Field Data Collection and Digitization of All Sites

(Updated)

Commercialization of an Automated Monitoring and Control System against the Olive and Med Fruit Flies of the Mediterranean Region

FruitFlyNet-ii: STR_B_A.2.1_0043

MEDITERRANEAN SEA BASIN PROGRAMME 2014-2020

3rd Interim Report (1.12.2022 - 31.10.2023)

Project Coordinator
Prof. Theodore Tsiligiridis
e-mail: tsili@aua.gr

BEN (AUA)	Theodore Tsiligiridis Dionysios Perdikis Costas Pontikakos Marios-Ioannis Swtiras
PP01 (UCO)	Meelad Yousef Flora Moreno Alcaide Emilio Manuel Calvo Cerezo Rafael de la Cueva Revuelta
PP02 (UNIMOL)	Andrea Sciarretta Armando, Amore Tania Travaglini
PP03 (LARI)	Ahmad ELBITAR Linda Kfoury Samer El Romeh Elia Choueiri
P04 (IO)	Ines Ksentini Manel Ben Ameur Marwa BOURI Mabrouka Ghabbari
P05 (CRHAB)	Mohamed Braham Hassib Ben Khedher Ahmed MOUSSA Amal LAMOUCHI Sondess TALMOUDI

Disclaimer: This document has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Programme. The contents of this document are the sole responsibility of the editor and can under no circumstances be regarded as reflecting the position of the European Union or of the Programme's management structures.

Table of Contents

List of Figures

List of Tables

Summary

The objective of A4.1.1 is to collect, study and deliver the field data required for the establishment and operation of the two Location Aware System (LAS) prototypes, namely the OliveFlyNet for Olive fruit fly and the MedFlyNet for Mediterranean fruit fly, in the 8 wide-area sites (Olive: Applicant, PP1-PP4, Peaches: PP2, PP5, Citrus: Applicant). This is an update of the previous deliverable. In the sites, a revision of the field elements has been performed with ground truth to verify the digitized field data. The maps have been updated accordingly. The use of mobile GIS for the collection of field data is also described.

1. BEN OliveFlyNet

In this section, the crop/pest data and the digitized data for the OliveFlyNet large-scale site of BEN are given. The details of the crop, the cultivation practices, the severity of the pest, the practices used in the monitoring and control of the pest, and the registered insecticides are given in a table format. Then, the maps of the digitized field data such as the borders, the trees, the orchards, the protected areas, the positions of the e-trap etc that are required to operate the LAS services in the OliveFlyNet site are given. Each map has been produced by the geodatabase. Then, the use of mobile GIS to navigate and collect field data is shown.

1.1. BEN *OliveFlyNet*: Crop and pest field data

The *OliveFlyNet* large-scale site of BEN is consisting of olive groves belonging to 17 owners. The site is in eastern Argolis, in eastern Peloponnese, an area known for its high-quality olive oil production in Greece. In the wider area of the site olive groves dominate. The farmers follow similar cultivation practices among the groves of the site. The olive fruit fly is the most serious pest of olives in that area and farmers spray every year to control it. The details for the crop and pest data are given in the following tables.

1.1.1. Test site

The details of the site are described in the following table.

Table 1.1. Crop data of the OliveFlyNet large-scale site of BEN

1.	Target pest	*Bactrocera oleae (olive fruit fly)*
2.	Name of the site area	*Arkadiko, Argolis*
3.	Total site surface (ha)	*About 30 ha*
4.	Dimensions of the site	*0.8 km x 0.55 km*
5.	Number of different orchards included and type of owner(s) - describe	*42 orchards/17 owners*
6.	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude: Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	*The site lies in a hilly area, its distance from the sea is about 6 km.*
7.	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*These are shown in the respective figure.*
8.	Indicate in the map any areas to be protected within the site or close by (i.e., houses, water bodies, water pumps, etc.).	*There are houses and small water reservoirs close to water pumps.*
9.	Give information for the surrounding vegetation/crops of the site	*The surrounding crops are olives, a citrus orchard, an apricot orchard, and small vegetable fields.*
10.	Indicate the position of different tree species, their cultivars, irrigated orchards, or other relevant details in the map of the site.	*It is only olives.*

11.	Indicate the road network and accessibility of the site and each orchard, as applicable.	*It has been included in the maps.*
12.	Indicate sources of electricity or drinkable water, if any.	*Sources in houses and water pumps.*
13.	Provide a few representative photos of the orchard elements (a tree, a row of trees etc.).	*See respective photo of the olive grove.*
14.	Other information	-

1.1.2. Trees and practices

Tree data and cultivation practices of the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 1.2. Tree data and cultivation practices of the OliveFlyNet large-scale site

1.	Production system (IPM, organic etc.) (as applicable per orchard/field within the site)	*IPM*
2.	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	*cv. Manaki (large size drupe, sensitive to the pest, protection period: June to November).*
3.	Tree age	*10-40 years old.*
4.	Tree density (trees/ha)	*≈120/ha.*
5.	Tree height	*≈2.5-3m.*
6.	Tree canopy diameter	*≈6m*
7.	Planting system (i.e. linear)	*Linear*
8.	Distance between the trees (in the row and between the rows)	*≈4.5X4.5m.*
9.	Tree shape - Pruning	*Spherical.*
10.	Fertilization method and its frequency	*Chemical fertilizers.*
11.	Irrigation method and its frequency	*Micro sprinklers.*
12.	Weed control	*Herbicides/ brush cutter.*
13.	Neighboring fruit fly host crops – possible infestation sources	*Olive crops.*
14.	Foreseen fruit load for this year production	*Medium.*
15.	Discuss other possible variation sources in infestation levels across the site (i.e., due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc)	*There is variation in height and slope that may affect the infestation levels.*
16.	Other information	

1.1.3. Target pest monitoring

The data for the target pest monitoring the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 1.3. Data for the target pest monitoring of the OliveFlyNet wide-area site

1.	Target pest	*Bactrocera oleae*
2.	Period of monitoring i.e. per orchard/cultivar, as applicable	*The olive fruit fly is monitored from June to November.*
3.	Type(s) of traps	*McPhail.*
4.	Bait(s) used	*Hydrolysed proteins.*
5.	Trap density/ha for monitoring	*1/5 ha.*
6.	Time interval for trap captures monitoring	*7 days.*
7.	Method for fruit damage monitoring	*Fruit samplings (125 per tree from 10 trees) during the sensitive period to record the eggs, larvae and pupae in the fruits.*
8.	Infestation levels in the orchard in the previous years, data of pest levels/damages	*≈10-30%*
9.	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Prays oleae.*
10.	Common diseases	*Spilocaea oleagina.*
11.	Other information	

1.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 1.4. Data for meteorological data monitoring of OliveFlyNet large-scale site

1.	Add information about the climatic conditions of the area of the site in annual basis	*Argolis has a hot Mediterranean climate. Average high monthly temperature is 23.6°C, mean 17.1°C, average low 9.4°C, average precipitation 471.4mm, average precipitation 86 days, average relative humidity 67.1% (climate data from Pyrgella meteorological station (1980 - 2010)).*
2.	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	• *For pest monitoring:* *Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction), precipitation per day.* • *For spraying:* *Temperature (at least every 30 minutes), RH (at least every 30 minutes), wind speed and direction and precipitation (at least every 15 minutes)*
3.	Add information for any meteorological station in the area, if exist.	1. *Meteorological station of the Hellenic National Meteorological Service in Pyrgetos village, at a distance ≈18 Km from the site.* 2. *National Observatory of Athens, in Didyma village, ≈15 Km from the site.*
4.	Other information	

1.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 1.5. Spraying decision rules for the target pest in the OliveFlyNet wide-area site

1.	Describe the spraying decision process	*Percentage of fruits with stings, eggs, larvae, number of flies caught in traps.*
2.	Pest capture critical densities during the season	*It is normally 5 adults per trap per week but depends on the season and the fruits damage.*
3.	Fruit damage threshold during the season	*1-5% depending on the season.*
4.	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*The change of fruit colour at veraison.*
5.	Models or prediction, if available	*Not available.*
6.	Other information	

1.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 1.6. Bait spraying application procedures against the target pest in the OliveFlyNet large-scale site

1.	Type of spraying used (cover spraying or bait spraying) (describe)	*Bait sprayings are used. In cases with high infestation levels then cover sprayings are applied.*
2.	Concentration of bait in the spraying solution	*2-3%*
3.	Quantity of bait spraying solution applied per tree	*300ml.*
4.	Ratio of trees to be sprayed (pest risk level, if applicable)	*All trees or half of them.*
5.	Means of spraying application (tractor or other, and their availability, describe)	*Tractors*
6.	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*The air temperature and wind speed limits are empirically considered during sprayings.*
7.	Registered insecticides (a.i.) against the target pest in IPM and organic crops	*Acetamiprid (cover spraying), Beauveria bassiana (cover spraying), Deltamethrin (cover spraying), Lambda-Cyhalothrin (bait spraying), Aluminum silicate (cover spraying), Spinosad (bait spraying), Zeta-cypermethrin (bait spraying).*
8.	PHI for each a.i.	*Acetamiprid (7 days), Beauveria bassiana (N/A), Deltamethrin (7 days), Lambda-Cyhalothrin (7 days), Aluminum silicate (N/A), Spinosad (14 days), Zeta-cypermethrin (7 days).*
9.	Selectivity of a.i. for natural enemies and pollinators	
10.	Other information	

1.1.7. Beneficial Insect Monitoring

The beneficial insect monitoring in the *OliveFlyNet* large-scale site of BEN is described in the following table.

Table 1.7. Beneficial insect monitoring in the OliveFlyNet large-scale site of BEN

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data recorded
2.	Means and methods for beneficials' monitoring	No data recorded
3.	Other information	-

Figure 1.1. Rows of tree in the OliveFlyNet large-scale site of BEN (Arkadiko, Greece)

2. BEN *OliveFlyNet*: Digitized Field Data

The digitized field data of the *OliveFlyNet* large-scale site of BEN are given in maps. The maps have been generated by the geodatabase.

2.1. Experimental site

Arkadiko is a small village in eastern Argolis, Peloponnese, Greece. It is part of the Epidavros Municipality.

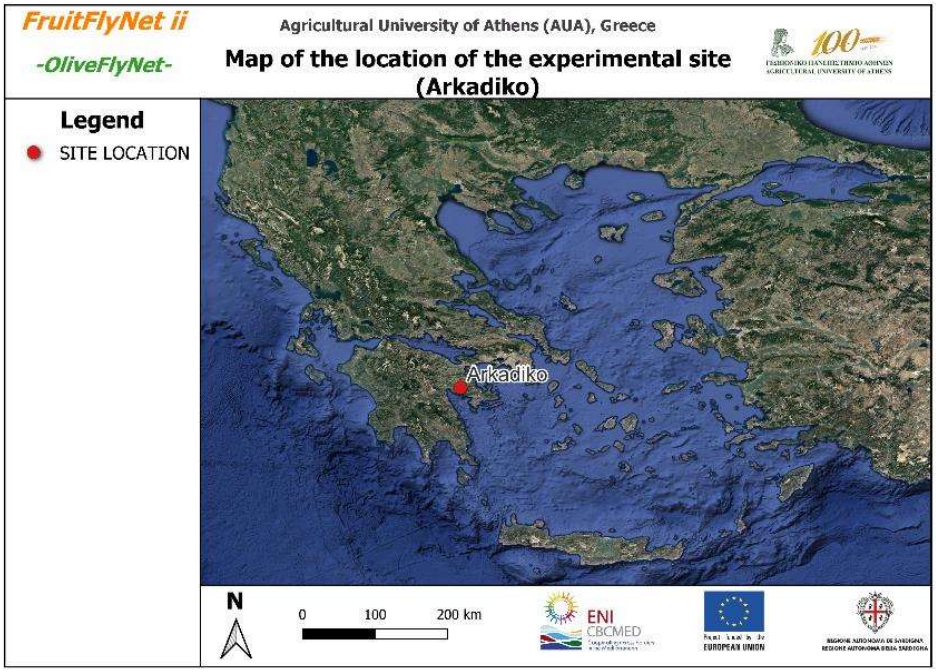


Figure 2.1. Map of location the OliveFlyNet large-scale site (Arkadiko, Greece).

The borders of the site are shown in the following figure.

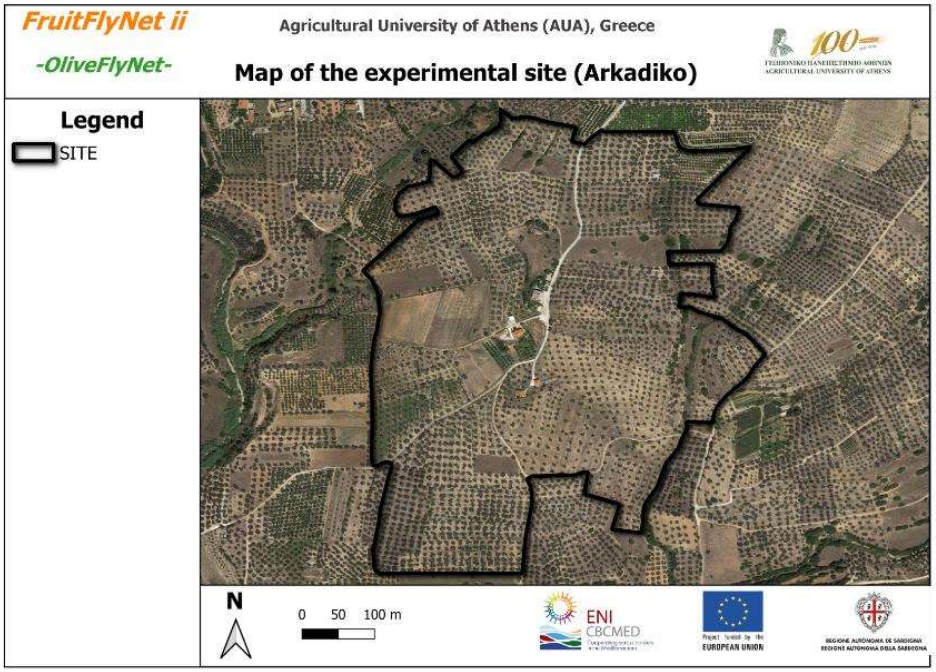
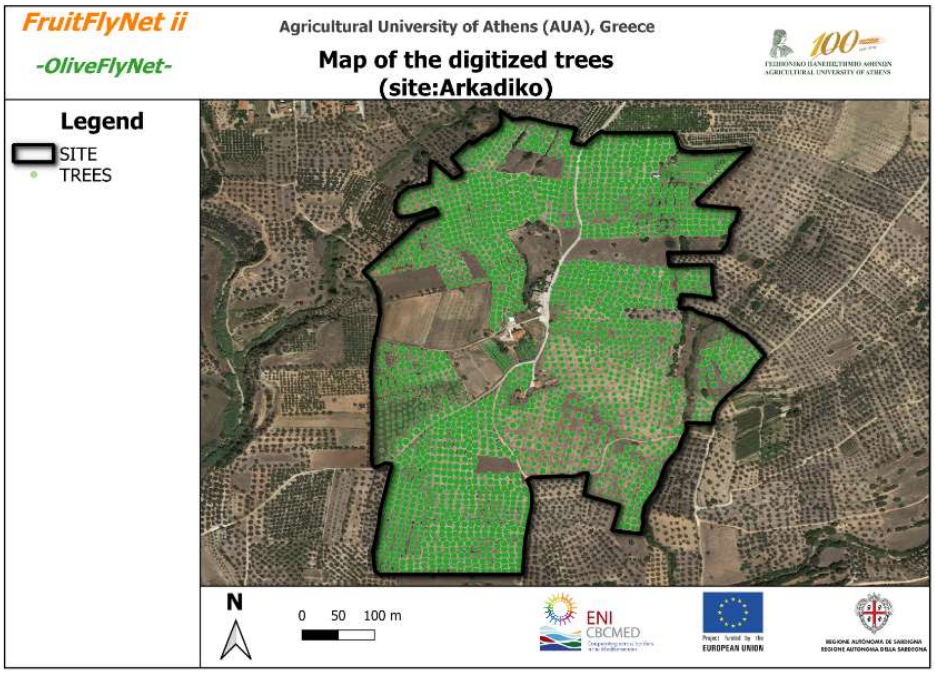


Figure 2.2. Map of the OliveFlyNet large-scale site

2.1.1. Trees of the experimental site

The position of the trees (points) in the olive orchards of the large-scale site of Arkadiko are shown in the following figure.



The position of the trees (polygons) in the olive orchards of the large-scale site of Arkadiko are shown in the following figure.

Figure 2.3. Map of the trees of the OliveFlyNet large-scale site (trees as points)

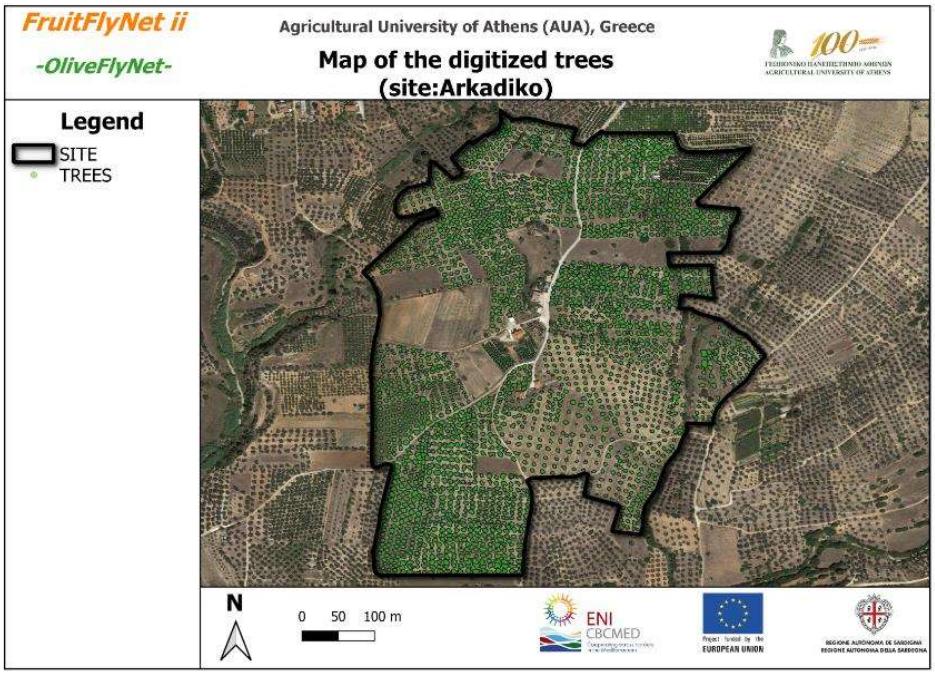


Figure 2.4. Map of the trees of the OliveFlyNet large-scale site (trees as polygons)

2.1.2. Orchards of the experimental site

The different orchards of the *OliveFlyNet* large-scale of BEN are shown in the following figure.

