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The Mediterranean Basin is an area characterised by diverse agricultural management systems due to the combination of African and European culture, high floral biodiversity, as well as climate differences from very dry and hot to very humid and cold areas.

Climate change threatens pollinators, and it is unclear how climatic conditions as well as farming practices can affect pollination provisions, honey bee survival and productivity. SafeAgroBee was a PRIMA project funded by National Funding Agencies aiming to address the above topic.

In SafeAgroBee project we focused on pollination provided by both wild and managed bees in a climatic gradient, as well as on practices improving the resilience of beekeeping on such a diverse geomorphological area. We addressed the resilience of bee pollinators on a changing environment, determined the carrying capacity of particular crops, investigate the adaptability of local bee populations, compared organic versus conventional beekeeping, tested the local populations on their resistance to varroa, investigated the use of local strains of beneficial bacteria against foulbrood, tested and validated monitoring tools and precision apiculture systems and developed novel models for predicting the health (e.g. Health Status Index) and productivity of the bees.

We have demonstrated a) that pollination efficiency and fruit yields can be increase by 20-30% with increased bee diversity; b) that honey bees perform, develop and survive significantly better under organic treatments and bee friendly agricultural practices; c) that local populations of honey bees show better adaptation ability, to be used under the pressure from climate changes; d) that beneficial bacteria of local populations of bees could be used to minimize effects of other bacterial diseases of honey bees; e) that innovative censoring systems can be beneficial reducing working load and predicting losses and f) that prediction models for pollination services, beekeeping production as well as Health Status Index of honey bees, now exist, for the benefit of the farmers and beekeepers.

The main outcomes of our project will be used to draw strategic plans and guidance for farmers and beekeepers. Mediterranean countries collaboration is essential to drive green solutions under climate change.



“Safeguarding agroecosystems resilience under climate change through efficient pollination and sustainable beekeeping”

***Dr. Fani Hatjina [ELGO ‘DIMITRA’ –GREECE]
& SafeAgroBee Consortium members***



Safeguarding agroecosystem resilience under climate change through efficient pollination and sustainable beekeeping (2021-2024)



Participant No *	PI name
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Partner 2	Vassilios Stathopoulos
Partner 3	Noureddine Adjlane
Partner 4	Menelaos Stavrinides
Partner 5	Janja Filipi
Partner 6	Bojan Stipešević
Partner 7	Gianni Gilioli
Partner 8	Roberto Pasi
Partner 9	Dany Yammouni
Partner 10	Dalida Darazy
Partner 11	Janez Prešern
Partner 12	Alenka Žunic Kosi
Partner 13	Fabrice Requier

January 2025|: SafeAgroBee project was one of the 4 winners for the **PRIMA's First Woman Greening Food Systems Award!**







