

# Integrated observing systems for multi-spatial scale plant diversity analyses and its relationship with ecosystem functioning in Mediterranean dehesas

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## 1. Project's overview

The Ph. D. project seeks developing new methods for studying diversity and ecosystem function relationships across high value ecosystems: **Mediterranean dehesas**.

The combination of multi-scale and multi-source data combined with simulations and citizen science aims to optimize and validate the first satellite remote sensing fully driven studies in *dehesas* and other similar ecosystems.

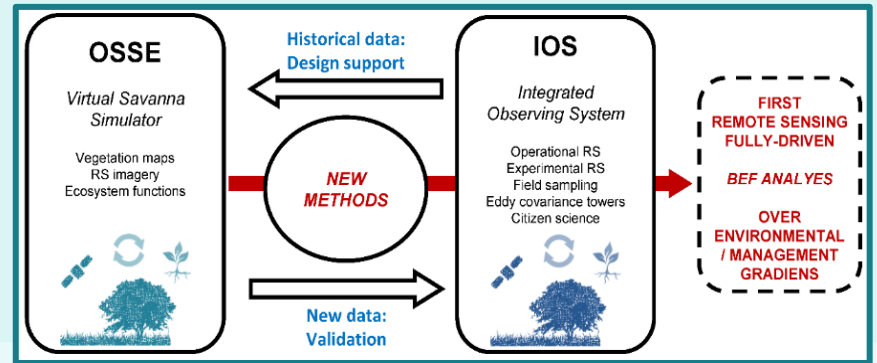


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## 2. Project phases

### 1) Optimization of automated species recognition with Flora Incognita App.

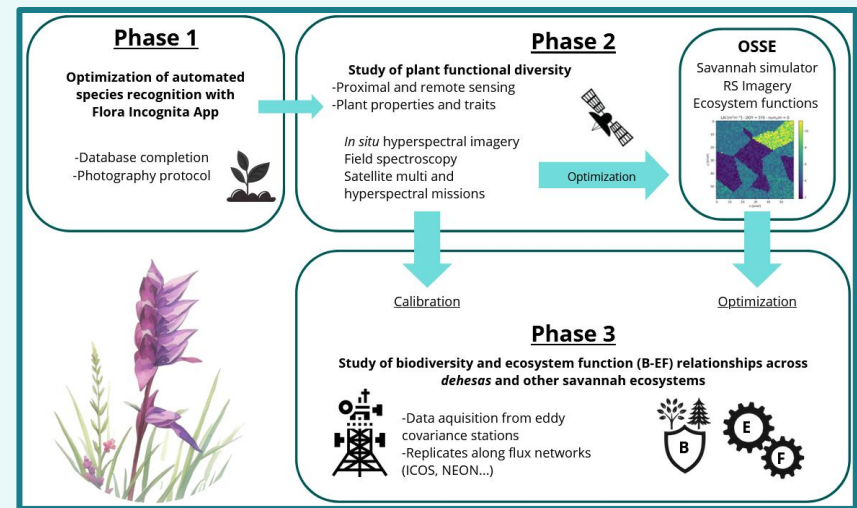
Photographic database completion with the missing Mediterranean species. A photography protocol has been developed for testing an improved version of identification algorithm, which identifies several species from a single plot photo and estimates its coverage.

### 2) Study of plant functional diversity through multi-scale spectral information.

Proximal and remote sensing to estimate plant properties and traits through *in situ* hyperspectral imagery, field spectroscopy and satellite multi and hyperspectral missions. These estimates will be correlated with diversity and functional metrics, such as Rao quadratic entropy.

