Machine learning-based disease detection alogorithm

ANYSOLUTION

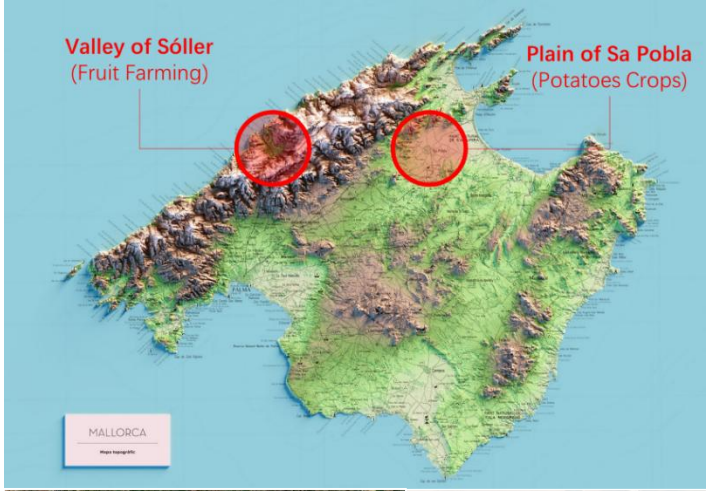
Open field case study integration

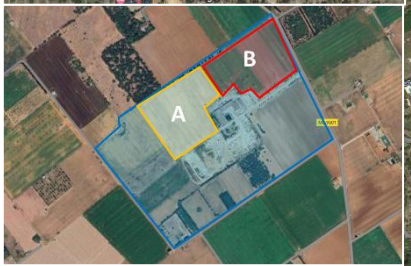
OBJECTIVES

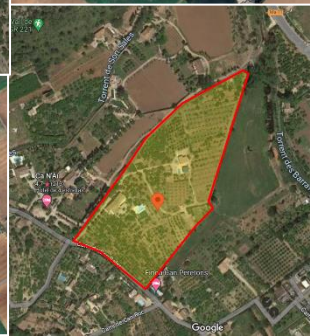
- To test and analyze the use of drones in two different crop settings located in the Balearic Islands (one on potato crops, the other for fruit farming in terraced crops) that could support traditional farmers in the monitoring and management of their cultures.
- To test different drone-based data acquisition using drone swarm, cooperative drones and large drone.
- To test different potential drone-based applications such as: (i) detection of plagues and diseases; (ii) health monitoring; (iii) spraying application; (iv) soil characterization; (v) detection and characterization of weeds; (vi) harvest planning.

TASK PROGRESS vs OBJECTIVES

- **Objective 1: To test and analyze the use of drones in two different crop settings**
  - 2 UCs: **fruit farming** (olive, orange and lemon) in *Sóller*, and **potatoes crops** in *Sa Pobla*.
  - Drone flights done regularly in each use case. **+60 flights missions** have been performed so far covering **12 crops and fields** distributed over **7 villages**.
  - First analysis and interpretation of the maps have been done manually between the three pilot's partners (ANYSOL, CDS, MNP). MNP has trained one of its agronomists on teledetection and precision farming so to improve the maps' interpretation.
  - Note that from RP2, it has been decided to focus the fruit farming UC on **olive grooves**.







TASK PROGRESS vs OBJECTIVES

- **Objective 2: To test different drone-based data acquisition**
  - ANYSOL has **3 drones**: one with RGB camera (DJI Mini3) and two with multispectral sensors (DJI Phantom4 and DJI Mavic3).
  - Data, maps and images are stored within the **data platform** of ANYSOL (**NADIA**) and will be made available with the SPADE platform once operational.
  - Small drones, swarm flights and under canopy flights will be tested once SDU drones and the navigations system will be available.
  - SPADE platform and node have been deployed for testing as well as OpenDroneMap solution.

TASK PROGRESS vs OBJECTIVES

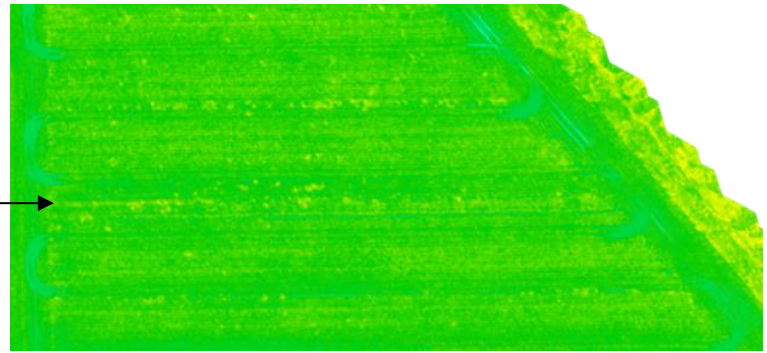
- **Objective 3: To test different potential drone-based applications**
  - Development of the **ML tool** for the **detection of pests and diseases** is underway through implementation of CS1-CH1 of Open Call #2 and thanks to the **higher resolution** of the Mavic 3
  - Integration with FarmB is ongoing
  - Barriers for the **spraying application** (not allowed in the Balearic Islands)