Marta Cortegano
*Associação
Terra Sintrópica
(Portugal)*



Thoraya Seada
*Carbon Footprint
Center
(Egypt)*



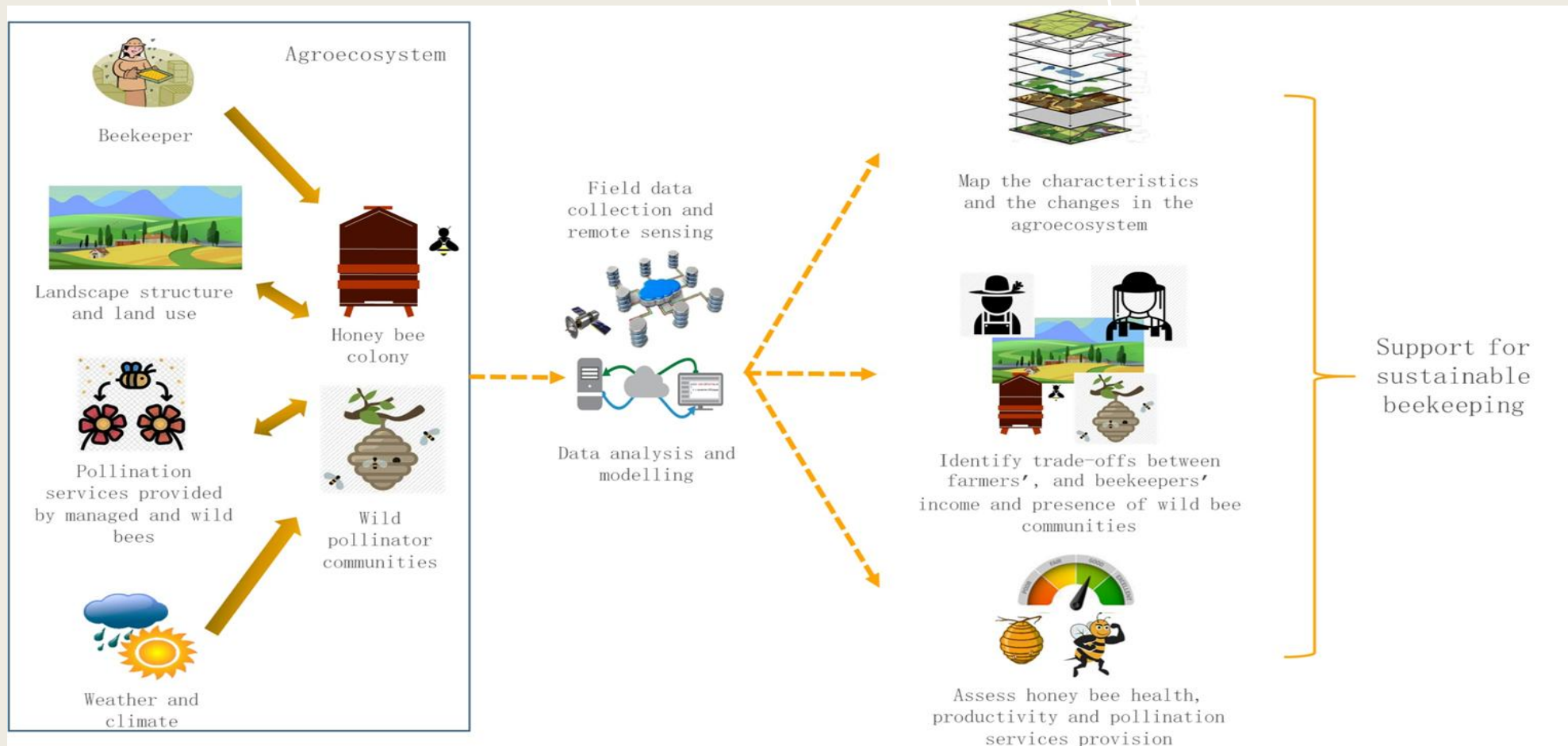
Fani Hatjina
*Hellenic Agricultural
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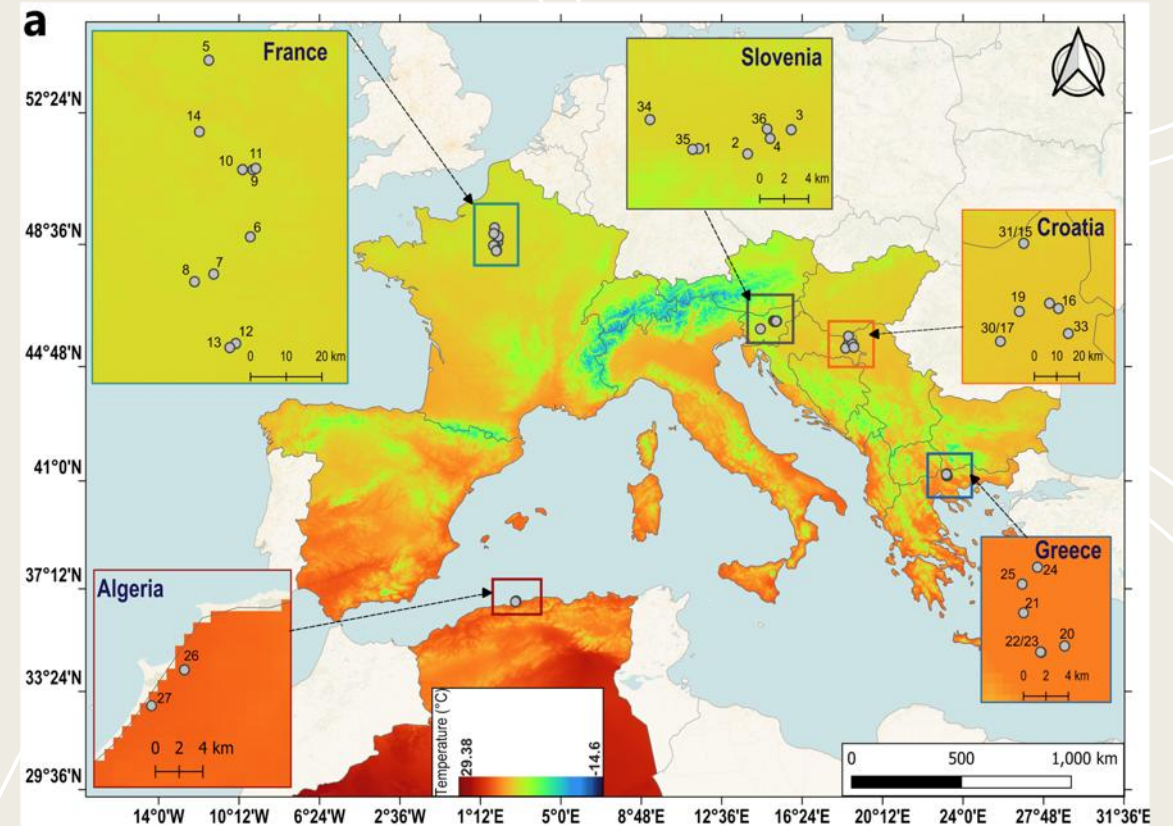
Yosra Ahmed Soltan
*Alexandria University
(Egypt)*