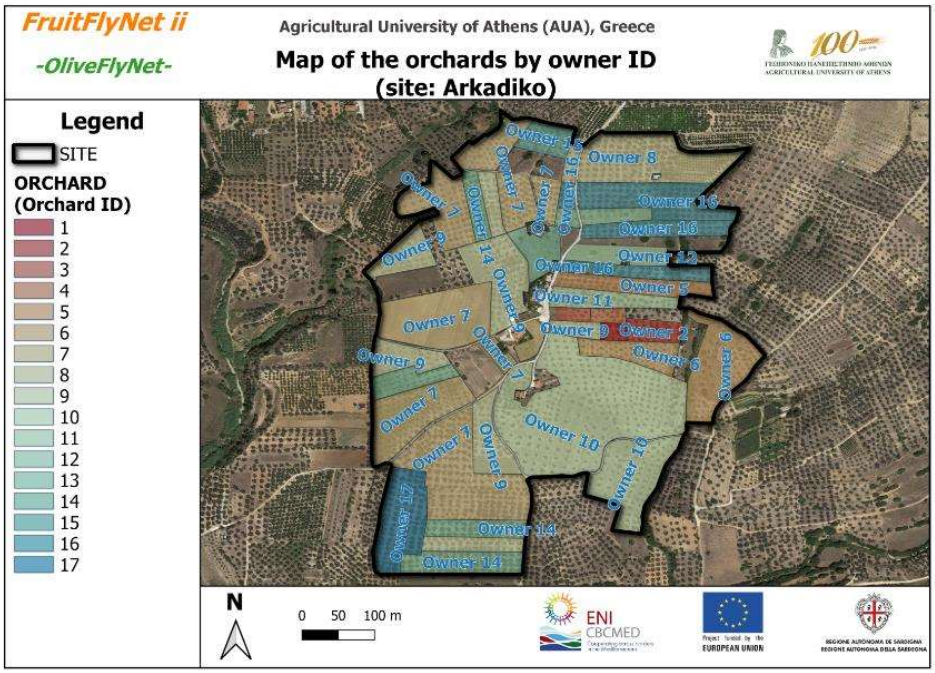


Figure 2.5. Map of the orchards of the OliveFlyNet large-scale site

2.1.3. Land uses of the experimental site

The land uses and their description of the *OliveFlyNet* large-scale of BEN are shown in the following figure.

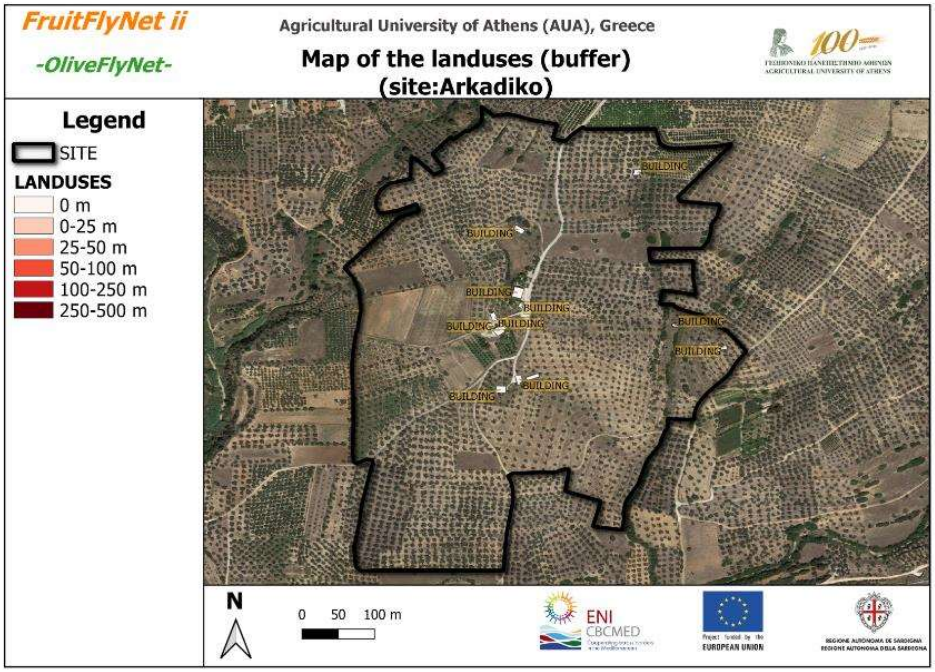


Figure 2.6. Map of the land uses of the OliveFlyNet large-scale site

2.1.4. Sensors

The maps of the meteorological sensors of the *OliveFlyNet* large-scale of BEN are shown in the following figure.

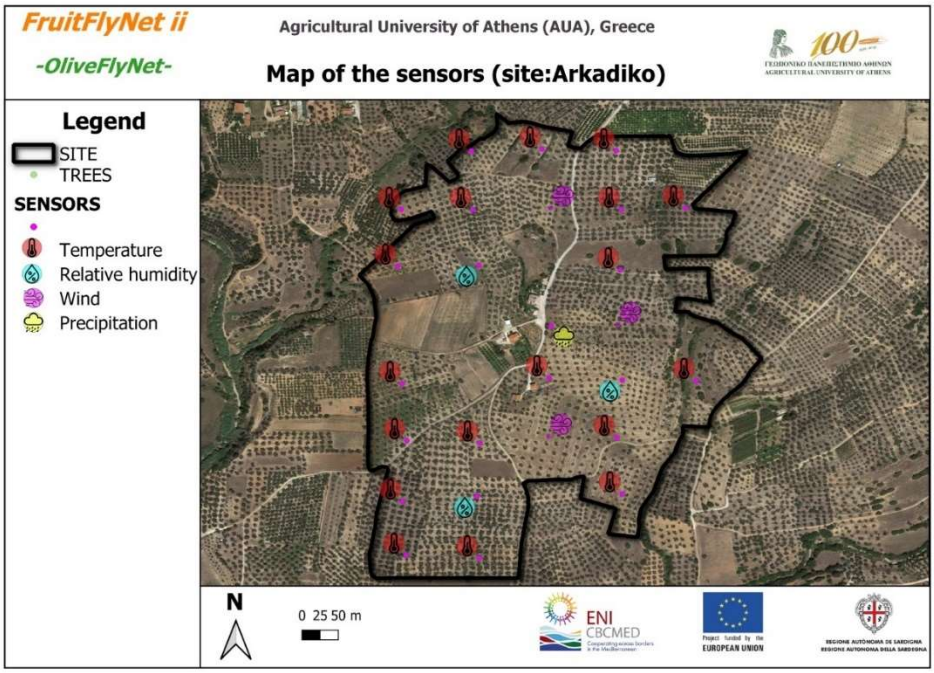


Figure 2.7. Map of the meteorological sensors of the OliveFlyNet large-scale site.

2.1.5. Traps

The indicative position of the yellow sticky e-traps established in the large-scale site of *OliveFlyNet* of BEN are shown in the following figure.

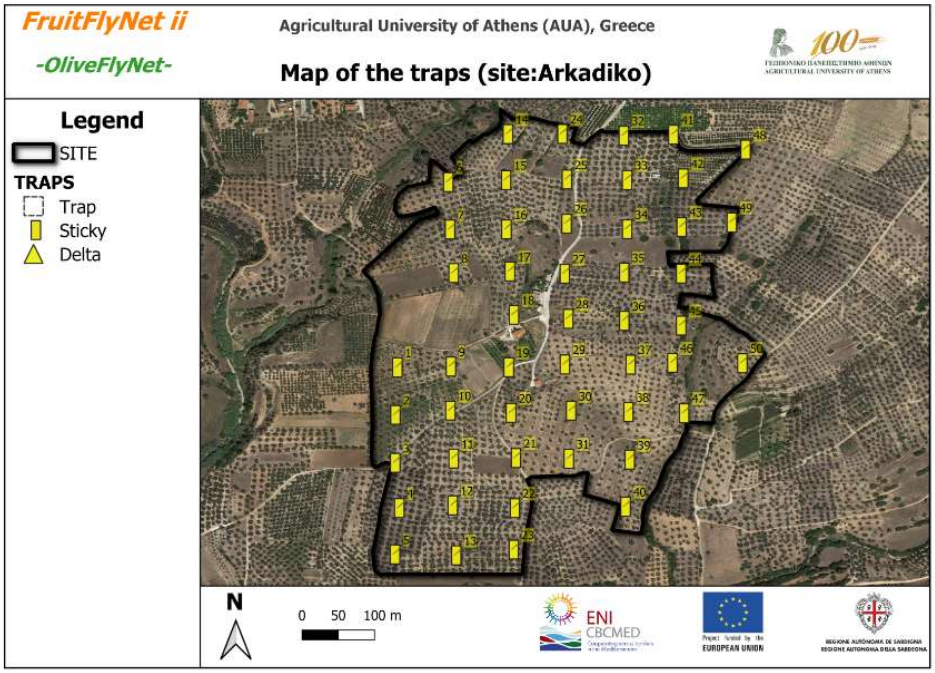


Figure 2.8. Map of the location of the traps

The indicative position of the yellow sticky e-traps established in the large-scale site of *OliveFlyNet* of BEN and the orchards of the experimental site are shown in the following figure.

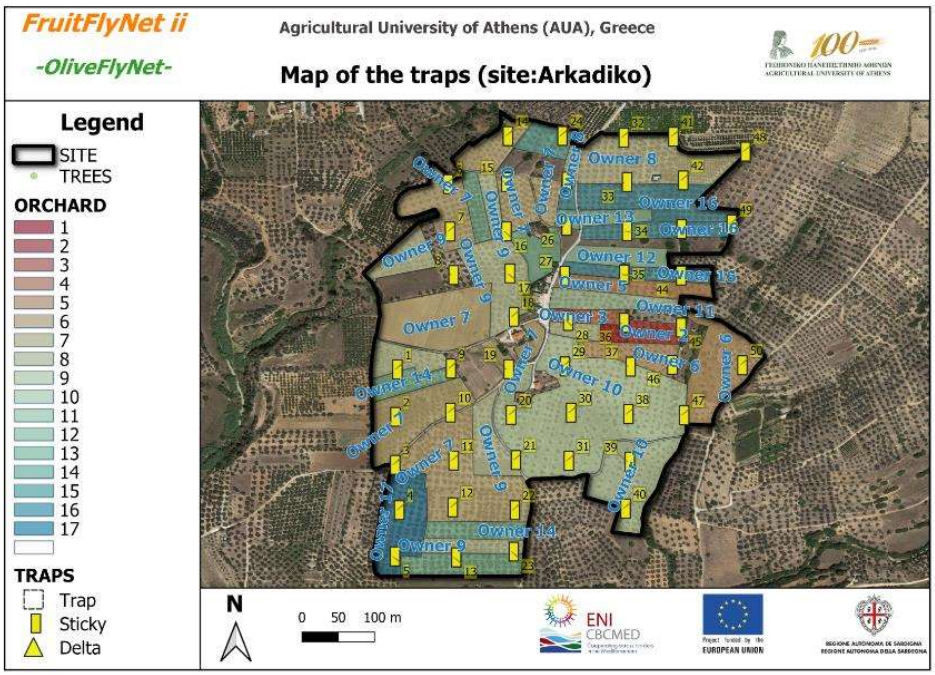


Figure 2.9. Map of the location of the traps, orchards, and trees

In the next figure it is shown the screen of the mobile GIS where the layers of site borders, traps and trees have been uploaded. The mobile can help in the navigation in the field and collection of georeferenced field data.

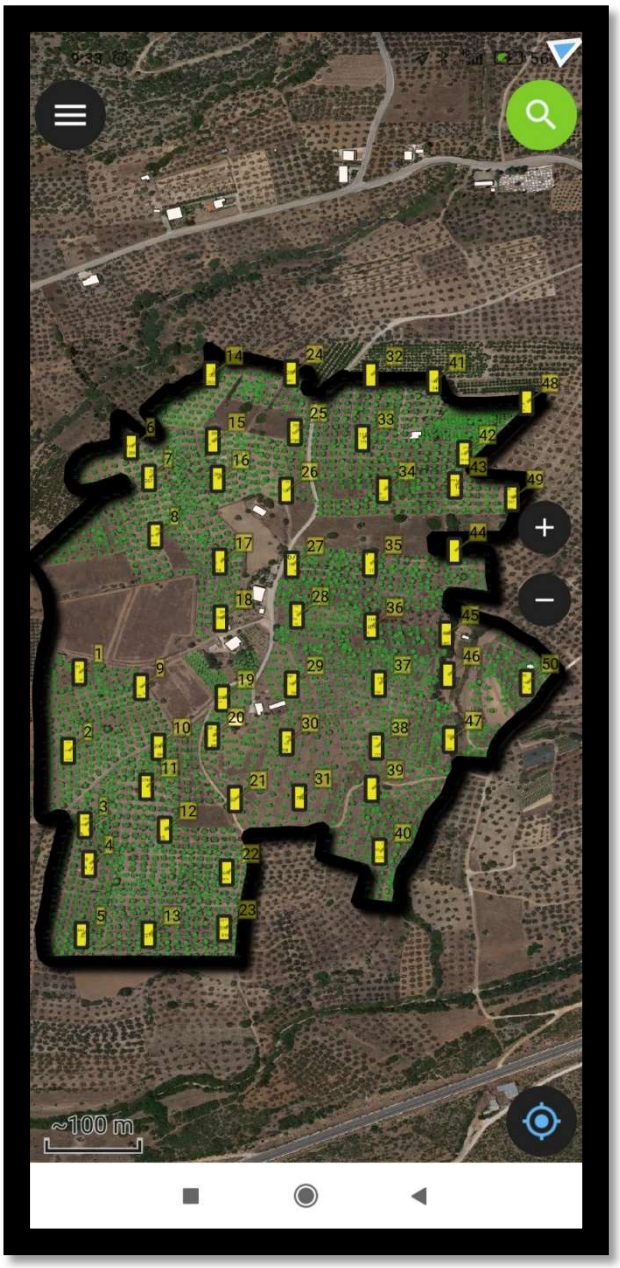


Figure 2.10. Mobile GIS- Trees and Trap network

Details of the trees and traps as uploaded in the GUI of the mobile GIS are shown in the next figure. Each tree or trap has an ID that is essential for field navigation and data collection i.e. in the case of trees data per selected tree about its fruit load, BBCH or for fruit sampling to record infestation rates.

Figure 2.11. Mobile GIS- Trees and Trap network (zoom in)

The QField layers of the mobile GIS are shown in the next figure.

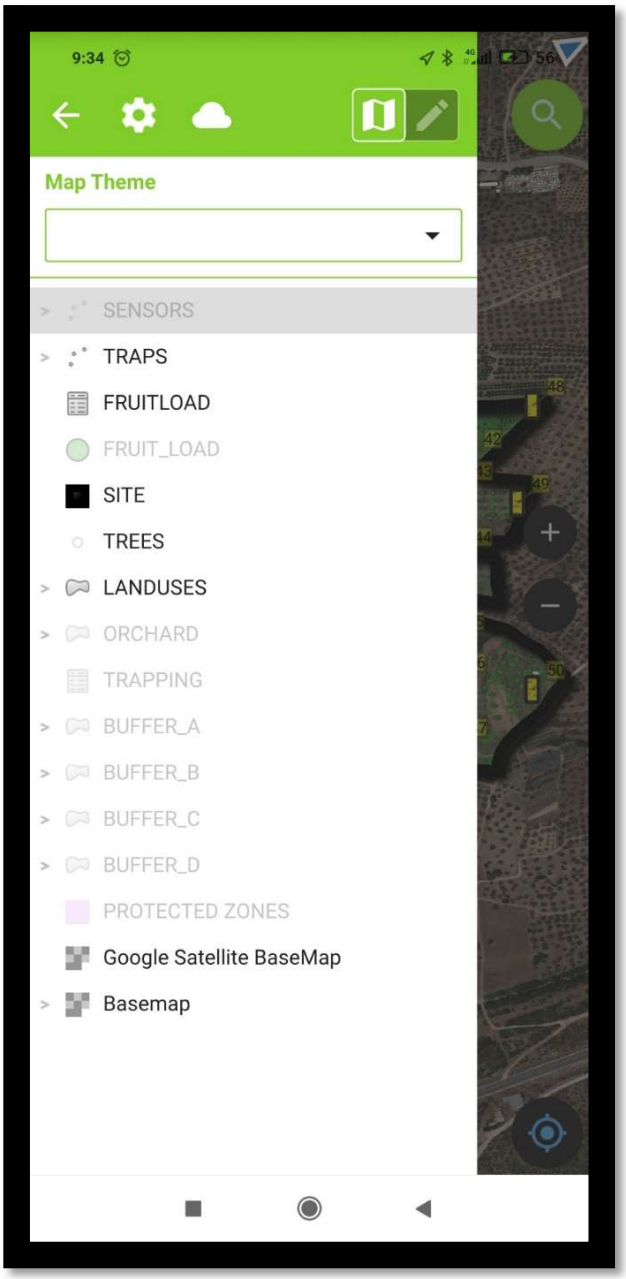


Figure 2.12. Mobile GIS – QField layers

The use of the mobile GIS to locate a trap is shown the following figure.

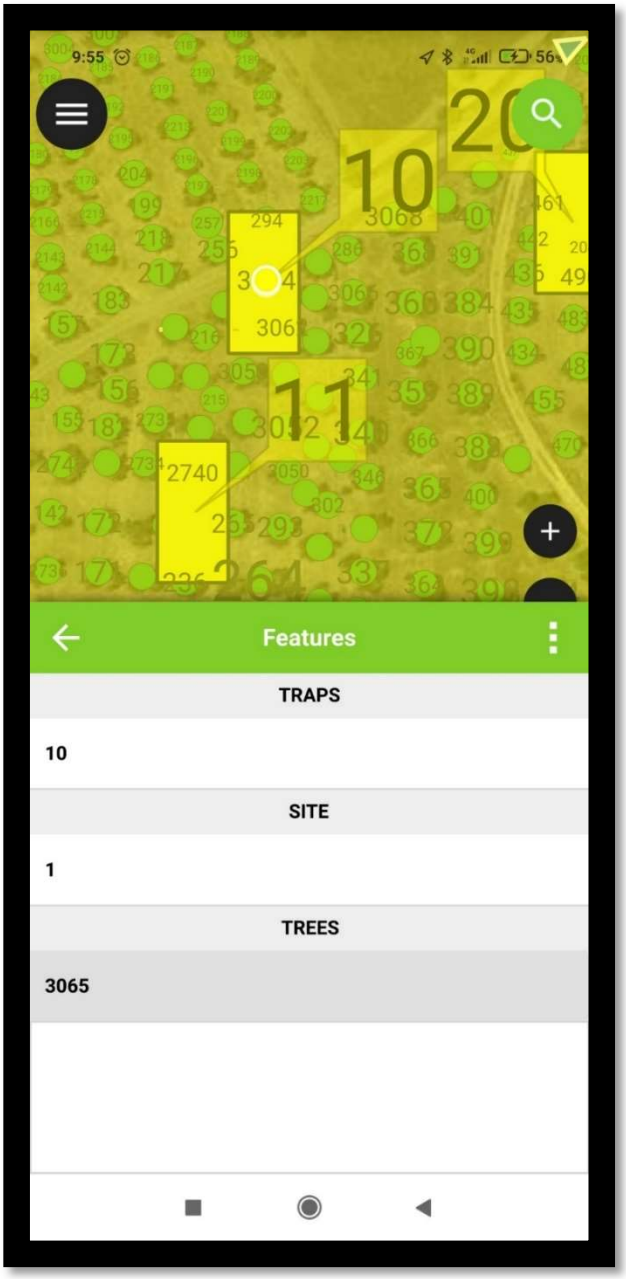


Figure 2.13. Mobile GIS – Trap by location (Trap ID=10)

The use of the mobile GIS to edit the details of a trap is shown in the next figure.