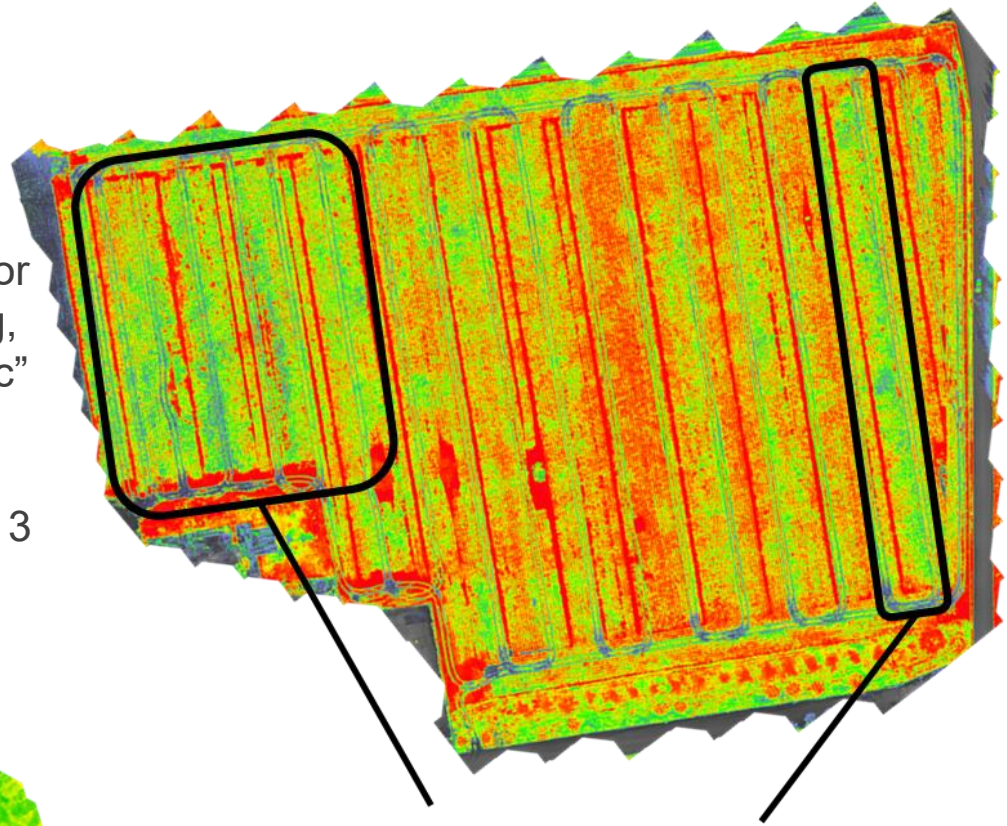
"Els Abats"
30m high flight mission

FIRST RESULTS

First Results for Potato Crops

- Current orthomosaics prove to be useful for the potatoe use case for **crop monitoring**, enabling easy identification of “problematic” areas. Previous resolution and precision was **not good enough for disease detection** (hence the acquisition of Mavic 3 and RTK base station).
- Easier **identification and localization** of weeds



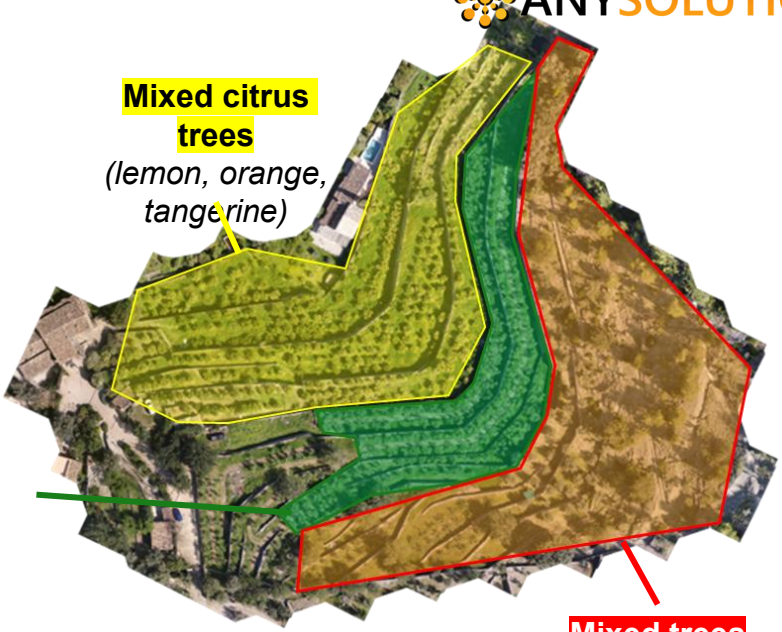


Examples of “problematic” areas in potato crop with GNDVI index map (*the redder the healthier*)