SafeAgroBee project - INTRODUCTION

Concept

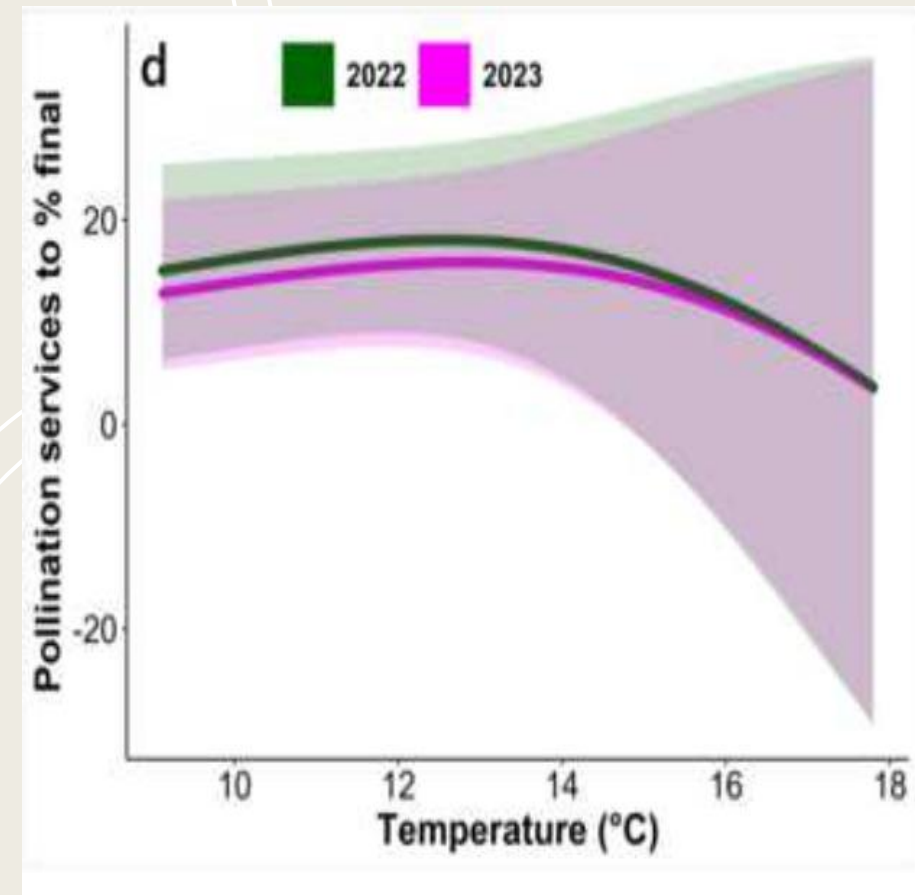
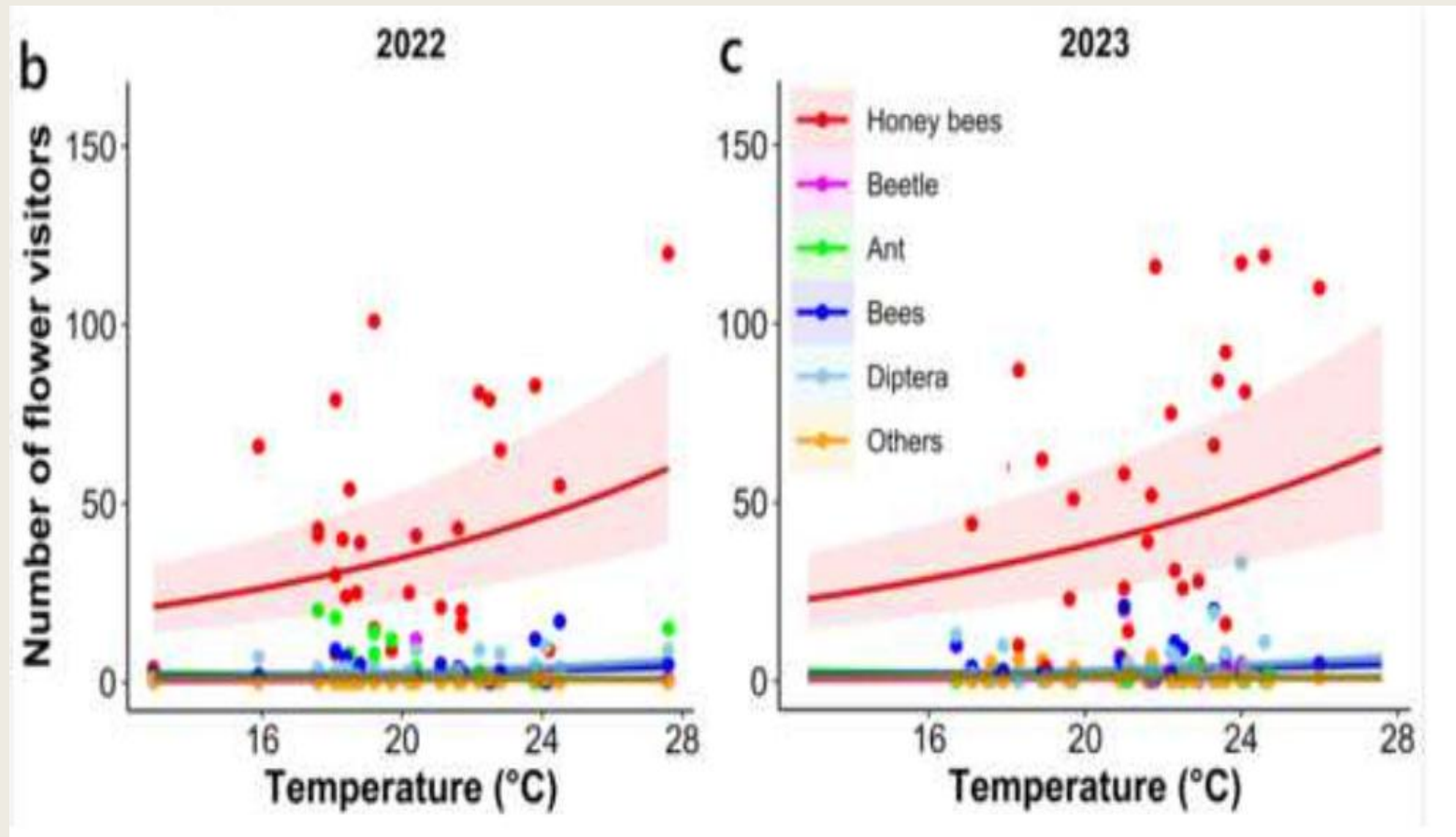