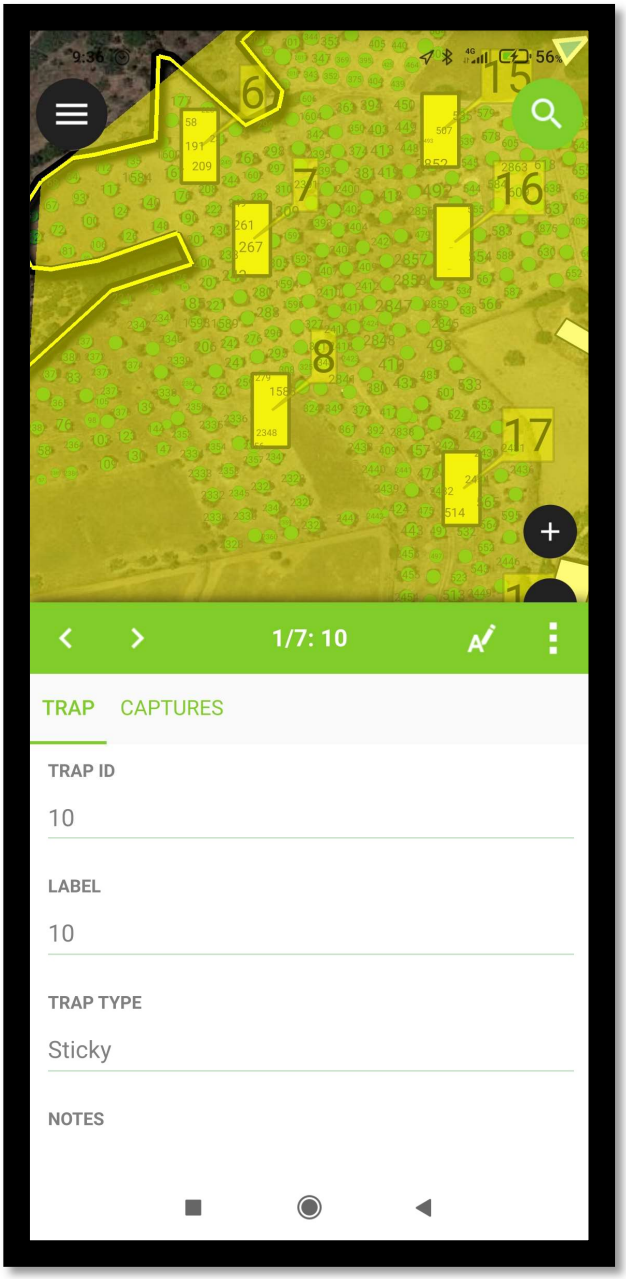


Figure 2.14. Mobile GIS – Trap editing

2.1.6. Protected zones

The protected areas were created using the national legislation and the land-uses (i.e., buildings) that were nearby and inside the experimental site. The size of the buffer zones will be defined based on the active ingredient to be used. The map of the buffer zones for pesticide hazard category *Toxic* are shown in the following figure.

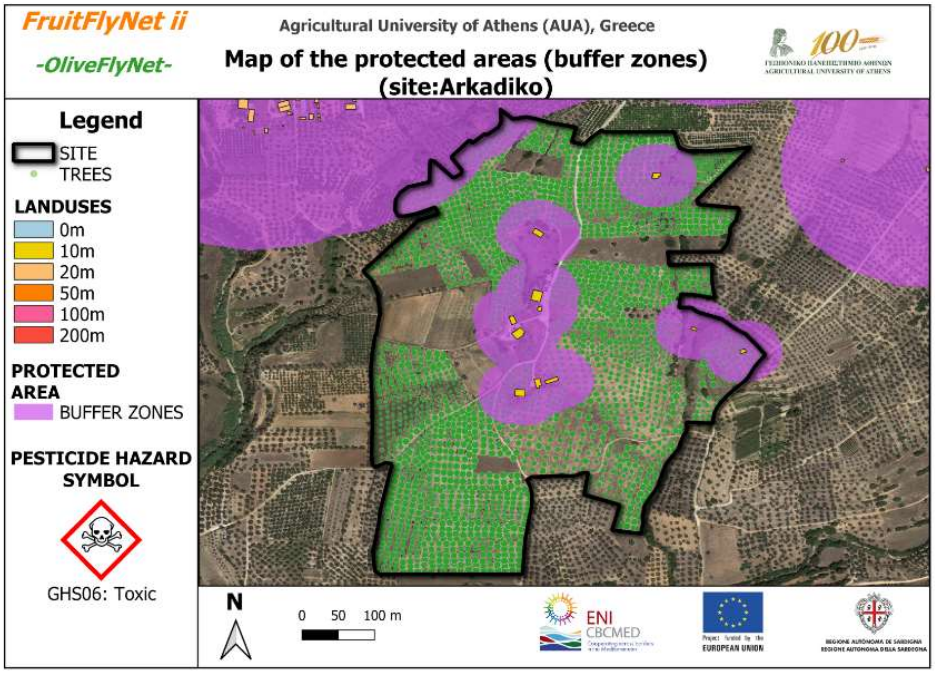


Figure 2.15. Map of the protected zones (GHS06:Toxic)

The map of the buffer zones for pesticide hazard category *Health hazard* is shown in the following figure.

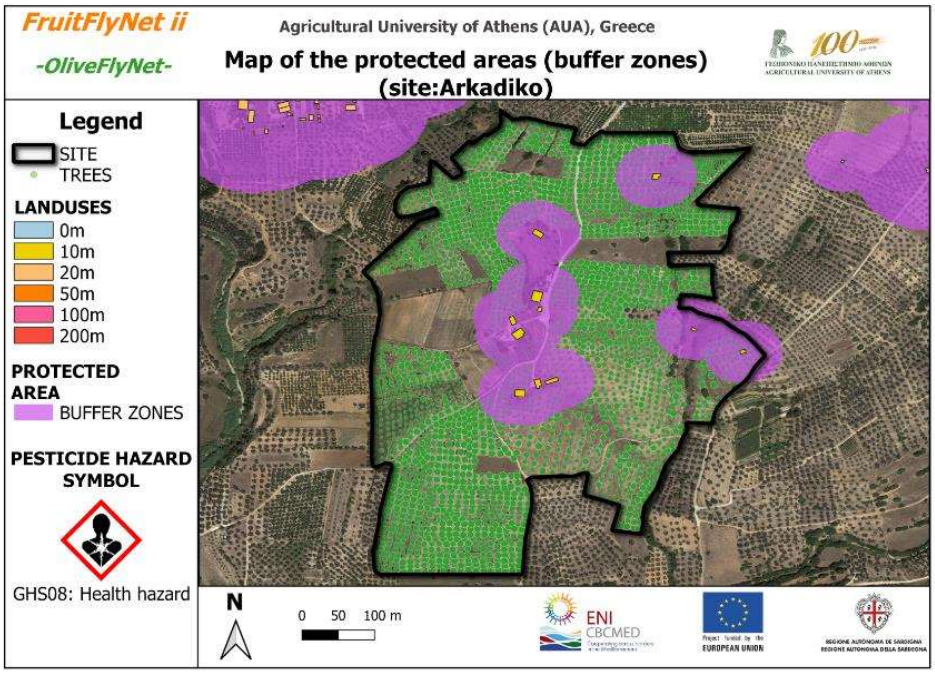


Figure 2.16. Map of the protected zones (GHS08: Health hazard)

The map of the buffer zones for pesticide hazard category *Harmful* is shown in the following figure.

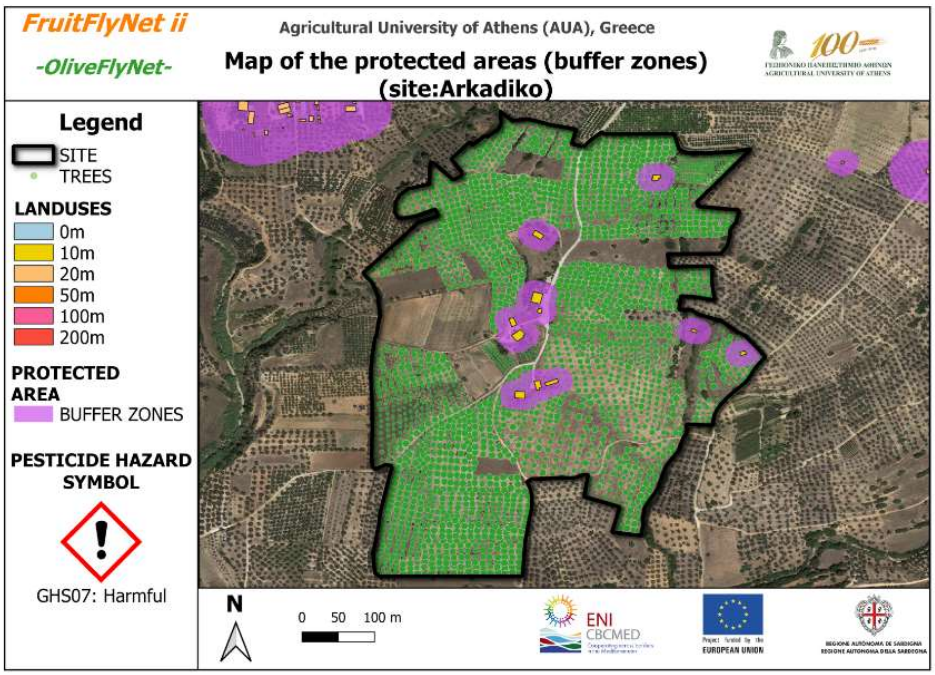


Figure 2.17. Map of the protected zones (GHS07:Harmful)

The map of the buffer zones for pesticide hazard category *None* is shown in the following figure.

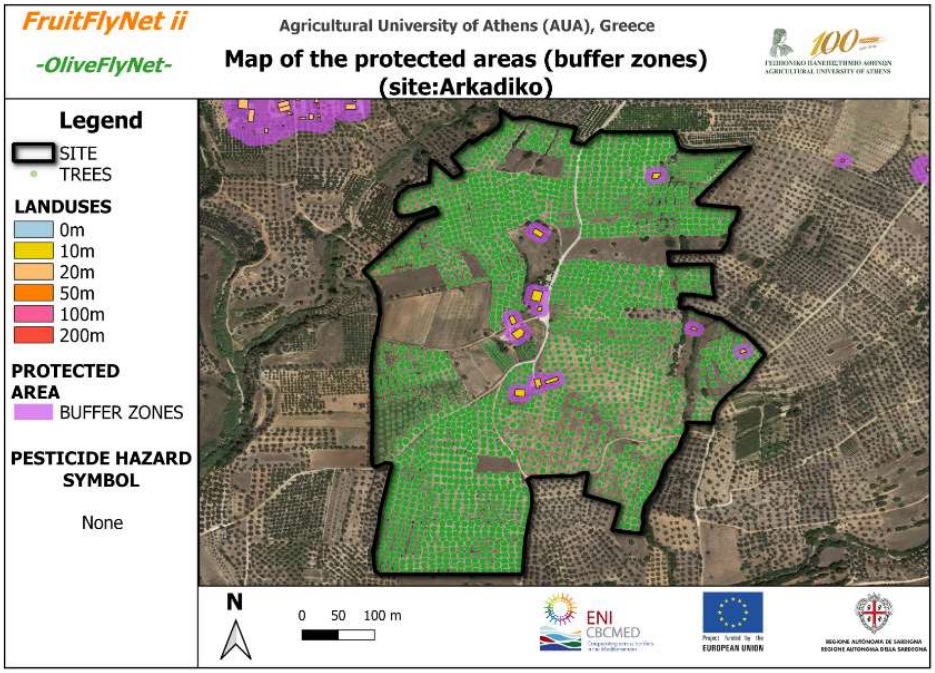


Figure 2.18. Map of the protected zones (Hazard:none)

3. BEN MedFlyNet

In this section the data for the *MedFlyNet* wide-area-scale site of BEN are given. In its first part, the details of the crops and their cultivation techniques, the information about the target pest and its control are shown in a table format. In the second part, the maps of the digitized field elements that are required to operate the LAS services in the site are given. Each map has been produced by the geodatabase. The mobile GIS was used for the collection of field data.

3.1. BEN MedFlyNet: Crop and pest field data

The large-scale site of BEN is consisting of citrus orchards belonging to 8 owners. The orchards lie within other citrus orchards and are in Argolis, in eastern Peloponnese, an area of the most important for citrus production in Greece. The cultivation practices are similar among the orchards. The Medfly is a serious pest in this area and farmers use sprays to control it. The cultivars ripe in a successive manner during autumn and have a different sensitivity to the Medfly which will be considered in the decision protocols. Details are given in the following tables.

3.1.1. Test site

The details of the site are described in the following table.

Table 3.1. Crop data of the MedFlyNet wide-area site of BEN

1.	Target pest	*Ceratitis capitata* (Medfly)
2.	Name of the site area	*Koutsopodi, Argolis*
3.	Total site surface (ha)	*25.7*
4.	Dimensions of the site	*257,000 m²*
5.	Number of different orchards included and type of owner(s) - describe	*8 owners.*
6.	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree), Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	*The surface of the site is flat, with no elevations.*
7.	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*See figure 3.5.*
8.	Indicate in the map any areas to be protected within the site or close by (i.e. houses, water bodies, water pumps, etc.).	*There are water pumps (figure 3.9).*
9.	Give information for the surrounding vegetation/crops of the site	*Citrus.*
10.	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	*It is only citrus.*
11.	Indicate the road network and accessibility of the site and each orchard, as applicable.	*It has been included in the maps.*
12.	Indicate sources of electricity or drinkable water, if any.	*Sources in water pumps.*
13.	Provide a few representative photos of the orchard elements (a tree, a row of trees etc)	*See figure 3.1*
14.	Other information	

3.1.2. Trees and practices

Tree data and cultivation practices of the *MedFlyNet* wide-area of BEN are given in the following table.

Table 3.2. Tree data and cultivation practices of the MedFlyNet wide-area site of BEN

1.	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	*IPM*
2.	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	*W. Navel (sensitive period: November)* *Navel (September and October)* *Clementine (October and November)* *Merlin (October and November)*
3.	Tree age	*10-60 years old*
4.	Tree density (trees/ha)	*≈500/ha*
5.	Tree height	*≈2.5-3m*
6.	Tree canopy diameter	*≈5m*
7.	Planting system (i.e. linear)	*Linear*
8.	Distance between the trees (in the row and between the rows)	*≈4.5X4.5m*
9.	Tree shape - Pruning	*Spherical.*
10.	Fertilization method and its frequency	*Chemical fertilizers.*
11.	Irrigation method and its frequency	*Micro sprinklers.*
12.	Weed control	*Herbicides/ brush cutter.*
13.	Neighboring fruit fly host crops – possible infestation sources	*Apricots in a distance of 200m.*
14.	Foreseen fruit load for this year production	*≈35-50tn/Ha*
15.	Discuss other possible variation sources in infestation levels across the site (i.e. due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.).	
16.	Other information	

3.1.3. Target pest monitoring

The data for the target pest monitoring the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 3.3. Data for the target pest monitoring of the MedFlyNet wide-area site of BEN

1.	Target pest	*Ceratitis capitata*
2.	Period of monitoring i.e. per orchard/cultivar, as applicable	*W. Navel (September and October).* *Navel (September and October).* *Clementine (October and November).* *Merlin (October and November).*
3.	Type(s) of traps	
4.	Bait(s) used	
5.	Trap density/ha for monitoring	
6.	Time interval for trap captures monitoring	
7.	Method for fruit damage monitoring	
8.	Infestation levels in the orchard in the previous years, data of pest levels/damages	≈10%
9.	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Aleurothrixus floccosus, Thrips, Archips rosanus, Calocoris.*
10.	Common diseases	
11.	Other information	

3.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 3.4. Data for meteorological data monitoring of MedFlyNet large site of BEN

1.	Add information about the climatic conditions of the area of the site in annual basis	*Argolis has a hot Mediterranean climate.* *Average high monthly temperature is 23.6°C, mean 17.1°C, average low 9.4°C,* *average precipitation 471.4mm,* *average precipitation 86 days,* *average relative humidity 67.1%* *(Climate data from Pyrgella meteorological station (1980 - 2010)).*
2.	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	• *For pest monitoring:* *Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction), precipitation per day.* • *For spraying:* *Temperature (at least every 30 minutes), RH (at least every 30 minutes), wind speed and direction and precipitation (at least every 15 minutes)*
3.	Add information for any meteorological station in the area, if exist.	*1. Meteorological station of the Hellenic National Meteorological Service in Pyrgetos village, at 8 km from the site.* *2. A meteorological station at 5 km from the site.* *http://penteli.meteo.gr/stations/argos .*
4.	Other information	

3.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 3.5. Spraying decision rules for the target pest in the MedFlyNet large site of BEN

1.	Describe the spraying decision process	*Presence of stings on the fruits.*
2.	Pest capture critical densities during the season	*Not in use.*
3.	Fruit damage threshold during the season	*Not in use.*
4.	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*The change of fruit colour at veraison.*
5.	Models or prediction, if available	*Not available.*
6.	Other information	

3.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 3.6. Bait spraying application procedures against the target pest in the MedFlyNet wide-area site of BEN

1.	Type of spraying used (cover spraying or bait spraying) (describe)	*In the cover sprayings the active ingredient phosmet is used. In the bait sprayings phosmet or deltamethrin is mixed with hydrolysed protein.*
2.	Concentration of bait in the spraying solution	*2-3%*
3.	Quantity of bait spraying solution applied per tree	*300ml.*
4.	Ratio of trees to be sprayed (pest risk level, if applicable)	*All trees or half of them.*
5.	Means of spraying application (tractor or other, and their availability, describe)	*Tractors*
6.	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*The air temperature and wind speed limits are empirically considered during sprayings.*
7.	Registered insecticides (a.i.) against the target pest in IPM and organic crops	*Acetamiprid, Beauveria bassiana, Deltamethrin, Lambda-Cyhalothrin, Malathion, Phosmet*
8.	PHI for each a.i.	*Acetamiprid: 14days.* *Beauveria bassiana: NA.* *Deltamethrin: 30days.* *lambda-Cyhalothrin: 7days.* *Malathion: 7days.* *Phosmet: 14days.*
9.	Selectivity of a.i. for natural enemies and pollinators	
10.	Other information	

3.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the *MedFlyNet* large site of BEN is described in the following table.

Table 3.7. Beneficial insect monitoring in the MedFlyNet large site of BEN

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data recorded
2.	Means and methods for beneficials' monitoring	No data recorded
3.	Other information	

3.1.8. The *MedFlyNet* wide-area site in Greece

In the following figure an orchard of the wide-area site in Koutsopodi, Greece is shown.

Figure 3.1. Rows of trees in the wide-area site (Koutsopodi, Greece)

3.2. BEN *MedFlyNet*: Digitized Field Data

The digitized field data of the *MedFlyNet* wide-area site of BEN are given in maps. The maps have been generated by the geodatabase.

3.2.1. Experimental site

Koutsopodi is a town and a former municipality in Argolis, Peloponnese, Greece. It is part of the municipality Argos-Mykines, of which it is a municipal unit.

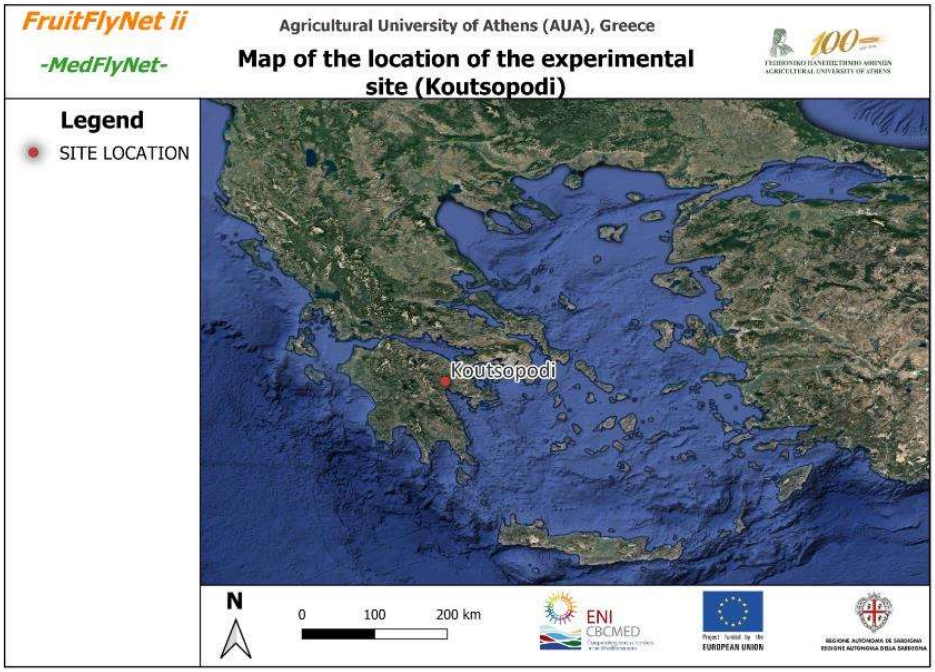


Figure 3.2. Map of the location of the wide-area site (Koutsopodi, Greece)

The borders of the site are shown in the following figure.