FIRST RESULTS

First Results for Olive Groves

- Configuration of the terrain (heavy slopped) and non-homogeneity of cultures make it very difficult for adequate monitoring



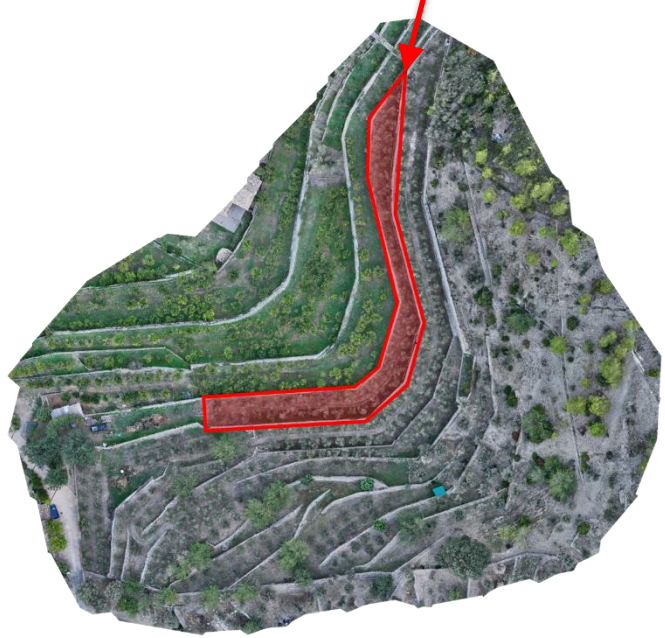
Example of terrain configuration and trees distribution in one of the studied farm

OPEN CALL

ANYSOLUTION

Close collaboration with beneficiaries of CStudy1-CH1: ML-based disease detection in Mediterranean crops, and agronomists of local farmers cooperatives

Area mapped with ground markers

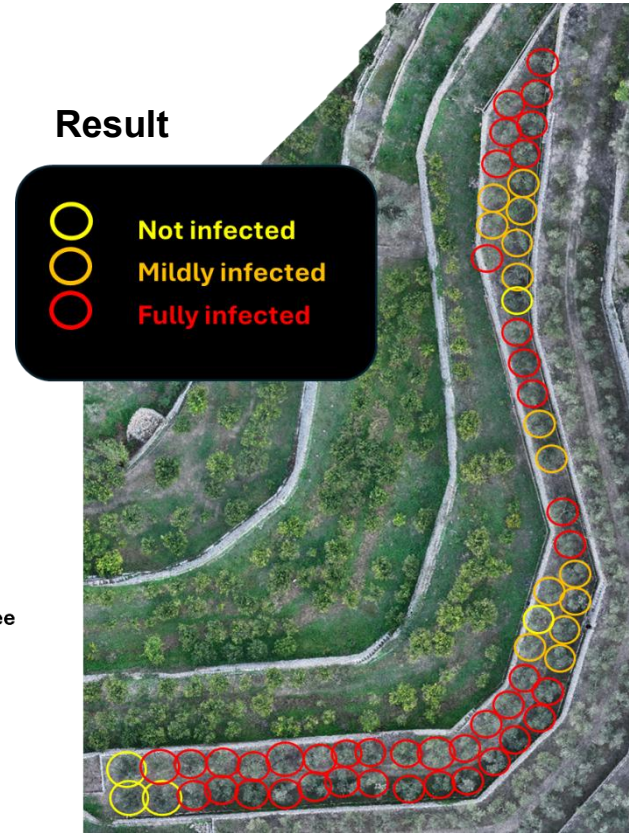


Ground marker for not infected tree

Ground marker for mildly infected tree

Ground marker for fully infected tree

Result



CAPACITY BUILDING OF LOCAL STAKEHOLDERS

A workshop was organized to inform local farmers and stakeholders on the use, benefits and potential of drone application in agriculture.

Main result: High level of interest for the technology, but more specifically in the use of drones for fumigation and precision spraying, focusing on three main areas:

- Administrative aspects – Requirements for pilot training and certification, drone registration and validation, and permits necessary for operation.
- Financial aspects – Investment and maintenance costs related to agricultural drones.
- Practical aspects – Operational guidance, including flight techniques, optimal speed and altitude, and lessons learned from previous projects

Based on these results, specific courses will be developed and implemented

DEVIATION FROM PLAN

- This pilot foresees the use of large drones for spraying applications. However, the autonomic regional laws currently **impede to fly large drones and completely forbid the use of drones for spraying applications**.

MITIGATION MEASURES

- **Lobby activities** and discussions are being held with regional policymakers to foster a change so to authorized the use of spraying drones.
- **Alternative use case** is being prepared in collaboration with NIBIO, using large drones as support for harvesting of olives (load carrier).