5 countries (Algeria, Croatia, France, Greece, Slovenia)



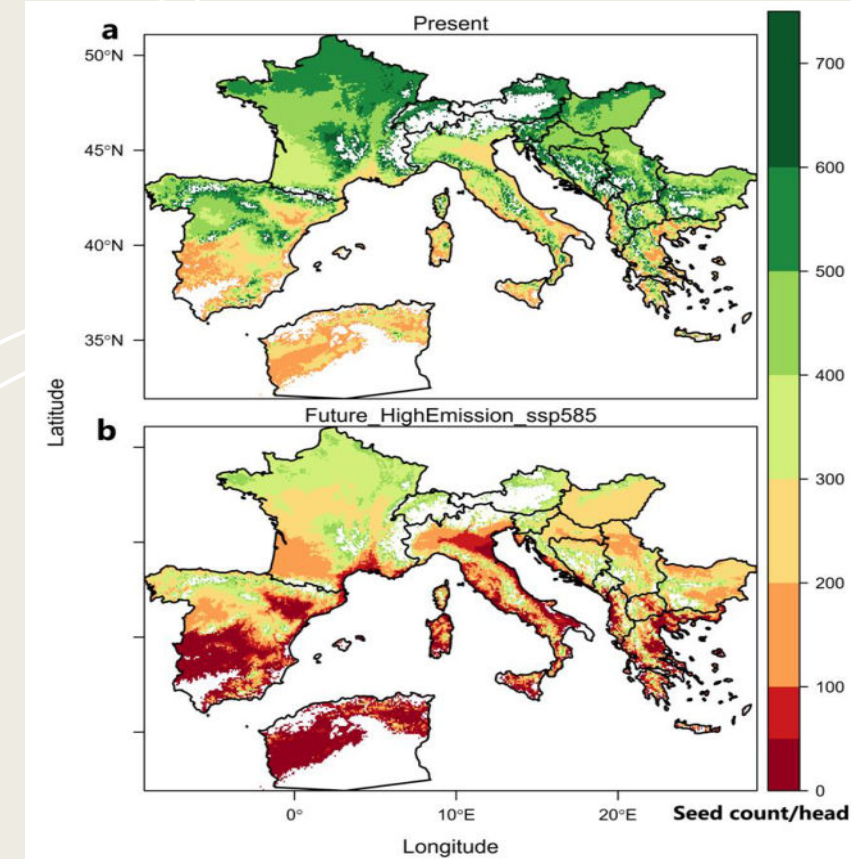
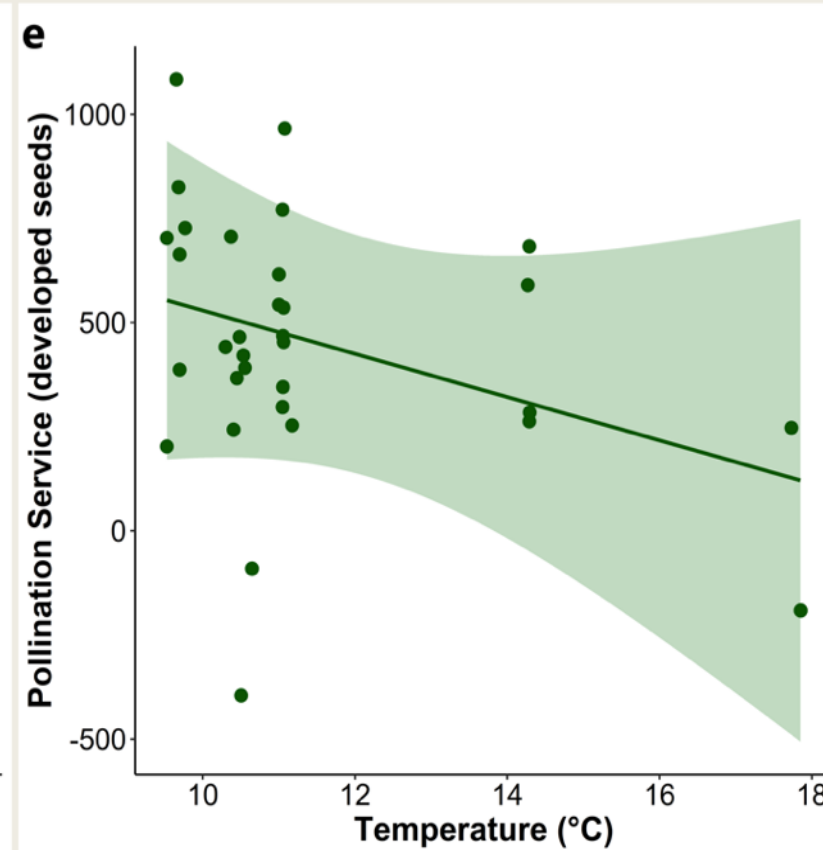
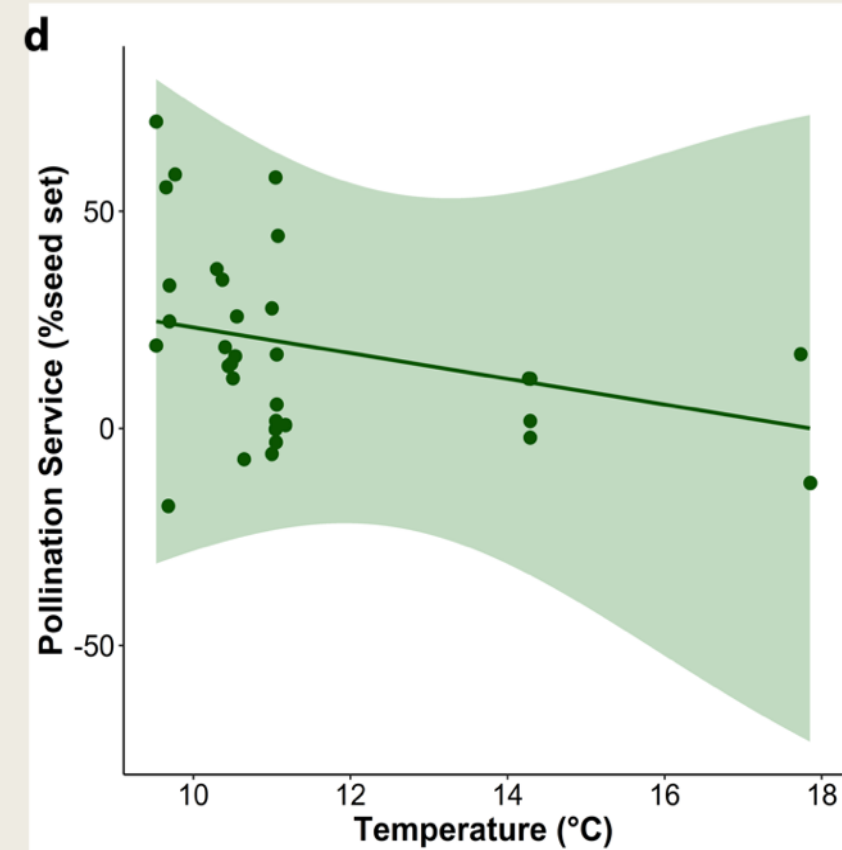
Apple pollination service along a climatic gradient