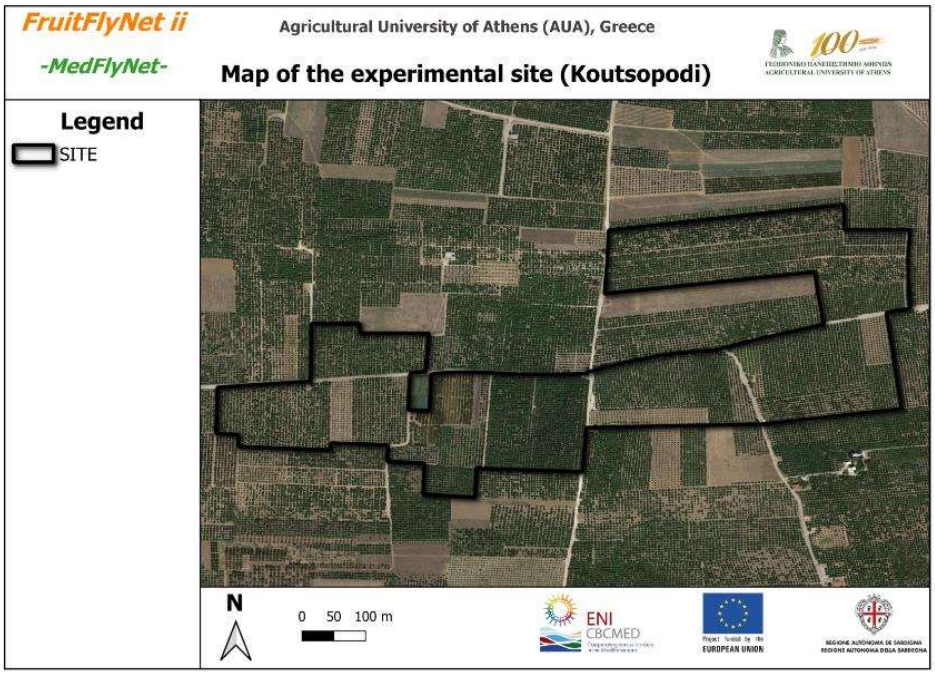


Figure 3.3. Map of the wide-area site

3.2.2. Trees of the experimental site

The position of the trees in the orchards of the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

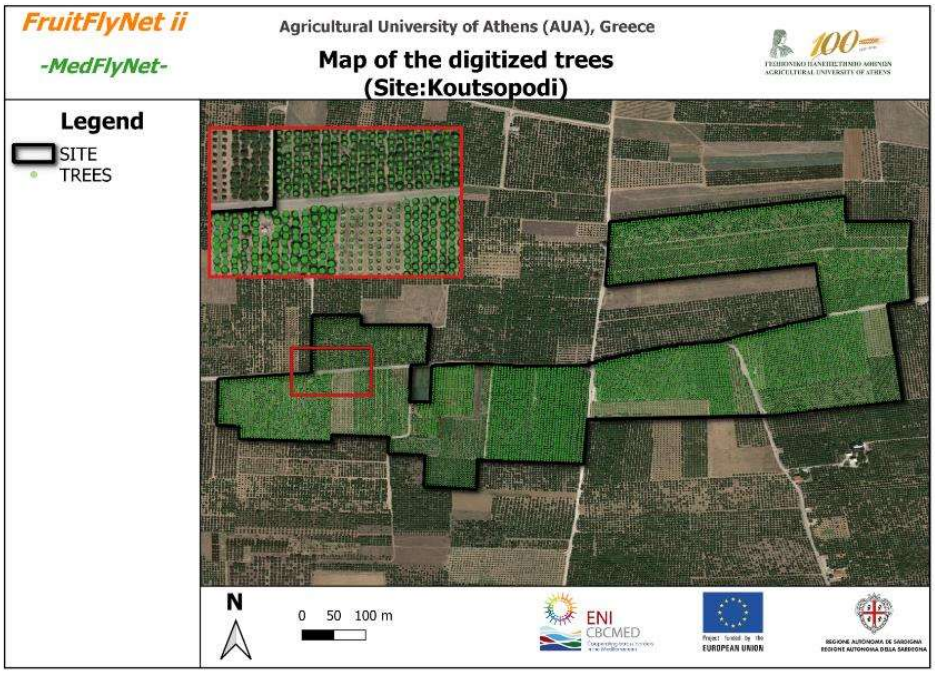


Figure 3.4. Map of the trees in the wide-area site (with overview)

3.2.3. Orchards of the experimental site

The different orchards of the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

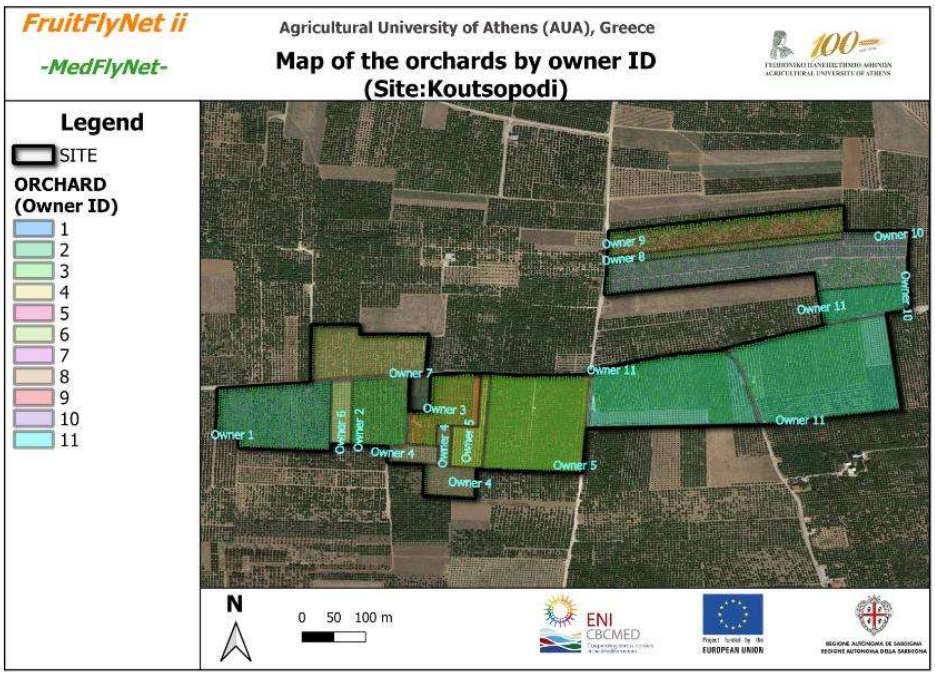


Figure 3.5. Map of the orchards in the wide-area site

3.2.4. Land uses of the experimental site

The land uses and their description of the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

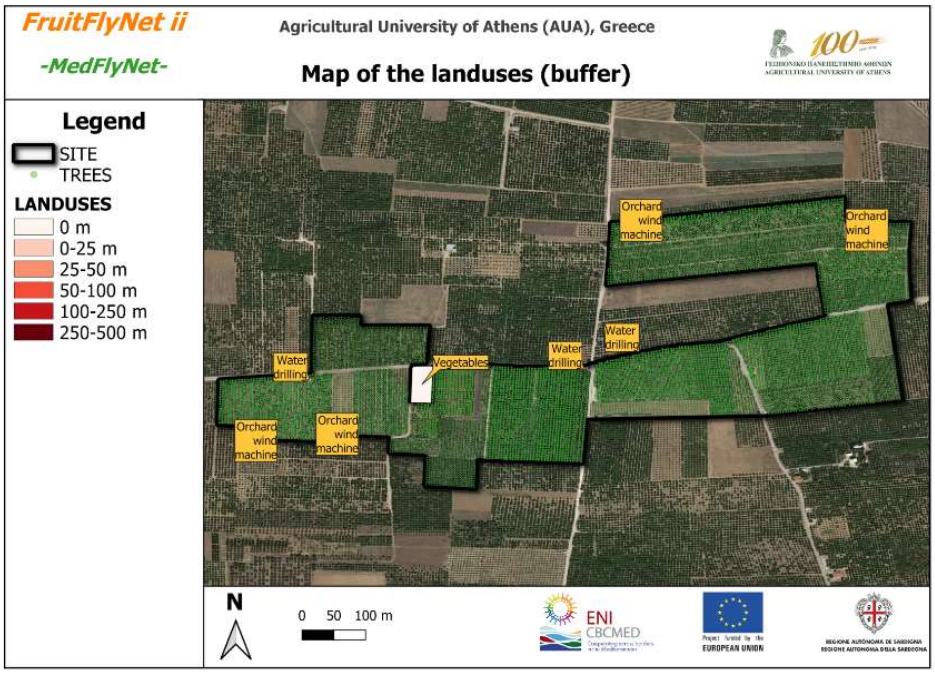


Figure 3.6. Map of the land uses in the wide-area site

3.2.5. Sensors

The indicative position of the sensors to be established in the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

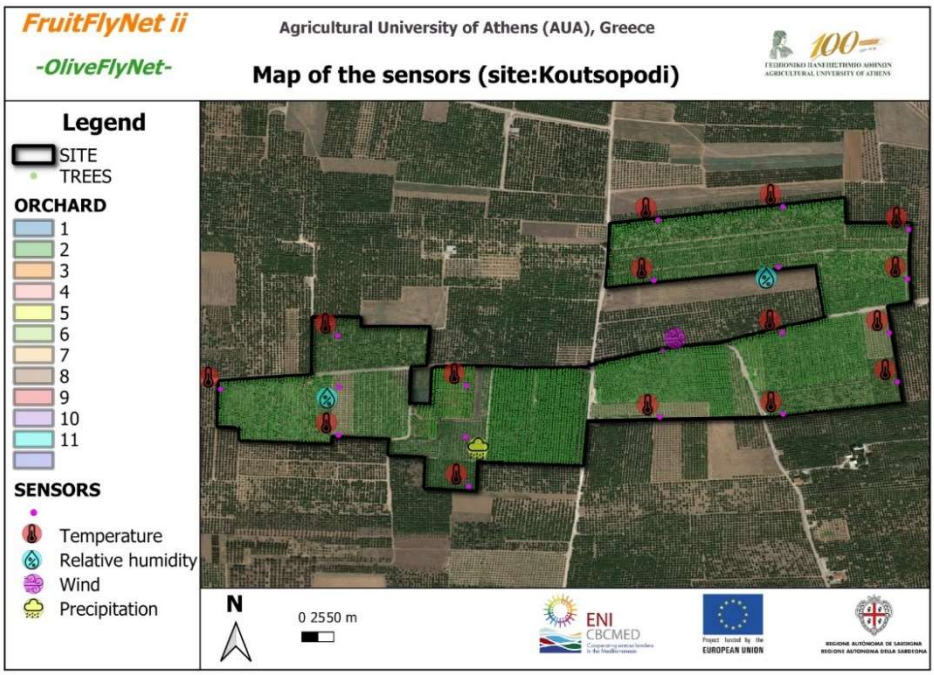


Figure 3.7. Map of the location of the sensors in the wide-area site

3.2.6. Traps

The indicative position of the yellow sticky e-traps to be established in the large site of *MedFlyNet* of BEN is shown in the following figure.

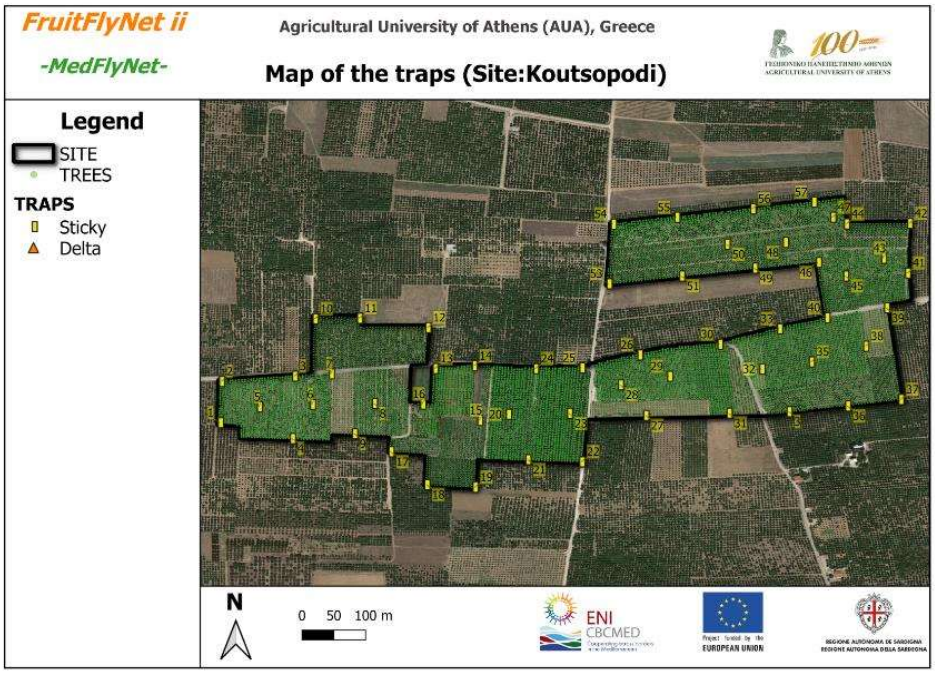


Figure 3.8. Map of the location of the traps in the wide-area site

3.2.7. Protected zones

The buffer zones of the pesticide hazard categories were generated in the wide-area *MedFlyNet* citrus (oranges) site. The map of the buffer zones for pesticide hazard category *Toxic* is shown in the following figure.

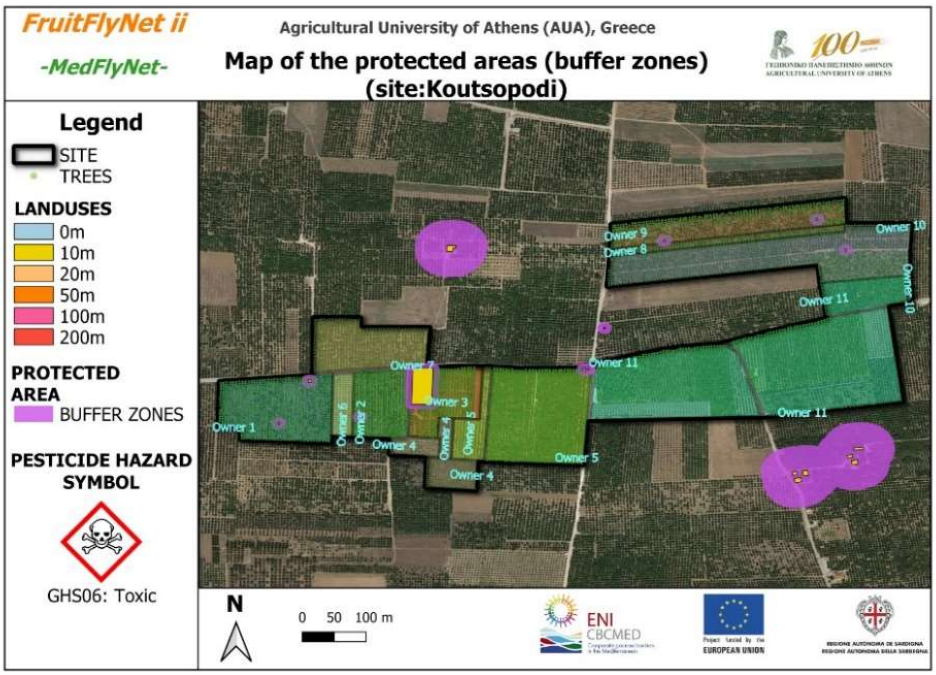


Figure 3.9. Map of the protected zones (GHS06: Toxic)

The map of the buffer zones for pesticide hazard category *Health hazard* is shown in the following figure.

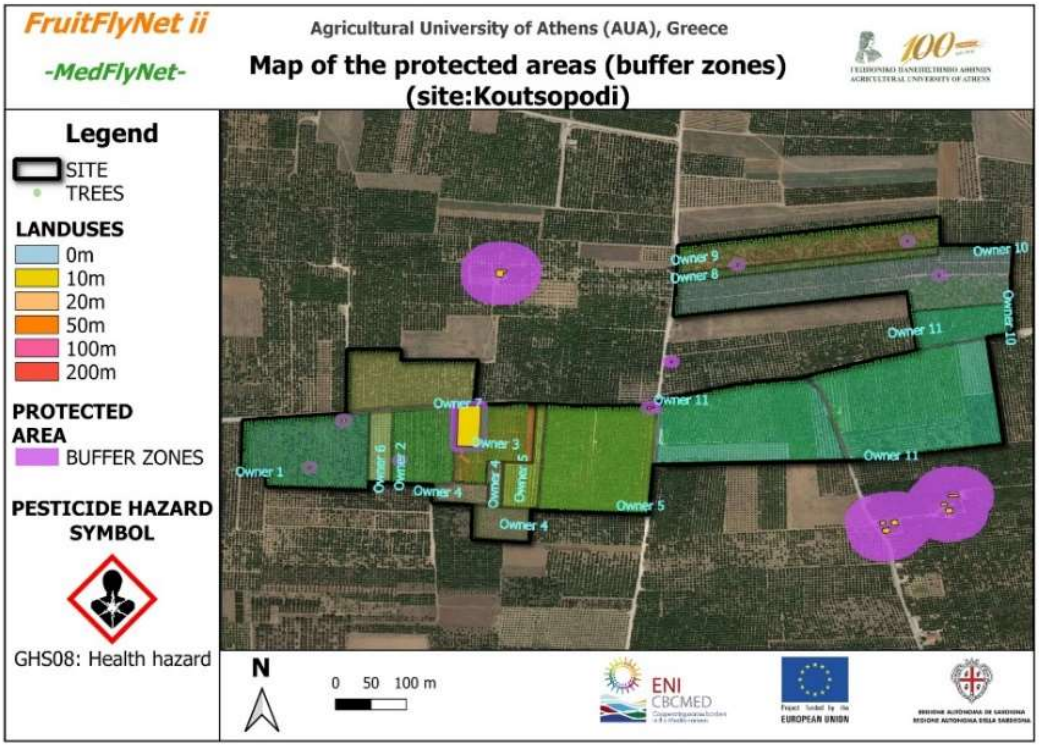


Figure 3.10. Map of the protected zones (GHS06: Health Hazard)

The map of the buffer zones for pesticide hazard category *Harmful* is shown in the following figure.

