework
- | MUST-B project
- | FAQ: MUST-B project
- | Don't miss
- | Published on this topic
- | See also
- | Related topics

Acknowledgements

PARMA
SUMMER SCHOOL

Food Safety Aspects of
Integrated Food Systems

MUSTB experts & EFSA staff

G rard Arnold, Simon More (Chair), Christopher J Topping, Simone Tosi



Thank you!



Subscribe to

efsa.europa.eu/en/news/newsletters
efsa.europa.eu/en/rss



Receive job alerts

careers.efsa.europa.eu – job alerts



Follow us on Twitter

[@efsa_eu](https://twitter.com/efsa_eu)
[@plants_efsa](https://twitter.com/plants_efsa)
[@methods_efsa](https://twitter.com/methods_efsa)
[@animals_efsa](https://twitter.com/animals_efsa)



Follow us Linked in

[Linkedin.com/company/efsa](https://www.linkedin.com/company/efsa)



Contact us

efsa.europa.eu/en/contact/askefsa

Credits icons: Flaticon.com
Credits images: unless specified, Shutterstock