Pollination experiments on 5 trees per site



Sunflower pollination service along a climatic gradient

Pollination experiments

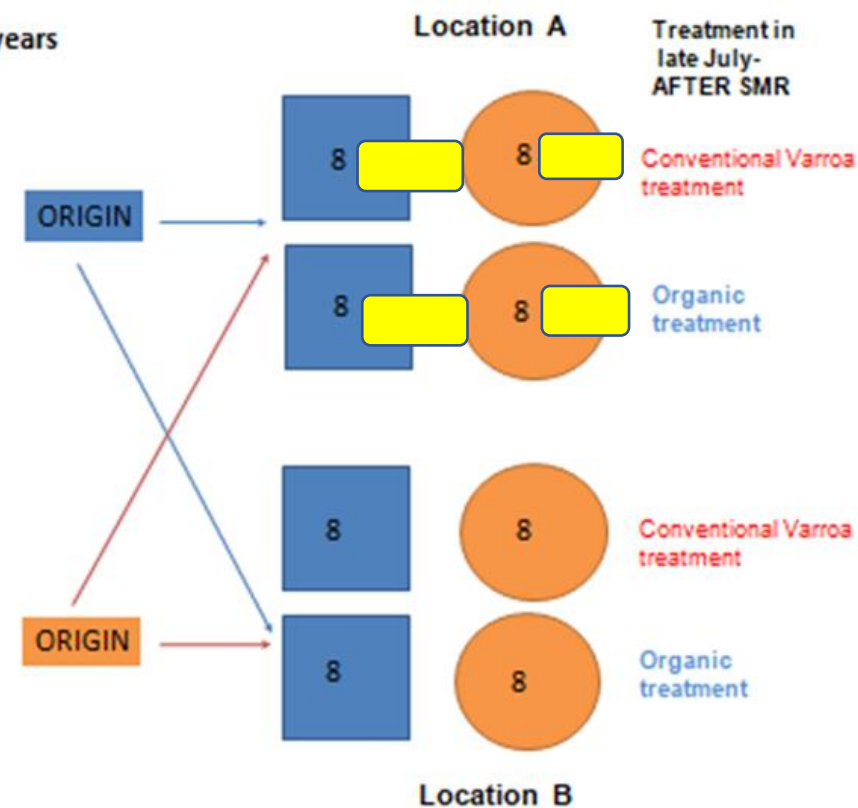


WP II. Adaptation of honey bees- Sustainable Beekeeping (Lead: HAO-API)

- Adaptation of specific honey bee local populations:
 - countries: Algeria, Croatia, France and Greece (112 colonies in total)
 - two different environmental conditions within country
 - conventional or organic management system.
 - performance test – two years
 - prevalence of diseases and parasites
 - SMR and REC behavior