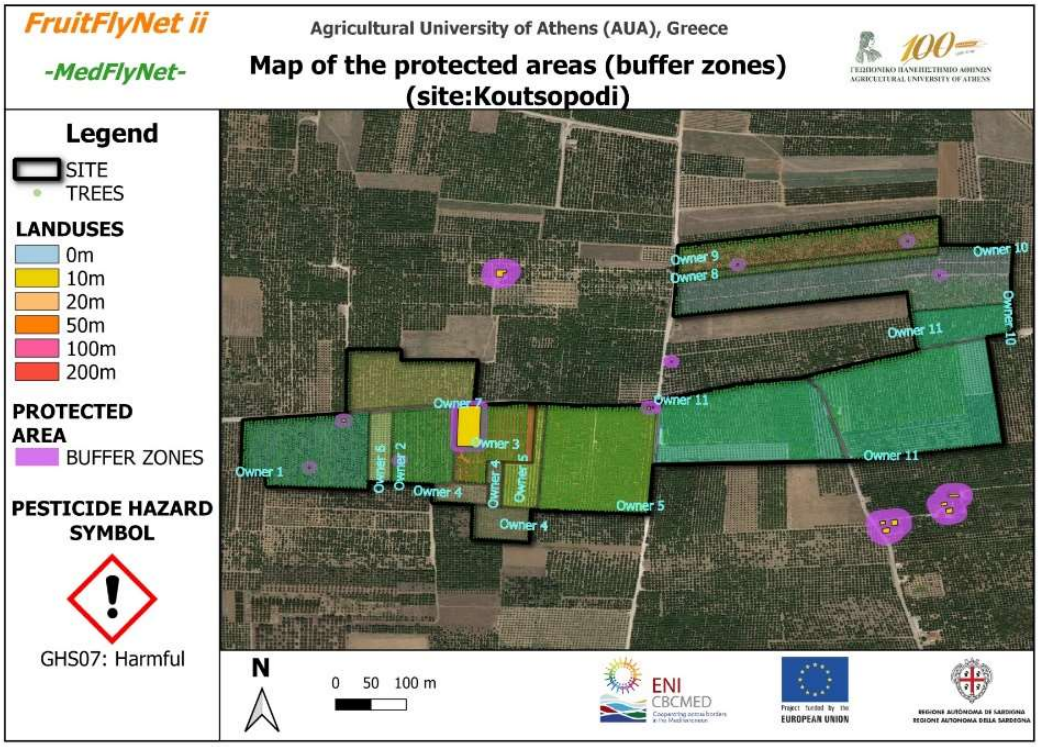


Figure 3.11. Map of the protected zones (GHS06: Harmful)

The map of the buffer zones for pesticide hazard category *None hazard* is shown in the following figure.

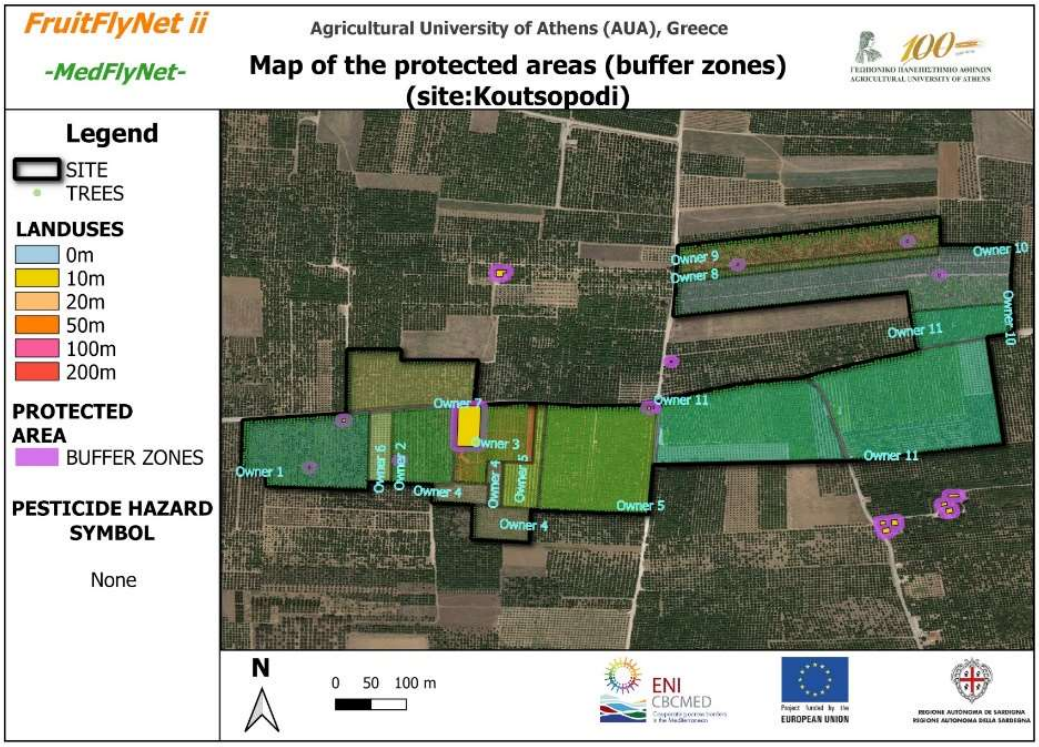


Figure 3.12. Map of the protected zones (GHS06: None)

4. BEN OliveFlyNet

In this section, the crop/pest data and the digitized data for the additional *OliveFlyNet* large-scale site of BEN that was used by BEN in the cropping season of 2023 are given. The use of a new olive site considered necessary because the fruit load of the trees of the OliveFlyNet large-scale site of BEN in Arkadiko, Argolis, that was used in 2022, was much lower than the minimum fruit load limit for the application of olive fruit fly control with the use of bait sprayings. For this reason, a new large site was used located in the village Metamorphosi, Laconia, eastern Peloponnese. The details of the crop, the cultivation practices, the severity of the pest, the practices used in the monitoring and control of the pest, and the registered insecticides are given in a table format. After that, the maps of the digitized field data such as the borders, the trees, the orchards, the protected areas, the positions of the e-trap etc that are required to operate the LAS services in the OliveFlyNet site in Metamorphosi Laconia are given. Each map has been produced using LAS methodology and stored in the developed geodatabase. The mobile GIS was used for the collection of field data.

4.1. BEN OliveFlyNet: Crop and pest field data

The *OliveFlyNet* large-scale site of BEN in Metamorphosi, Laconia, is consisted of olive groves belonging to 11 owners. The site is in the south-east of Sparta (the capital of Laconia), an area known for its high-quality olive oil production in Greece. In the wider area of the site, olive groves dominate. The farmers follow similar cultivation practices among the groves of the site. The olive fruit fly is the most serious pest of olives in that area and farmers spray every year to control it. The details for the crop and pest data are given in the following tables.

4.1.1. Test site

The details of the site are described in the following table.

Table 4.1. Crop data of the OliveFlyNet large-scale site of BEN in Metamorphosi Laconia.

1	Target pest	*Bactrocera oleae* (olive fruit fly)
2	Name of the site area	Metamorphosi village, Laconia
3	Total site surface (ha)	30 ha
4	Dimensions of the site	1020 m 560 m
5	Number of different orchards included and type of owner(s) - describe	54 orchards/11 owners
6	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude: Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	The site is in a flat area, 120 meters in altitude and its distance from the sea is 11.4 km. Longitude:22.90436 Latitude: 36.81035 (WGS 84)
7	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	These are shown in the respective figure.
8	Indicate in the map any areas to be protected within the site or close by (i.e., houses, water bodies, water pumps, etc.).	In the site, there are a warehouse, a water pump. Nearby the area of the site there are 2 farms with sheep and goats.
9	Give information for the surrounding vegetation/crops of the site	The surrounding crops are olives.
10	Indicate the position of different tree species, their cultivars, irrigated orchards, or other relevant details in the map of the site.	It is only olives.
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	It has been included in the maps.
12	Indicate sources of electricity or drinkable water, if any.	Sources in houses and water pumps.
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc.).	See figures
14	Other information	-

4.1.2. Trees and practices

Tree data and cultivation practices of the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 4.2. Tree data and cultivation practices of the OliveFlyNet large-scale site in Metamorphosi, Laconia

1	Production system (IPM, organic etc.) (as applicable	IPM

	per orchard/field within the site)	
2	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	Mainly cv. Koroneiki (small-size drupe, sensitive to the pest, protection period: June to December) There are a few fields planted with cv. Kalamon (large-size drupe, sensitive to the pest, protection period: June to November).
3	Tree age	10-50 years old.
4	Tree density (trees/ha)	≈220/ha.
5	Tree height	≈2.5-3m.
6	Tree canopy diameter	≈5-6m
7	Planting system (i.e. linear)	Linear
8	Distance between the trees (in the row and between the rows)	≈4mX6m.
9	Tree shape - Pruning	Spherical.
10	Fertilization method and its frequency	Chemical fertilizers, frequency per season: 1 application of soil fertilization and 3-4 applications of leaf fertilization
11	Irrigation method and its frequency	Micro sprinklers.

4.1.3. Target pest monitoring

The data for the target pest monitoring the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 4.3. Data for the target pest monitoring of the OliveFlyNet wide-area site

1	Target pest	*Bactrocera oleae*
2	Period of monitoring i.e. per orchard/cultivar, as applicable	The olive fruit fly is monitored from June to November.
3	Type(s) of traps	McPhail.
4	Bait(s) used	Hydrolysed proteins or ammonium salts.
5	Trap density/ha for monitoring	1/5 ha.
6	Time interval for trap captures monitoring	7 days.
7	Method for fruit damage monitoring	Fruit samplings (125 per tree from 10 trees) during the sensitive period to record the eggs, larvae and pupae in the fruits.
8	Infestation levels in the orchard in the previous years, data of pest levels/damages	≈10-30%
9	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Prays oleae*
10	Common diseases	*Spilocaea oleagina, Colletotrichum acutatum, Pseudocercospora cladosporioides*
11	Other information	-

4.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 4.4. Data for meteorological data monitoring of OliveFlyNet large-scale site.

1.	Add information about the climatic conditions of the area of the site in annual basis	Metamorphosi has a hot Mediterranean climate. The average high monthly temperature is 29.4°C, the mean is 12.1°C, the average low is 11.8°C, the average precipitation is 604.6mm (climate data from Molaoi meteorological station (2018 - 2022).
2.	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	• For pest monitoring: Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction), precipitation per day. • For spraying: Temperature (at least every 30 minutes), RH (at least every 30 minutes), wind speed and direction and precipitation (at least every 15 minutes)
3.	Add information for any meteorological station in the area, if exist.	Meteorological station of the National Observatory of Athens Service in Molaoi, Laconia, at a distance ≈4 Km from the site. Longitude : 22.85814° E Latitude : 36.79956° N (WGS 84) Altitude: 128m
4.	Other information	-

4.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 4.5. Spraying decision rules for the target pest in the OliveFlyNet wide-area site

1.	Describe the spraying decision process	Percentage of fruits with punctures, eggs, larvae, number of flies caught in traps.
2.	Pest capture critical densities during the season	It is normally 5 adults per trap per week but depends on the season and the fruits damage.
3.	Fruit damage threshold during the season	1-5% depending on the season.
4.	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	The change of fruit colour at veraison.
5.	Models or prediction, if available	Not available.
6.	Other information	-

4.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *OliveFlyNet* large-scale site of BEN are given in the following table.

Table 4.6. Bait spraying application procedures against the target pest in the OliveFlyNet large-scale site

1	Type of spraying used (cover spraying or bait spraying) (describe)	Bait sprayings are used. In cases with high infestation levels then cover sprayings are applied.
2	Concentration of bait in the spraying solution	2-3%
3	Quantity of bait spraying solution applied per tree	300ml.
4	Ratio of trees to be sprayed (pest risk level, if applicable)	All trees or half of them.
5	Means of spraying application (tractor or other, and their availability, describe)	Tractors
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	The air temperature and wind speed limits are empirically considered during sprayings.
7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	Acetamiprid (cover spraying), Beauveria bassiana (cover spraying), Deltamethrin (cover spraying), Lambda-Cyhalothrin (bait spraying), Aluminum silicate (cover spraying), Spinosad (bait spraying), Zeta-cypermethrin (bait spraying), Flupyradifurone (cover spraying), Cyantraniliprole (bait cover).
8	PHI for each a.i.	Acetamiprid (7 days), Beauveria bassiana (N/A), Deltamethrin (7 days), Lambda-Cyhalothrin (7 days), Aluminum silicate (N/A), Spinosad (14 days), Zeta-cypermethrin (7 days), Flupyradifurone (cover spraying) (14 days), Cyantraniliprole (bait cover) (7 days).
9	Selectivity of a.i. for natural enemies and pollinators	Acetamiprid and deltametrhin cause adverse affects on many non-target arthropods and aquatic organisms. Spinosad is harmful to aquatic organisms, but less toxic to non-target arthropods.
10	Other information	-

4.1.7. Beneficial Insect Monitoring

The beneficial insect monitoring in the *OliveFlyNet* large-scale site of BEN is described in the following table.

Table 4.7. Beneficial insect monitoring in the OliveFlyNet large-scale site of BEN

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data recorded
2.	Means and methods for beneficials' monitoring	No data recorded
3.	Other information	

4.1.8. The OliveFlyNet wide-area site in Greece

In the following figure an olive tree of cv. Koroneiki of the OliveFlyNet site in Metamorphosis, Greece is shown.

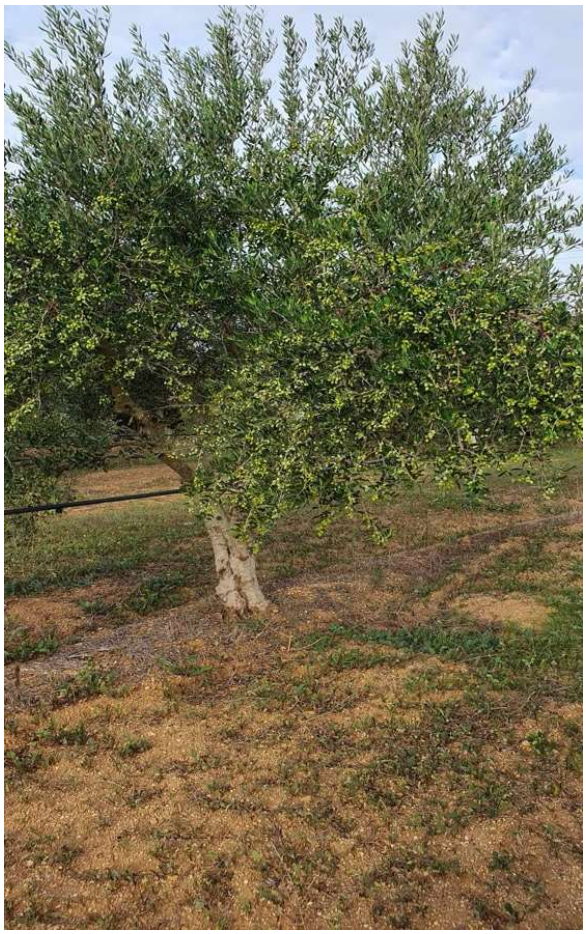


Figure 4.1. Olive tree, cv. Koroneiki, in the OliveFlyNet site of BEN (Metamorphosis, Greece)

In the following figure an orchard of the OliveFlyNet site in Metamorphosis, Greece is shown.

Figure 4.2. Rows of olive trees (cv. Kalamon) in the OliveFlyNet large-scale site of BEN (Metamorphosis, Greece)

4.2. BEN OliveFlyNet: Digitized Field Data

The digitized field data of the *OliveFlyNet* large-scale site of BEN in Metamorphosi Laconia are given in maps. The maps have been generated by the geodatabase.

4.2.1. Experimental site

Metamorphosi is a small village in south Peloponnese, Greece. It is part of the Monemvasia Municipality. The location of Metamorfosi is shown in the following figure.

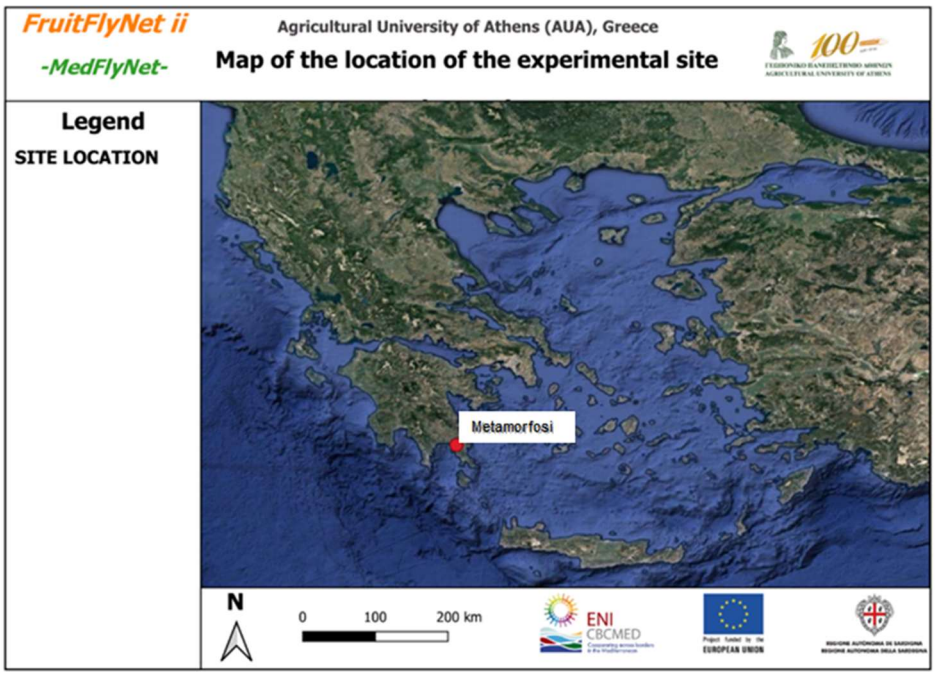


Figure 4.3. Map of location the OliveFlyNet large-scale site (Metamorphosi , Greece)

The borders of the site are shown in the following figure.

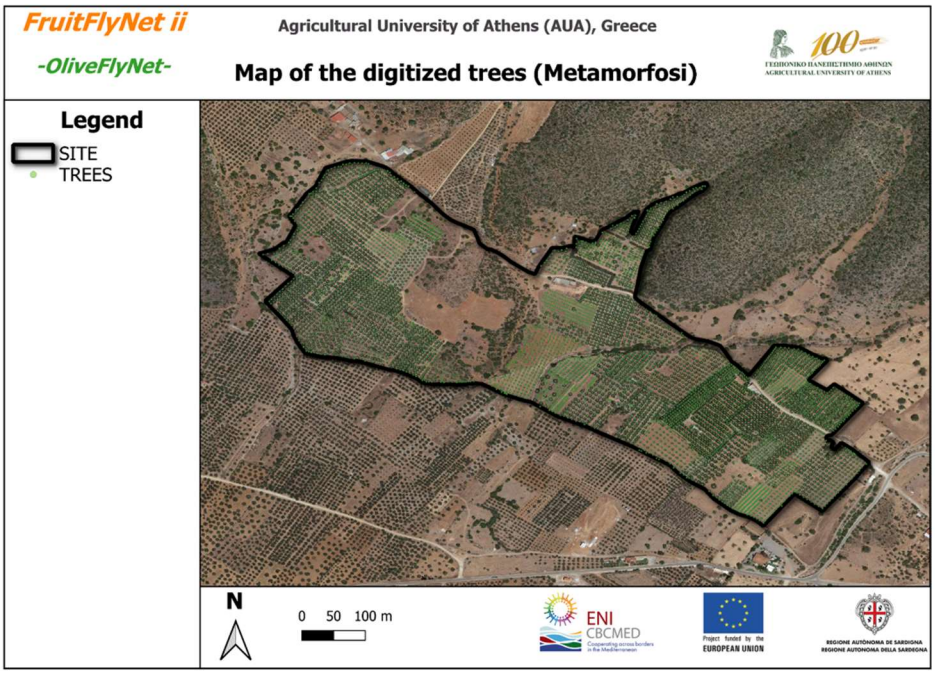


Figure 4.4. Map of the OliveFlyNet large-scale site

4.2.2. Trees of the experimental site

The position of the trees in the olive orchards of the large-scale site of Arkadiko are shown in the following figure.

