



The research project **ECO-OLIVES** ("Ecological management of European olive agroforestry: linking biodiversity conservation, ecosystem services and productivity") investigates olive agroforestry systems in the Italian Tuscany through three main approaches: (1) biodiversity assessments of birds, bats and arthropods; (2) statistical modelling of multiple ecosystem services & (3) development and application of decision-support tools to support ecological farm management. The main goal of this project is to identify improved strategies to integrate biodiversity and ecosystem services such as natural pest control into sustainable farming and land use.

This project represents an international cooperation between the universities of Vienna, Sant'Anna Pisa and Würzburg in Austria, Italy and Germany.



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With the research project **ECO-OLIVES**, we aim to better understand the critical role of biodiversity and associated ecosystem services for sustainable olive farming. For two years (2022-2023), we will study 12 olive agroforestry systems in the Monte Pisano region nearby Pisa, Italy.

Our team will collect data on birds, bats, insects and spiders and study their interactions to better understand their role in the food web and for ecosystem services like biological pest control – and ultimately also to the olive harvest.

By combining field experiments, biodiversity sampling, socio-ecological surveys, DNA-analyses and app development, we aim to advance our understanding of sustainable farming!



Our methods will include:

→ **Experimental enclosures of birds and bats**

On each olive farm, we will select 8 trees for our project, as shown in the schematic picture below (left). Four of these trees will be included in cages made of bamboo and surrounded by a net that will exclude birds and bats, but not insects. This experiment will not change the microclimatic conditions but allow us to evaluate the effects of birds and bats on insects and olive yields. The picture on the bottom right shows an example enclosure from a previous research project. The cages will be installed between September 2022 and 2023 (12 months) and will be completely maintained by our team.



→ **Canopy fogging**

By the beginning of the project, we will sample insects using a highly specific approach called „canopy fogging“. The eight study trees of each farm will be fogged using natural pyrethrum. Fogging will happen only once per farm during nights (about two hours per session). All of the natural/organic pyrethrum disappears and is no longer detectable after a few hours.



→ **Biodiversity sampling**

To better understand the importance of birds, bats, insects and spiders for ecological management, ecosystem services and sustainable farming, we will record many biodiversity data using visual observations, acoustic recorders, scientific mark-recapture methods and field sampling using three different types of traps that will be exposed to the field for nine weeks between May/June and September/October in both study years (2022 and 2023). Example picture of these traps and recorder are shown below.



→ **Application-oriented approaches**

All of our work aims to contribute to the development of well-informed applications to improve the conservation and management of biodiversity in olive farms.

Next to our biodiversity-focused approach, we will assess socio-ecological perspectives and economic impacts on/of biodiversity and integrate these findings into our results and the development of innovative decision-support tools.

At all times of the projects, we will work on fruitful collaborations with scientists, farmers and other stakeholders within and beyond our study area.