WP II and WP III

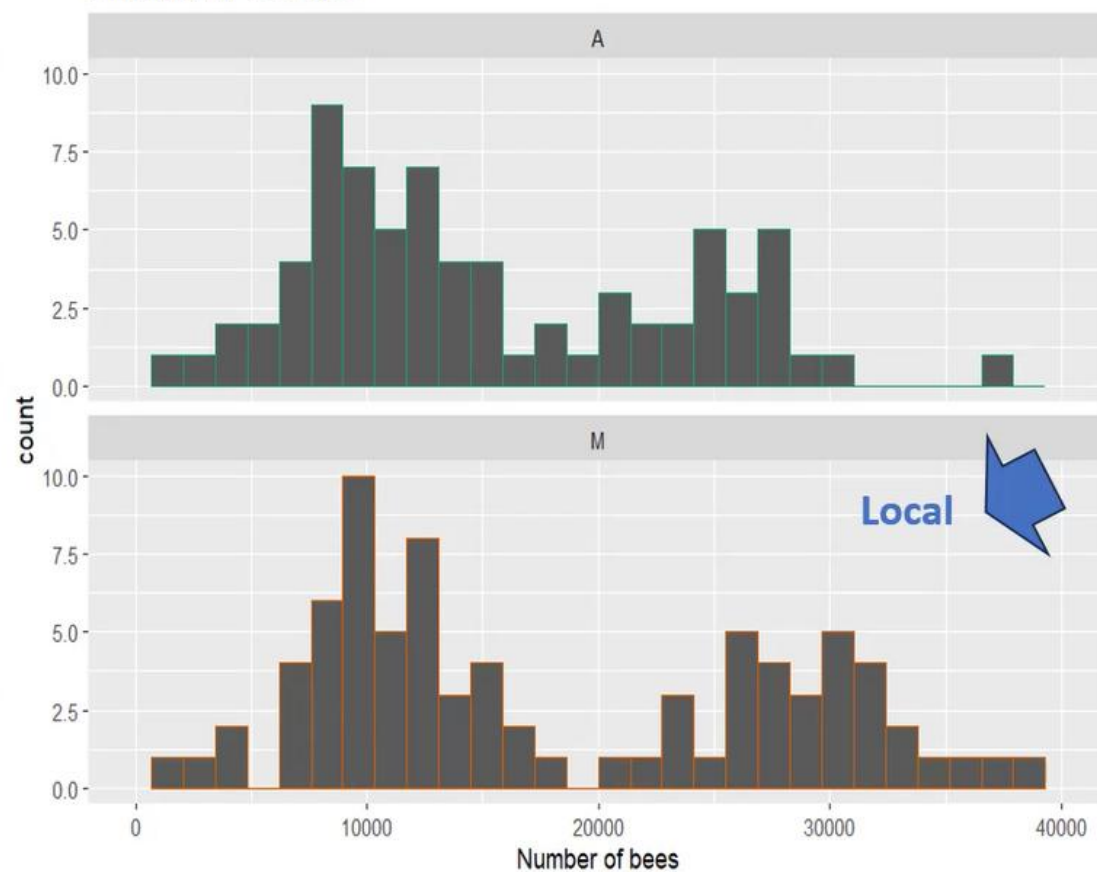
2 years



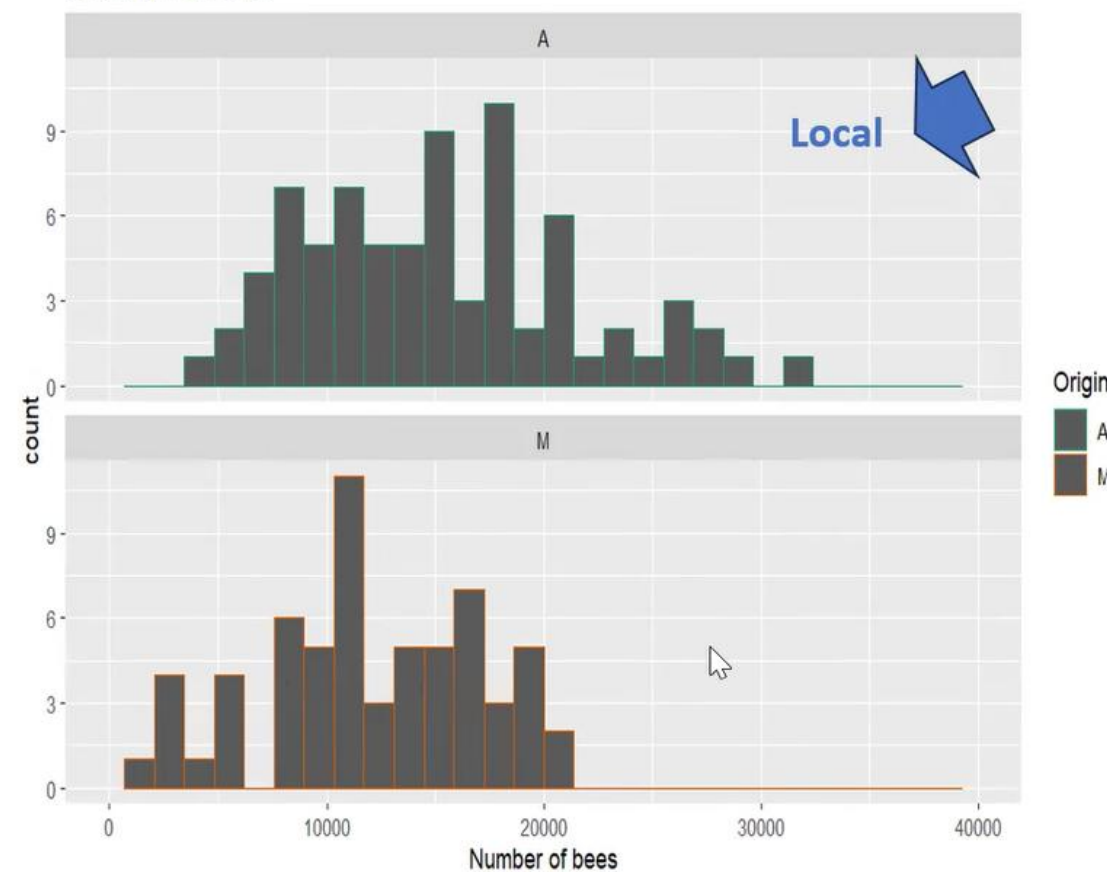
Task II.1. Adaptation of local populations

D II.5. Performance outputs for 2nd year of monitoring from all colonies