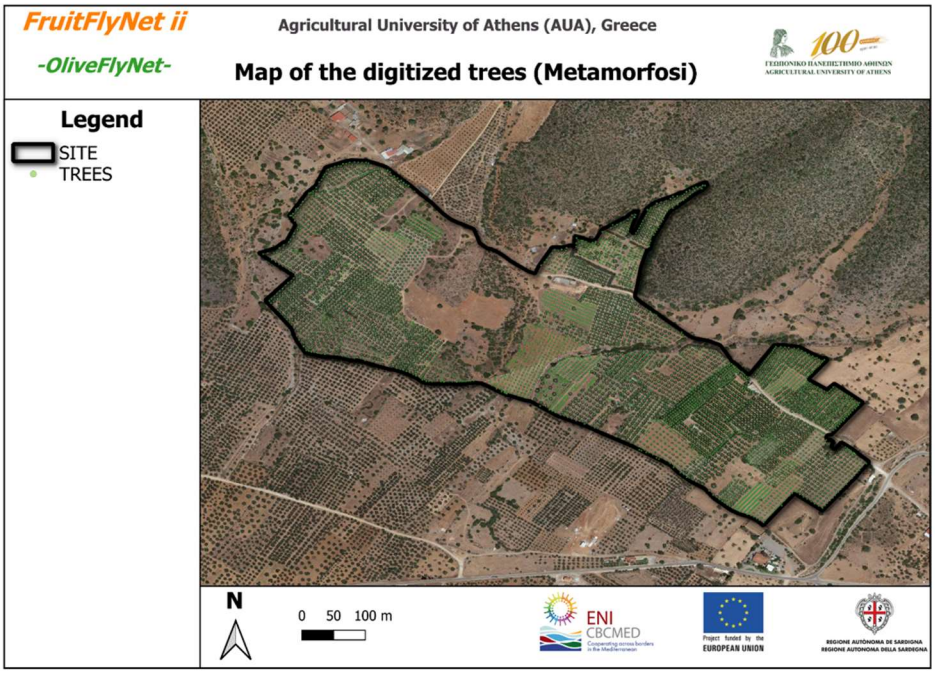


Figure 4.5. Map of the trees of the OliveFlyNet large-scale site (trees as points)

4.2.3. Orchards of the experimental site

The different orchards of the *OliveFlyNet* large-scale of BEN are shown in the following figure.

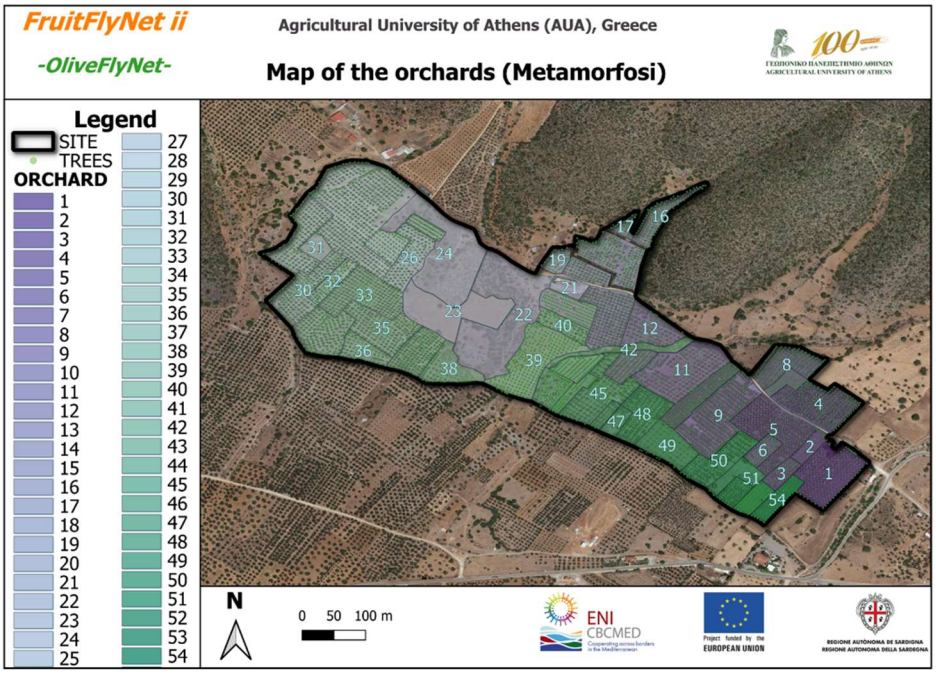


Figure 4.6. Map of the orchards of the OliveFlyNet large-scale site

4.2.4. Land uses of the experimental site

The land uses and their description of the *OliveFlyNet* large-scale of BEN are shown in the following figure.

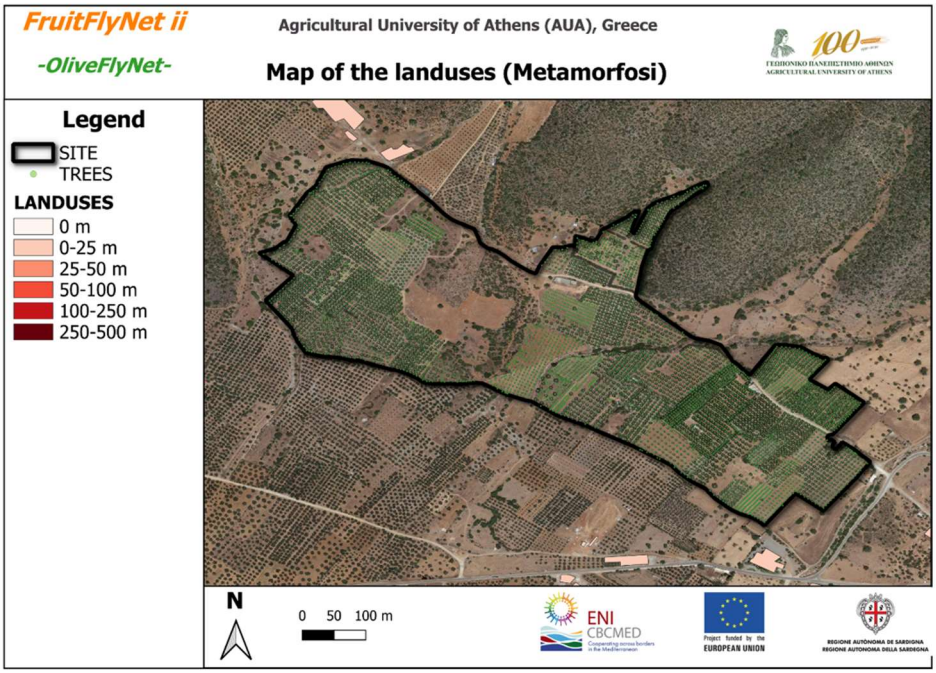


Figure 4.7. Map of the land uses of the OliveFlyNet large-scale site

4.2.5. Traps

The indicative position of the yellow sticky e-traps established in the large-scale site of *OliveFlyNet* of BEN are shown in the following figure.

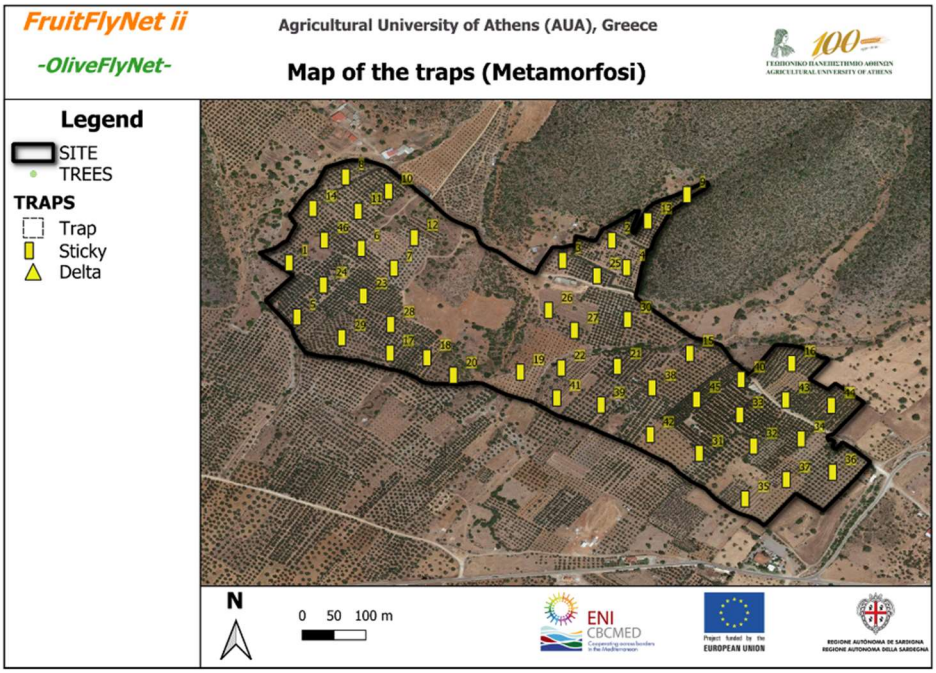


Figure 4.8. Map of the location of the traps

In the next figure it is shown the screen of the mobile GIS where the layers of site borders, traps and trees have been uploaded. The mobile can help in the navigation in the field and collection of georeferenced field data.

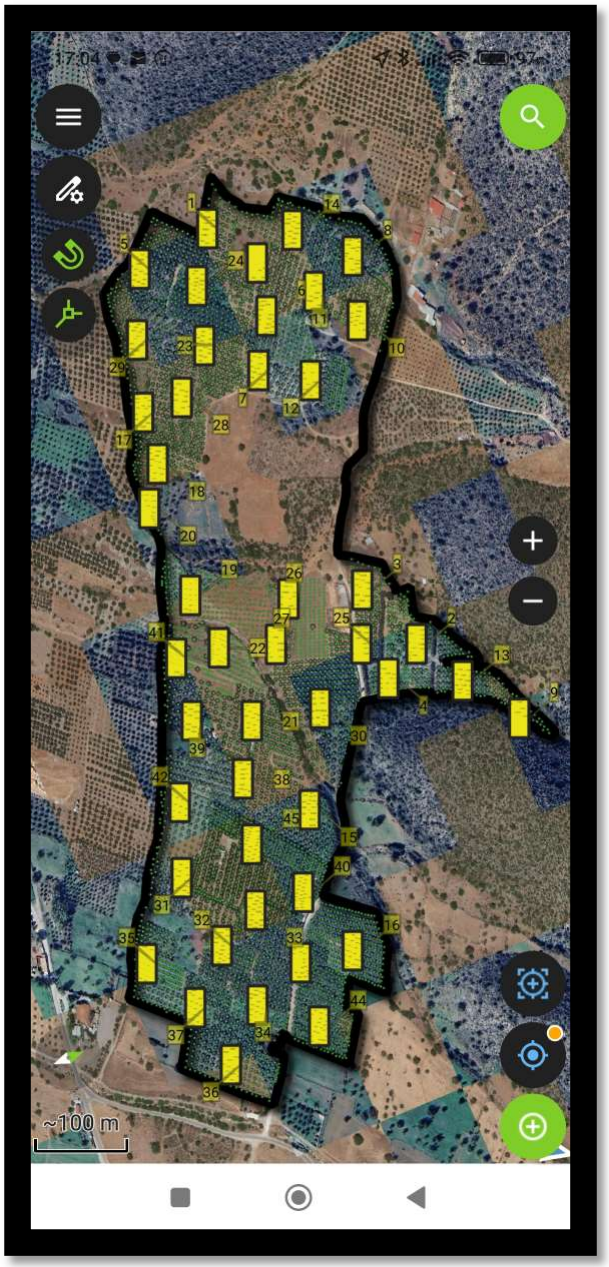


Figure 4.9. Mobile GIS- Trees and Trap network

Details of the trees and traps as uploaded in the GUI of the mobile GIS are shown in the next figure.

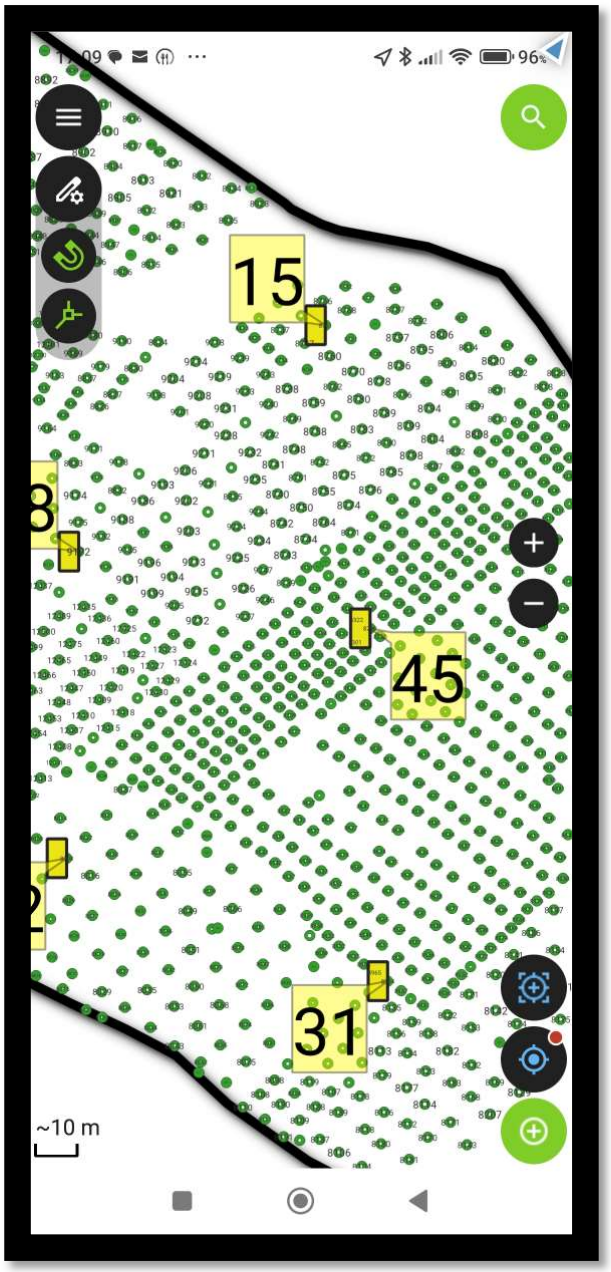


Figure 4.10. Mobile GIS- Trees and Trap network (zoom in)

Each tree or trap has an ID that is essential for field navigation and data collection i.e. in the case of trees data per selected tree about its fruit load, BBCH or for fruit sampling to record infestation rates.

The QField layers of the mobile GIS are shown in the next figure.

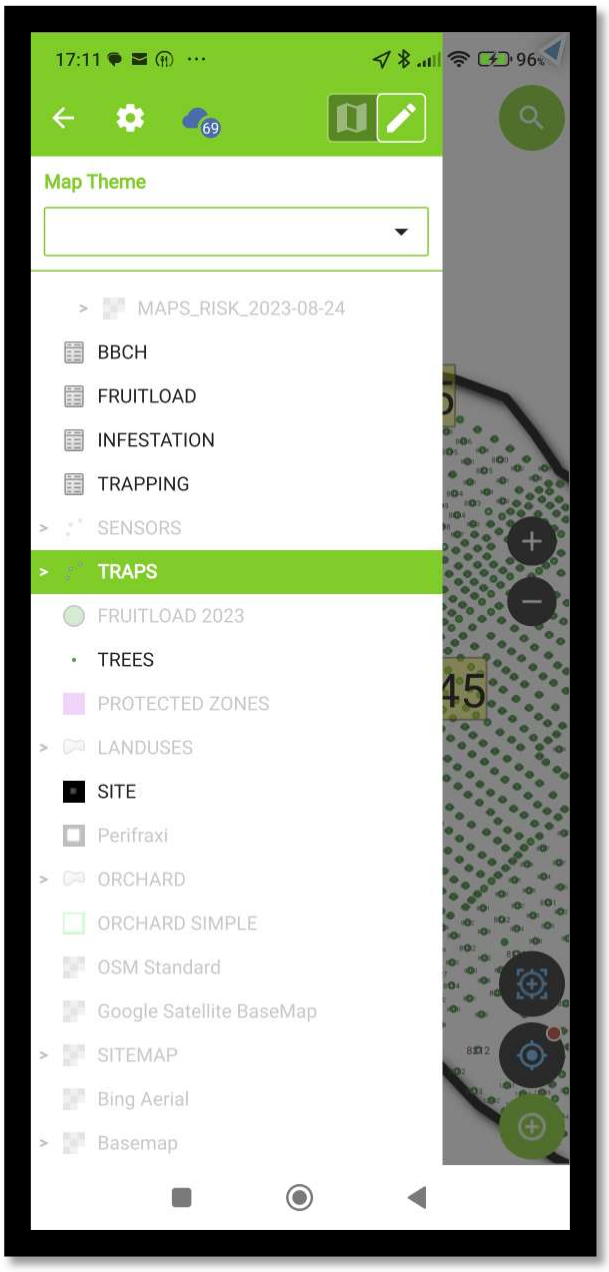


Figure 4.11. Mobile GIS – QField layers

The use of the mobile GIS to locate a trap is shown the following figure.

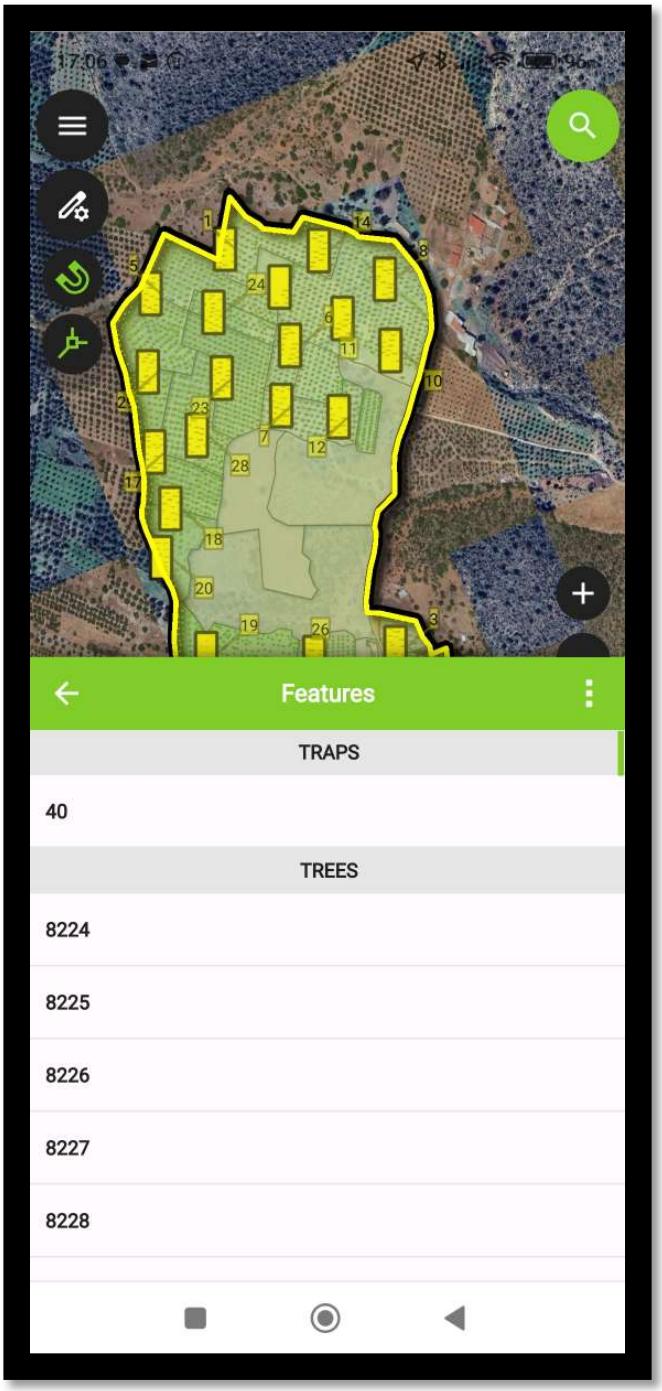


Figure 4.12. Mobile GIS – Trap by location

The use of the mobile GIS to edit the details of a trap is shown in the next figure.