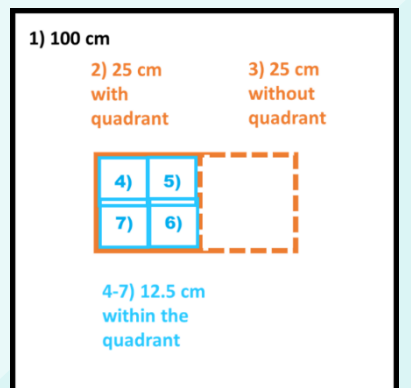
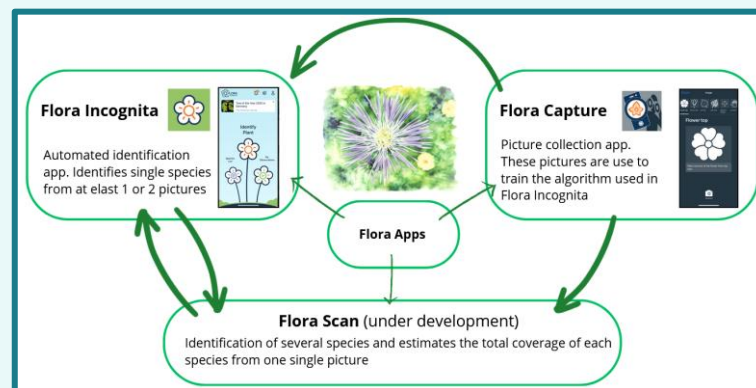
### 3) Study of biodiversity and ecosystem function (B-EF) relationships across dehesas and other similar savannah ecosystems.

Multi-source satellite imagery will be acquired and calibrated with previous phases and it will be applied to other regions across long term monitoring networks, such as ICOS, NEON, or FLUXNET to validate the results.

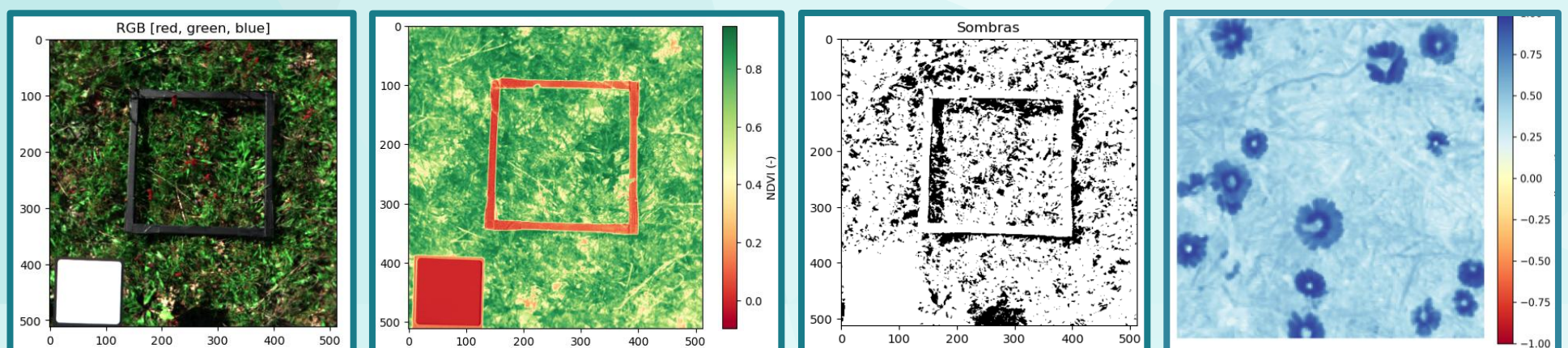


## 3. Advances made so far

In the first phase, some of the target missing species have been captured and uploaded for the algorithm training. The photography protocol has been performed through biodiversity and field spectroscopy plots for a whole phenological cycle.



In the second phase, *in situ* hyperspectral very high resolution imagery is being used to explore the relationship of plant optical properties with plant functional diversity obtained through biophysical sampling and taxonomy inventories. Images are being pre-processed by removing noisy bands and masking non-objective pixels, such as soil and flowers. Diversity metrics have been calculated from ground data and spectral data to explore the correlation between traits and reflectance factors.



### Next steps:

- Explore plant optical types and 'spectral species' clustering
- Explore the correlation between plant diversity metrics and reflectance factors when resampling image to coarser pixel sizes

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