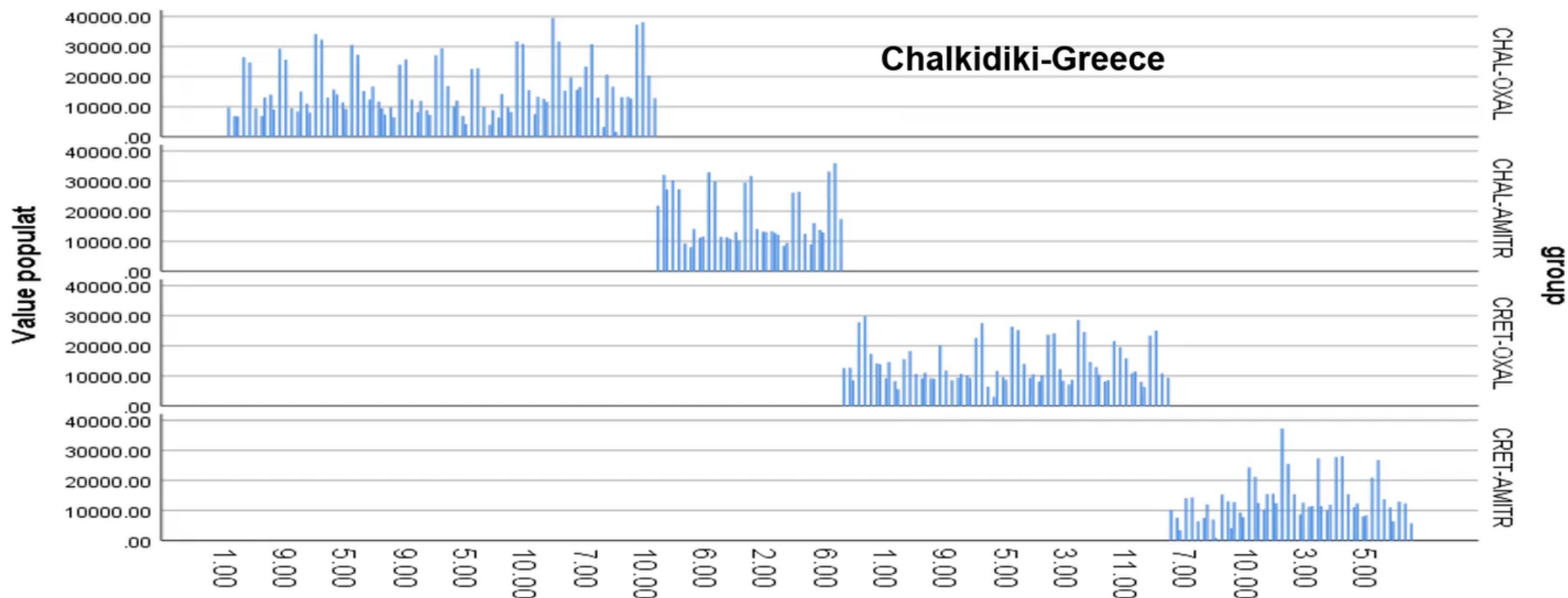
Chalkidiki BEES 2023



Crete BEES 2023



D II.3. Performance outputs for 1st year of monitoring from all colonies



Origin	1 Chalkidiki (local)	121
	2 Crete	113
Treatment	1 Oxalic acid	148
	2 Amitraz	86