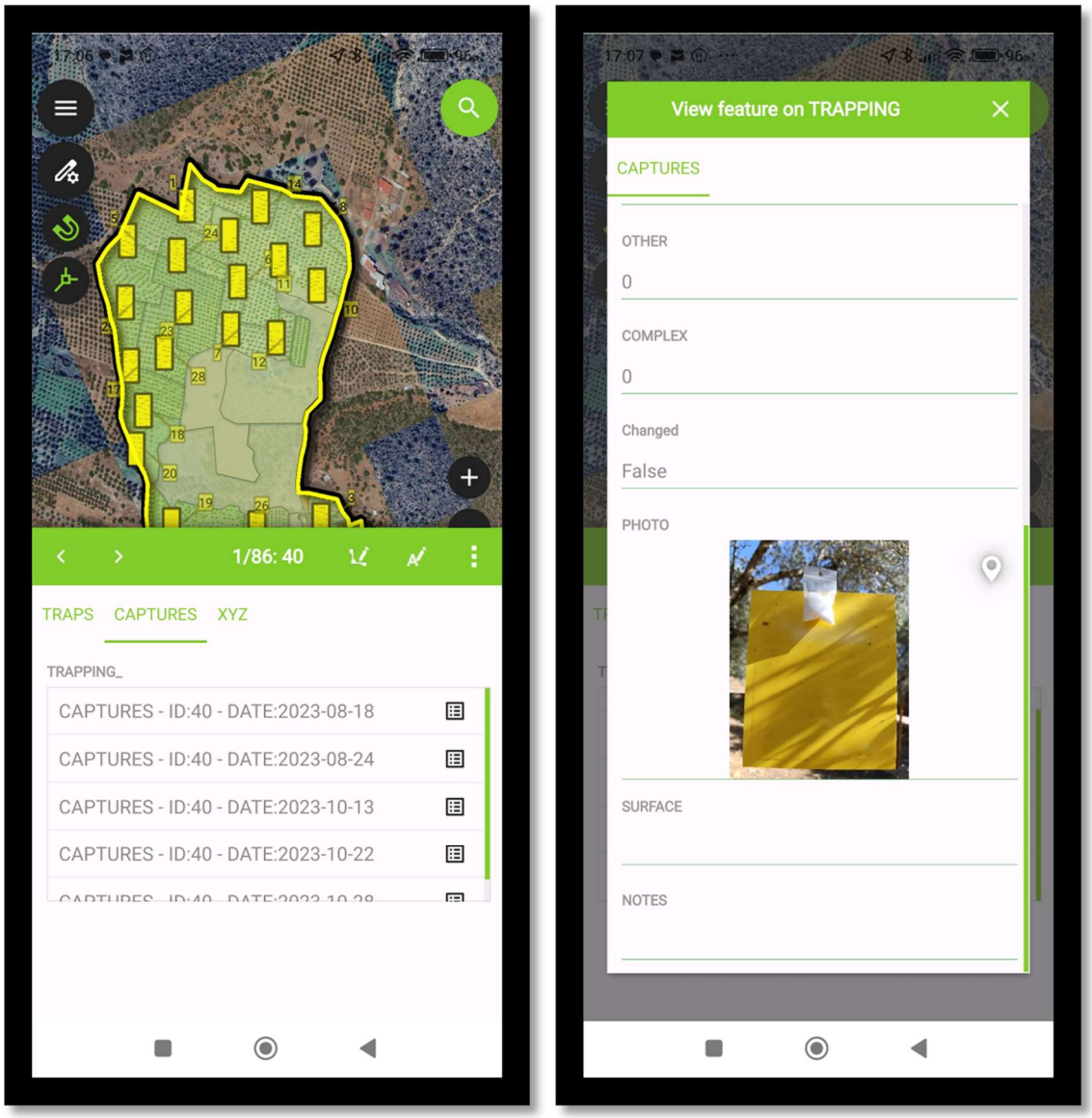


Figure 4.13. Mobile GIS – Trap editing

4.2.6. Protected zones

The protected areas were created using the national legislation and the land-uses (i.e., buildings) that were nearby and inside the experimental site. The size of the buffer zones changes according the active ingredient of the spraying solution. The map of the buffer zones for pesticide hazard category *none* are shown in the following figure.

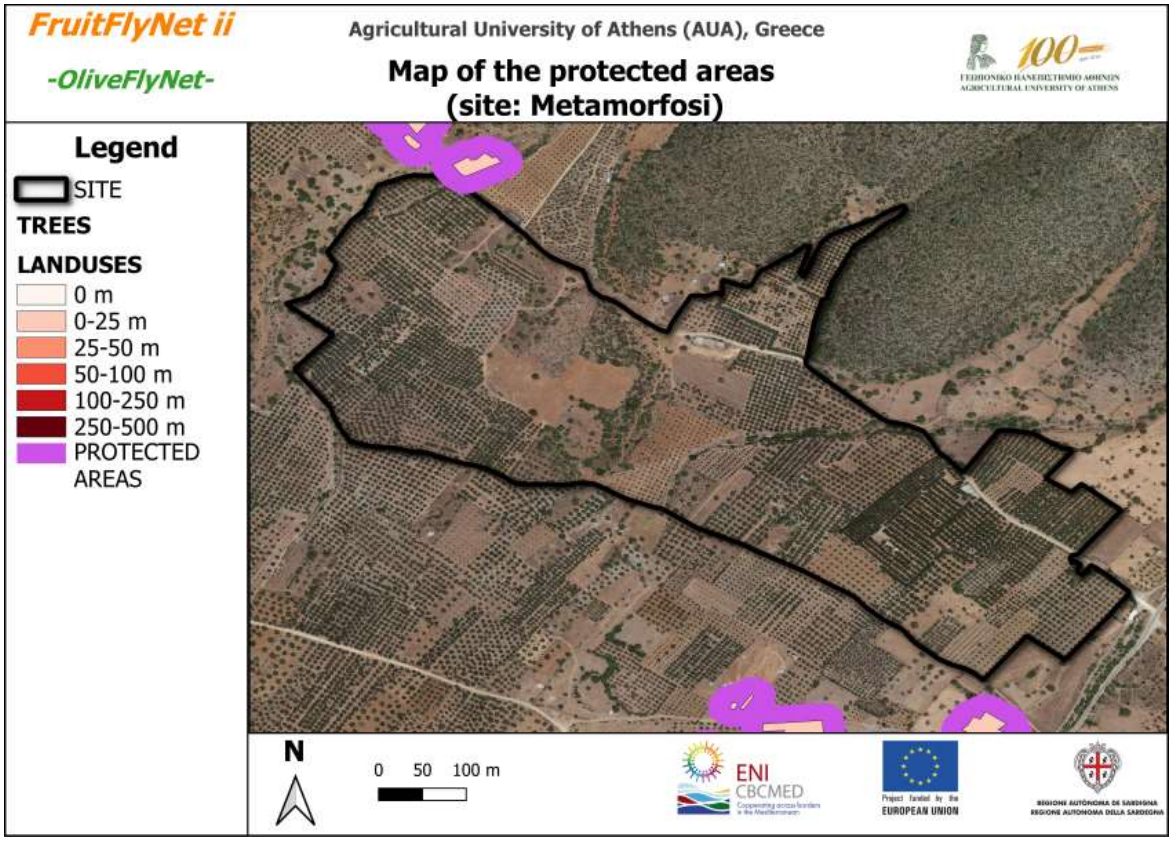


Figure 4.14. Map of the protected zones (Hazard:none)

5. BEN MedFlyNet

In this section the data for the additional *MedFlyNet* wide-area-scale site of BEN in the village Foiniki, Laconia, used by BEN in 2023 are given. This new wide-area site was used by BEN in the effort to test the *MedFlyNet* e-traps and monitor the Medfly in citrus orchards with fruits at a sensitive stage for the Medfly during summer and before the end of the project. In the area of Foiniki the cv. Valencia is cultivated having fruits that mature in summer and thus these orchards were suitable for the field activities.
In the first part of this deliverable, the details of the crops and their cultivation techniques, the information about the target pest and its control are shown in a table format. In the second part, the maps of the digitized field elements that are required to operate the LAS services in the site are given. Each map has been produced using LAS methodology and stored in the developed geodatabase. The mobile GIS was used for the collection of field data.

5.1. BEN MedFlyNet: Crop and pest field data in Foiniki, Laconia

The large-scale site of BEN is consisted of citrus orchards belonging to 6 owners. The orchards lie within other citrus orchards in the village of Foiniki, in the south-east of Sparta, an area of the most important for citrus production in Greece. The cultivation practices are similar among the orchards. The Medfly is a serious pest in this area and farmers use sprays to control it. Details are given in the following tables.

5.1.1. Test site

The details of the site are described in the following table.

Table 5.1. Crop data of the MedFlyNet wide-area site of BEN

1.	Target pest	*Ceratitis capitata* (Medfly)
2.	Name of the site area	Foiniki, Laconia
3.	Total site surface (ha)	25ha
4.	Dimensions of the site	920m, 440m
5.	Number of different orchards included and type of owner(s) - describe	6 owners
6.	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	The surface of the site is flat, with no elevations.
7.	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	See respective figure.

8.	Indicate in the map any areas to be protected within the site or close by (i.e. houses, water bodies, water pumps, etc.).	There are water pumps+++
9.	Give information for the surrounding vegetation/crops of the site	Citrus crops.
10.	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	It is only citrus.
11.	Indicate the road network and accessibility of the site and each orchard, as applicable.	It has been included in the maps.
12.	Indicate sources of electricity or drinkable water, if any.	Sources in water pumps.
13.	Provide a few representative photos of the orchard elements (a tree, a row of trees etc)	See figures.
14.	Other information	-

5.1.2. Trees and practices

Tree data and cultivation practices of the *MedFlyNet* wide-area of BEN in Foiniki, Laconia are given in the following table.

Table 5.2. Tree data and cultivation practices of the MedFlyNet wide-area site of BEN

1.	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	IPM
2.	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	cv. Valencia (sensitive period: July and August) cv. Clementine (sensitive period: August and September)
3.	Tree age	10-40 years old
4.	Tree density (trees/ha)	≈500/ha
5.	Tree height	≈2.5-3m
6.	Tree canopy diameter	≈4-5m
7.	Planting system (i.e. linear)	Linear
8.	Distance between the trees (in the row and between the rows)	≈4.5X4.5m
9.	Tree shape - Pruning	Spherical
10.	Fertilization method and its frequency	Chemical fertilizers, frequency per season: 1 application of soil fertilization and 3 applications of leaf fertilization
11.	Irrigation method and its frequency	Micro sprinklers.

12.	Weed control	Herbicides/ brush cutter.
13.	Neighboring fruit fly host crops – possible infestation sources	Figs scattered at distances of 200-500 m.
14.	Foreseen fruit load for this year production	≈30-50tn/Ha
15.	Discuss other possible variation sources in infestation levels across the site (i.e. due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.).	There is no variation in height, slope, only the existence of different varieties (Valencia, Clementine) which may influence the levels of infestation.
16.	Other information	-

5.1.3. Target pest monitoring

The data for the target pest monitoring the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 5.3. Data for the target pest monitoring of the MedFlyNet wide-area site of BEN.

1.	Target pest	*Ceratitis capitata*
2.	Period of monitoring i.e. per orchard/cultivar, as applicable	cv. Valencia (July, August, September) cv. Clementine (August, September and October)
3.	Type(s) of traps	McPhail.
4.	Bait(s) used	Ammonium salts and hydrolysed proteins.
5.	Trap density/ha for monitoring	1/5 ha.
6.	Time interval for trap captures monitoring	7 days.
7.	Method for fruit damage monitoring	Fruit samplings (5 per tree from 10 trees) during the sensitive period to record the eggs, larvae and pupae in the fruits.
8.	Infestation levels in the orchard in the previous years, data of pest levels/damages	≈10%
9.	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Aleurothrixus floccosus, Thrips, Archips rosanus, Calocoris*.
10.	Common diseases	*Phoma tracheiphila, Phytophthora citrophthora, P. syringae*
11.	Other information	-

5.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 5.4. Data for meteorological data monitoring of MedFlyNet large site of BEN

1.	Add information about the climatic conditions of the area of the site in annual basis	The area has a hot Mediterranean climate. The average high monthly temperature is 29.4°C, the mean is 12.1°C, the average low is 11.8°C, the average precipitation is 604.6mm (climate data from Molaoi meteorological station (2018 - 2022).
2.	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	• For pest monitoring: Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction), precipitation per day. • For spraying: Temperature (at least every 30 minutes), RH (at least every 30 minutes), wind speed and direction and precipitation (at least every 15 minutes)
3.	Add information for any meteorological station in the area, if exist.	Meteorological station of the National Observatory of Athens Service in Molaoi, Laconia, at a distance ≈4 Km from the site. Longitude : 22.85814° E Latitude : 36.79956° N (WGS 84) Altitude: 128m
4.	Other information	-

5.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 5.5. Spraying decision rules for the target pest in the MedFlyNet large site of BEN

1.	Describe the spraying decision process	Presence of stings on the fruits.
2.	Pest capture critical densities during the season	Not in use.
3.	Fruit damage threshold during the season	Not in use.
4.	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	The change of fruit colour at veraison.
5.	Models or prediction, if available	Not available.
6.	Other information	-

5.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *MedFlyNet* wide-area site of BEN are given in the following table.

Table 5.6. Bait spraying application procedures against the target pest in the MedFlyNet wide-area site of BEN

1.	Type of spraying used (cover spraying or bait spraying) (describe)	In the cover sprayings the active ingredient deltamethrin is used. In the bait sprayings deltamethrin is mixed with hydrolysed protein.
2.	Concentration of bait in the spraying solution	2-3%
3.	Quantity of bait spraying solution applied per tree	300ml.
4.	Ratio of trees to be sprayed (pest risk level, if applicable)	All trees or half of them.
5.	Means of spraying application (tractor or other, and their availability, describe)	Tractors
6.	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	The air temperature and wind speed limits are empirically considered during sprayings.
7.	Registered insecticides (a.i.) against the target pest in IPM and organic crops	Acetamiprid, Beauveria bassiana, Deltamethrin, Lambda-Cyhalothrin
8.	PHI for each a.i.	Acetamiprid: 14days. *Beauveria bassiana*: NA. Deltamethrin: 30days. lambda-Cyhalothrin: 7days.
9.	Selectivity of a.i. for natural enemies and pollinators	Acetamiprid and deltametrhin cause adverse affects on many non-target arthropods and aquatic organisms. Spinosad is harmful to aquatic organisms, but less toxic to non-target arthropods.
10.	Other information	-

5.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the *MedFlyNet* large site of BEN is described in the following table.

Table 5.7. Beneficial insect monitoring

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data recorded
2.	Means and methods for beneficials' monitoring	No data recorded
3.	Other information	-

5.1.8. The MedFlyNet wide-area site in Greece

A Citrus tree (cv. Valencia) in the MEDFlyNet site of BEN (Foiniki, Greece) is shown in the following figure.

Figure 5.1.Citrus tree (cv. Valencia) in the MEDFlyNet site of BEN (Foiniki, Greece)

An orchard of citrus trees (cv. Valencia) in the MEDFlyNet large-scale site of BEN (Foiniki, Greece) is showing in the following figure.

Figure 5.2. Rows of citrus trees (cv. Valencia) in the MEDFlyNet large-scale site of BEN (Foiniki, Greece).

5.2. BEN MedFlyNet: Digitized Field Data

The digitized field data of the *MedFlyNet* wide-area site of BEN are given in maps. The maps have been generated by the geodatabase.

5.2.1. Experimental site

Foiniki is a town and a former municipality in south Peloponnese, Greece. It is part of the municipality of Monemvasia.

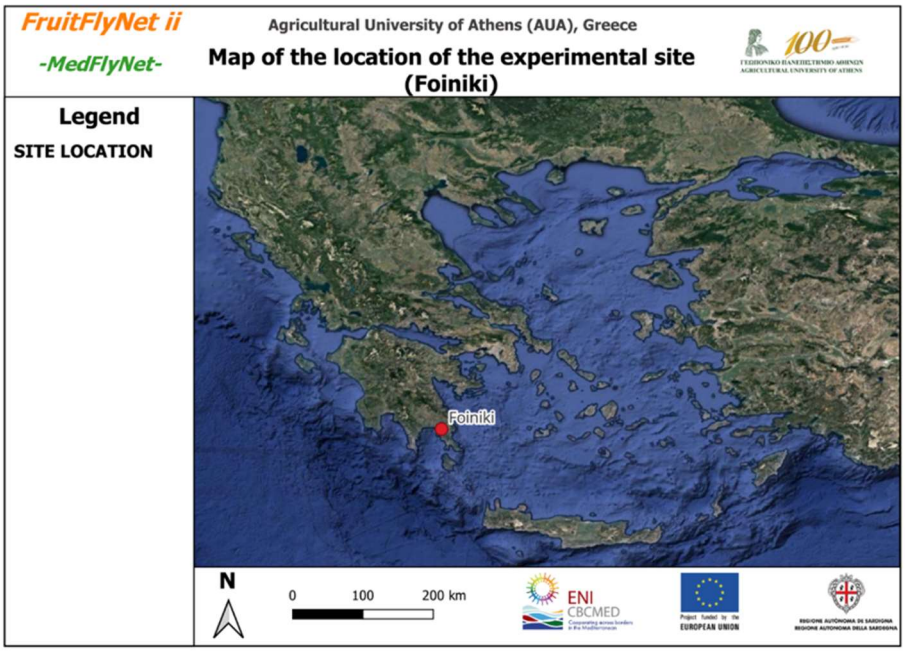


Figure 5.3. Map of the location of the wide-area site (Foiniki , Greece)

The borders of the site are shown in the following figure.

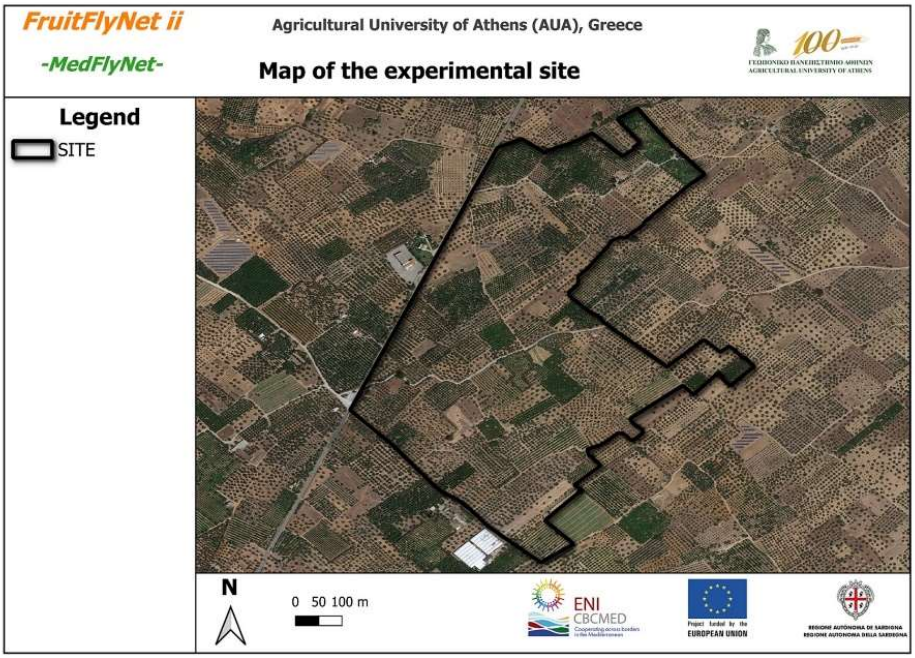


Figure 5.4. Map of the wide-area site

5.2.2. Trees of the experimental site

The position of the trees in the citrus orchards with the sensitive cultivars in the period of the study of the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

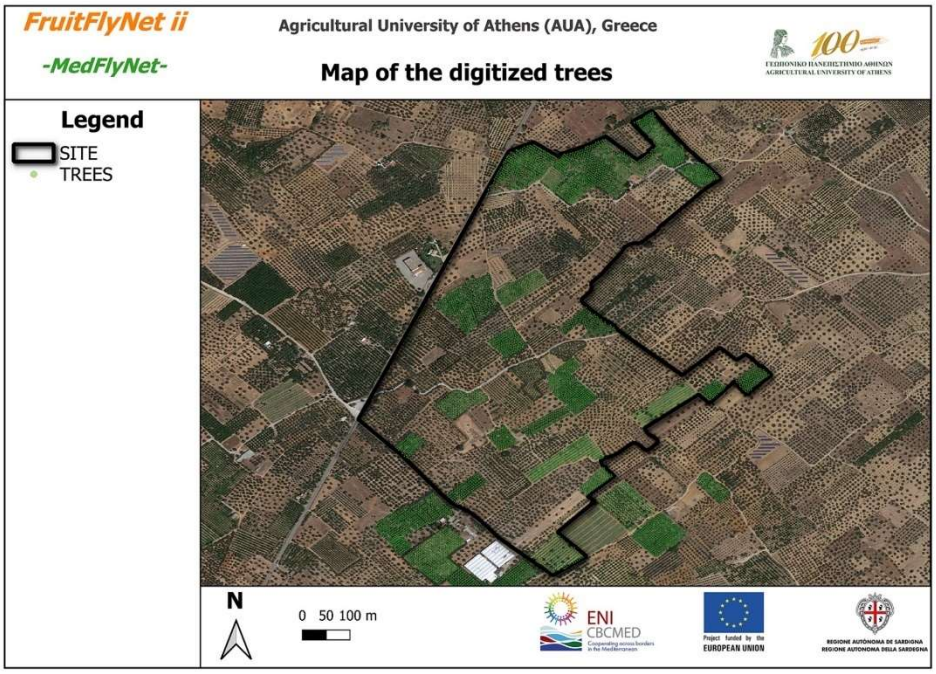


Figure 5.5. Map of the trees in the wide-area site (with overview).