WP 3. Minimizing losses of honey bee colonies

Task III.2. Use of microbiota against bacterial and fungus



Task III.1. Mitigation measures

- Different treatments
- Evaluation of losses according to environment/ risk of pesticide uses

WP 4. Digital technologies

Mibeez

The newly released hive scales allow for **precise tracking of hive weight fluctuations**. This data supports the monitoring of honey production, hive resource availability, and population changes within the colony. The scales are essential for continuous weight monitoring, providing critical information for researchers and beekeepers to assess hive performance over time, and **they have also been deployed in France, Slovenia, Algeria, Greece and Croatia**.



B005

The **B005** unit integrates sensors for **sound, temperature, humidity, and hive vibration** via accelerometers, microphones and other sensors. The device records data onto a 128GB SD card for long-term data logging. The B005 was developed to provide reliable data collection for research on bee behavior, hive environmental conditions, and health assessments. **It has been deployed in Greece, France and Croatia. 233.5 GB of data collected**

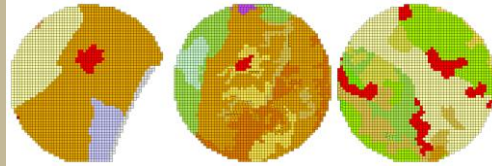


WP 5. Modelling tools supporting sustainable beekeeping

Developed and implemented the **Colony-based model**

Developed and implemented the **Patch-based model**

Linked them in a single **Individual-based Model**



Assessing the **Health Status Index** which:

Explores the health and resilience of a honeybee colony related to different scenarios of landscape **composition** / Landscape **offer** level / hive **response to stressors**

- It **quantifies the overall health** score for a honeybee colony by considering: External drivers/ In-hive products storage/ Hive demography

It allows to **assess the honeybee health and resilience** dynamically

VIDEOS

Dr. Fani Hatjina: The SafeAgroBee project

<https://drive.google.com/file/d/1iWbHsxdskK0R18RPgtNdt0075uwFmwG/view?usp=sharing>

Dr. Nizar Haddad: Sustainability in Mediterranean Basin

<https://drive.google.com/file/d/1K5hvegA1W57IWPJLCc3dZmiaDvS5Vlq/view?usp=sharing>

Prof. Dia Tolika: Climatological scenarios in the Mediterranean Basin

https://drive.google.com/file/d/1w_V-4frN1eooLJwvTx8uw3j1I7Y7L6a/view?usp=sharing

Prof. Bojan Stipešević: Sunflower and Bees

https://drive.google.com/file/d/1HS_wDbEq52A4HvicvboUnUWPW2iro5bS/view?usp=sharing

Dr. Fani Hatjina: Colony adaptation and varroa treatment

https://drive.google.com/file/d/1pO9sT6szN3DBkY_MWkNUGtpFymjWoQuI/view?usp=sharing

Prof. Marin Kovačić: SMR & Recapping

<https://drive.google.com/file/d/1JDc1NMGf17BA6MpD0P15XjUiGZI6RZPM/view?usp=sharing>

Dr. Dany Yamouni: Beneficial Bacteria

https://drive.google.com/file/d/1gMAL3dzbUDk_4YYr3EOn2kz7CfL5xwDv/view?usp=sharing

Mrs Yuliia Semeniuk: Bee Counters and scales

https://drive.google.com/file/d/1bFQftZYHTKBuUsuG_jlJTyBS_AuGeSRH/view?usp=sharing

Mrs Yuliia Semeniuk: Sound analysis

https://drive.google.com/file/d/1ShcB_OI8x_dFO9dzZVwJtnh_P4M4nlYP/view?usp=sharing

Dr. Andrea De Francesco: Modeling tools for sustainable beekeeping

<https://drive.google.com/file/d/1Q7yKWmW5buomMCz4Vfz5-xq67C43ZPWu/view?usp=sharing>

Future work

- ❑ Research on land regeneration post wildfires disturbances (suggested)
- ❑ Improving the IT tools including CO2 monitoring and minimizing gas emissions from honey bee colonies
- ❑ Monitor the stress levels of conventional treatments/ colony recovery/ possible mitigation measures
- ❑ Further work on beneficial bacteria
- ❑ Improve attractiveness of wild pollinators to crops
- ❑ Economic evaluation of loss of production due to lack of pollinators/ temperature increase



Thank you!



We can help bees and
beekeeping to survive