5.2.3. Orchards of the experimental site

The different orchards of the large-scale site of *MedFlyNet* of BEN are shown in the following figure.

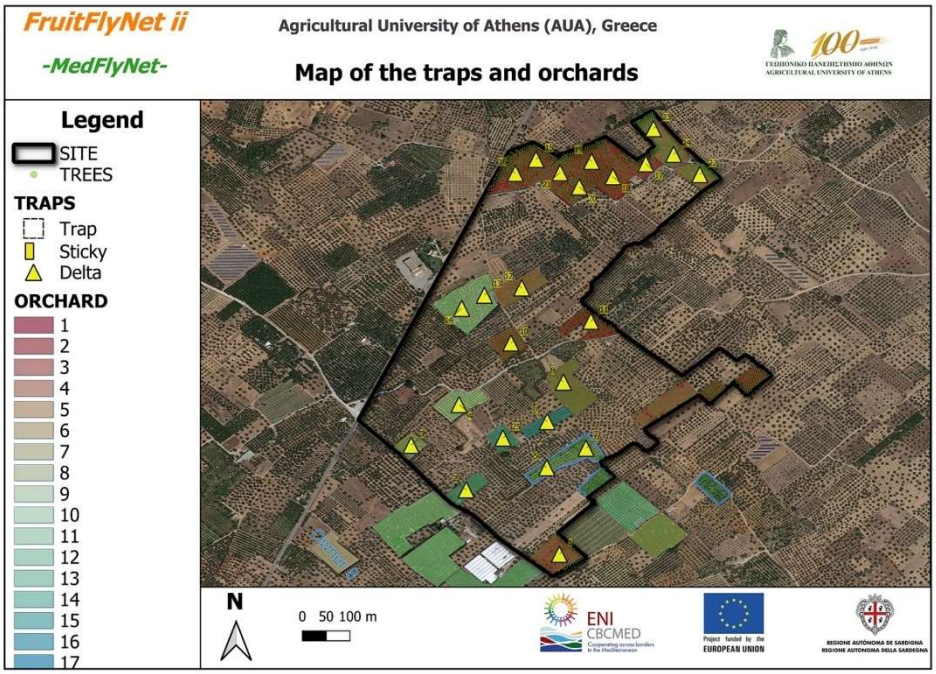


Figure 5.6. Map of the orchards in the wide-area site

5.2.4. Sensors

The indicative position of the sensors to be established in the large-scale site of MedFlyNet of BEN are shown in the following figure.

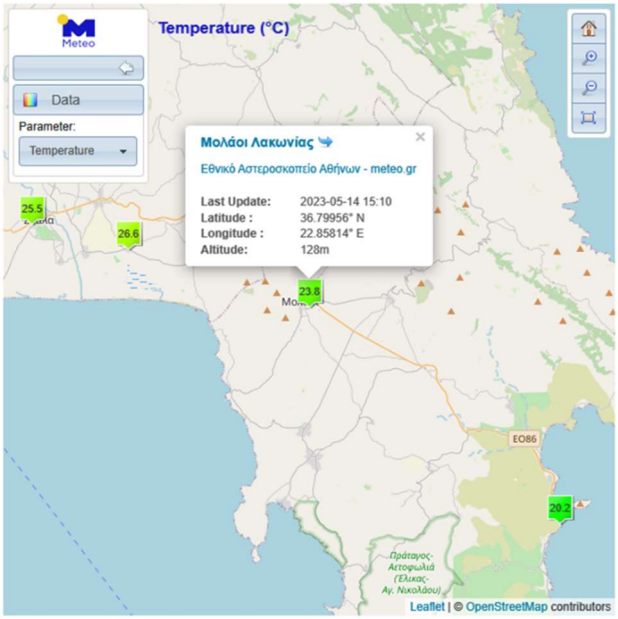


Figure 5.7. Map of the location of the sensors in the wide-area site

5.2.5. Traps

The indicative position of the yellow sticky e-traps to be established in the large site of MedFlyNet of BEN is shown in the following figure.

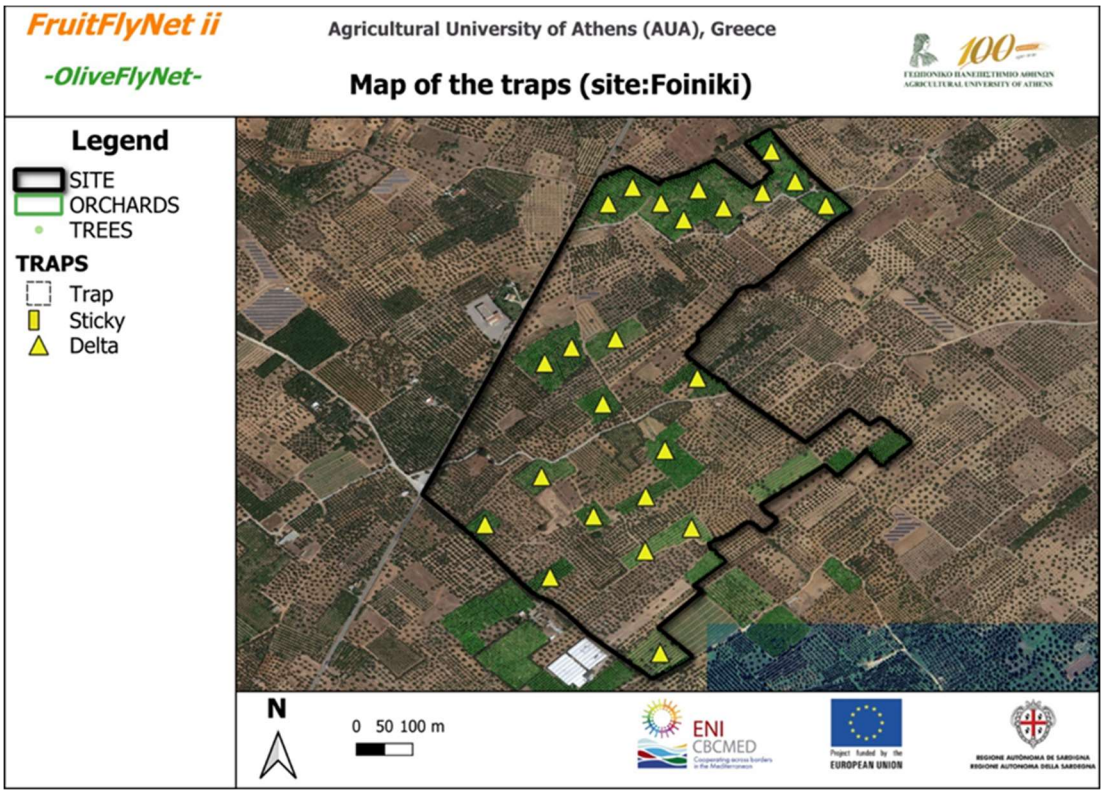


Figure 5.8. Map of the location of the traps in the wide-area site

6. PP1 OliveFlyNet

In this reporting period (01/12/2022 – 31/10/2023) the Geodatabase was updated to incorporate the changes found in the field. The year 2023, 15 e-traps, out of a total of 52 traps, have been placed in the wide-area, as shown in the following picture. All the updates to the Geodatabase were sending to BEN in order to develop a mobile GIS project in QFiled app that could be used for field data collection. The credentials for this mobile GIS project were received on 20th September 2023 and the GIS mobile was used until the end of the sampling period on 17th October 2023. With the filed data of the dates of the sampling period, olive fly population, infestation, BBCH phenological state, risk and spray density maps were done for a visual interpretation of the data and as improvement for decision making. The wide-area site of PO1 is consisting of olive orchards of 25.2 Ha located in the area where olives, almonds, and vegetables are cultivated. The olive fruit fly causes serious damage in this area. Details are given in the following tables.

6.1. Test site

The details of the site are described in the following table.

Table 6.1. Crop data of the OliveFlyNet wide-area site of PP1

1	Target pest	Olive Fly *(Bactrocera oleae)*
2	Name of the site area	Rivera Alta
3	Total site surface (ha)	26.27
4	Dimensions of the site	0.534 km x 0.512 km
5	Number of different orchards included and type of owner(s) - describe	A single orchard and a single owner
6	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	128 meters above sea level. 37º 57´05” N 4º 37´30” W Northern part of the plot with humidity and irregular relief, near the reservoir.
7	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	In the east and northeast there are uncultivated plots, dedicated to grazing. https://earth.google.com/earth/d/1ZFBuYzAkuKCPb6al76t5rWK9zzmBi33l?usp=sharing
8	Indicate in the map any areas to be protected within the site or close by (i.e. houses, water bodies, water pumps, etc.)	The wide-area site has only one protected area, a water bodie for human consumption. The buffer zone is 50 m from the edge of the water bodie. Indicated on the map (Annexed 1) and https://earth.google.com/earth/d/1ZFBuYzAkuKCPb6al76t5rWK9zzmBi33l?usp=sharing

9	Give information for the surrounding vegetation/crops of the site	There are uncultivated plots, other areas destined to different crops such as: almond, quinoa, garlic or onion.
10	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	Indicated on the map https://earth.google.com/earth/d/1ZFBuYzAkuKCPb6al76t5rWK9zzmBi33l?usp=sharing
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	National road access Co-3103 km 4,9 Two accesses. (Indicated on Google Earth map as main and secondary entrance).
12	Indicate sources of electricity or drinkable water, if any.	There are no drinking fountains. Electricity is supplied by the general power line in the área, owned by the energy distribution company, Endesa. Inside the wide -area, it is distributed by its own network.
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc.).	 
14	Other information	

6.2. Trees and practices

Tree data and cultivation practices of the *OliveFlyNet* wide-area site of PP1 are given in the following table.

Table 6.2. Tree data and cultivation practices of the OliveFlyNet large site of PP1

1	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	IPM
2	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	The wide area is dedicated to olive groove. The olive's cultivars are all for olive oil: • Picual, medium size drupe, medium-high sensitivity to olive fly, harvesting in December. • Nevadillo Azul, medium-big size drupe, medium sensitivity to olive fly, harvesting from mid-November to December. Protection period is similar to all cultivars, usually from September to harvesting date. Harvest time for the cultivation of the olive tree from 50 to 60 days. High sensitivity to the target pest for olive cultivation.
3	Tree age	20 years
4	Tree density (trees/ha)	250 Trees per hectare
5	Tree height	Between 4 and 6 meters
6	Tree canopy diameter	5 meters
7	Planting system (i.e. linear)	linear
8	Distance between the trees (in the row and between the rows)	The distance of the trees in the row is 5 meters. The distance between rows is 8 meters.
9	Tree shape - Pruning	Spherical shape
10	Fertilization method and its frequency	Fertigation four times a year.
11	Irrigation method and its frequency	Drip irrigation once a week.
12	Weed control	Control by pre-emergent herbicide and brush cutter.
13	Neighboring fruit fly host crops – possible infestation sources	Does not apply.
14	Foreseen fruit load for this year production	6.000-8.000 kg/ha
15	Discuss other possible variation sources in infestation levels across the site (i.e. due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc)	The area near the reservoir has a more adverse terrain with unevenness and more humidity, which is why there could be a higher incidence of attack. The west and northwest zone near the Guadalmellato river, also presents a zone of humidity and with it a greater probability of attack.
16	Other information	Only olives for the mill. No type of tillage is carried out.

6.3. Target pest monitoring

The data for the target pest monitoring the *OliveFlyNet* wide-area site of PP1 are given in the following table.

Table 6.3. Data for the target pest monitoring of the OliveFlyNet large site of PP1

1	Target pest	*Bactrocera oleae*
2	Period of monitoring i.e. per orchard/cultivar, as applicable	Generally, the monitoring period startsat the beginning of the phenological state H, usually in July-August, to the harvesting time (mid-November to December).
3	Type(s) of traps	McPhail and chromotropics.
4	Bait(s) used	Biamonic phosphate 4% and pheromones.
5	Trap density/ha for monitoring	3 McPhail and 3 chromotropics for the whole farm. The technical staff of the IPM association, which the farm is a member, places the traps and do the field visits.
6	Time interval for trap captures monitoring	Sampling every 15 days while the fruit is in matte green stage and each week from the moment it changes to bright green, in September generally.
7	Method for fruit damage monitoring	Sampling 20 homogeneous olive trees in the whole farm. Fruit monitoring period and frequency is the same than the traps. Area with usual problems (more than 10% chopped fruit if not treated). Take 10 fruits/sampling tree taken from all directions.
8	Infestation levels in the olive groves in the previous years, data of pest levels/damages	2019 Flies per trap and day (McPhail): 49.71. Flies per trap and day (Yellow sticky trap) 33.07. Damage: 9.50% olive fruit with puncture. 2020 Flies per trap and day (McPhail): 6. Flies per trap and day (Yellow sticky trap): 6.6. Damage: 9.25% olive fruit with puncture.
9	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Prays oleae, Saissetia oleae*
10	Common diseases	*Verticillium dahliae, Spilocaea oleagina,*
11	Other information	

6.4. Meteorological Data Monitoring

The means for the meteorological data monitoring the *OliveFlyNet* wide-area site of PP1 are given in the following table.

Table 6.4. Data for meteorological monitoring of the PP1 OliveFlyNet wide-area site

1	Add information about the climatic conditions of the area of the site in annual basis	It is characterized by a warm and temperate climate, with warm and rainy winters. Classified as Mediterranean climate (Köpen- Geiger). It has an average annual temperature of 17.9 ºC with maximums of 40 ºC and minimums of 3 ºC. The average annual rainfall is 545 mm.
2	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	The main metereorological parameters to be monitored are temperature (maximum, minimum, average), wind speed, and relative humidity. Temperature study is decisive in the development, mating, oviposition (higher temperatures of 14ºC) and intensity of the fly attack. High relative humidity and mild temperature define endemic areas.
3	Add information for any meteorological station in the area, if exist.	Agroclimatic Station of Córdoba, located about 18 km from the evaluated area. Latitude: 37º 51' 25'' N. Longitude: 04º 48' 10'' W. Altitude: 94 m.
4	Other information	

6.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *OliveFlyNet* wide-area site of PP1 are given in the following table.

Table 6.5. Spraying decision rules for the target pest in the OliveFlyNet wide-area site of PP1

1	Describe the spraying decision process	The data resulting from the monitoring are compared with the treatment threshold. If them exceed the threshold, a treatment is needed. The treatment thresholds for the first treatment are: – 1 olive fly/McPhail/day and 1% fruit with puncture, or – 5 olive fly/yellow sticky trap/day and 1% fruit with puncture. The thresholds for the second and successive treatments are: – 1 olive fly/McPhail/day and 1% fruit with new puncture, or – 3 olive fly/yellow sticky trap/day and 1% fruit with new puncture. If the treatment moment is closed to the harvesting time, it will be a bait treatment. At other moment, it will be cover treatment.
2	Pest capture critical densities during the season	During the last season, the above-mentioned (point 1 of this table) thresholds were followed. The dates with critical captures were: 03/10/2022: 10 flies per trap and day 03/11/2022:20 flies per trap and day 10/11/2022: 27 flies per trap and day

3	Fruit damage threshold during the season	1.25% olive fruit with puncture, 17/10/2022. 2.25% olive fruit with puncture, 03/11/2022. 2.75% olive fruit with puncture: 23/11/2022.
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	When the fruit has a matte green color, sampling should be carried out every 15 days. Once it changes to bright green, they will be made every week. At the time the threshold is exceeded, bait treatments would be performed and then if necessary, treatment in the total plant. The size of the fruit would be another factor to consider. When the size is shown about 1 cm coinciding with the principle of phenological state H "Hardening of bone", until veraison. Perform the same sampling procedure as for color. Preference for varieties of earlier maturation. In this case, the farmer has a field technician who carries out the monitoring with the indications described in this section.
5	Models or prediction, if available	No models or prediction system is used by the farmer.
6	Other information	

6.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the OliveFlyNet large site of PP1 are given in the following table.

Table 6.6. Bait spraying application procedures against the target pest in the OliveFlyNet wide-area site of PP1

1	Type of spraying used (cover spraying or bait spraying) (describe)	Cover spraying treatment usually, using an atomizer. When the treatment is closed to harvesting time, it will be a bait treatment.
2	Concentration of bait in the spraying solution	For cover treatment: Acetamiprid 20% (SP) p/p concentration 0.3 kg/ha Deltametrin 2.5% (EW)p/v 0.4-0.7 l/ha For bait treatment: Spinosad 0.024% 1L/ha
3	Quantity of bait spraying solution applied per tree	Spinosad 0.024%, 0.028 l/tree
4	Ratio of trees to be sprayed (pest risk level, if applicable)	The farmer doesn't use any risk map. The treatment is applied to all trees equally, in the case of a cover treatment. If the treatment is with bait, it is applied to 1 of every 4 rows.
5	Means of spraying application (tractor or other, and their availability, describe)	Treatment with tractors and atomizer. Immediate availability.
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	In Spain, the national law doesn't set an exact value for the climatic conditions to stop the spraying. However, farmer usually stop spraying when the temperature or wind speed is too high (about 4 m/s or more) or start the rain.

		Critical climatic conditions for the area during spraying are: 75%RH, 55mm precipitation and 24 ºC temperature. Wind speed is not considered critical in the area.
7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	Acetamiprid 20% (SP) p/p Cipermetrina 5% (EC) p/v Deltametrina2.5 %(EW) p/w Spinosad 0.024% (CB) p/v
8	PHI for each a.i.	Acetamiprid 20% (SP) p/p, 28 days. Cipermetrina 5% (EC) p/v, 3 days. Deltametrina 2.5 %(EW) p/w, 7 days. Spinosad 0,024% (CB) p/v, 7 days.
9	Selectivity of a.i. for natural enemies and pollinators	Acetamiprid 20% (SP) p/p, very toxic for aquatic organisms and non-target arthropods. Toxic to wildlife Cipermetrina 5% (EC) p/v, Toxic to fish and aquatic invertebrates. Deltametrina 2.5 %(EW) p/w, very toxic to aquatic organisms, with long lasting effects. Spinosad 0.024% (CB) p/v Harmful to aquatic organisms, with long lasting effects. Toxic to bees three hours after treatment. Toxic to aquatic invertebrates.
10	Other information	No alternative method to chemical control is used.

6.7. Beneficial insect monitoring

The beneficial insect monitoring in the *OliveFlyNet* wide-area site of PP1 is described in the following table.

Table 6.7. Beneficial insect monitoring in the OliveFlyNet wide-area site of PP1

1	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data recorded
2	Means and methods for beneficials' monitoring	No data recorded
3	Other information	

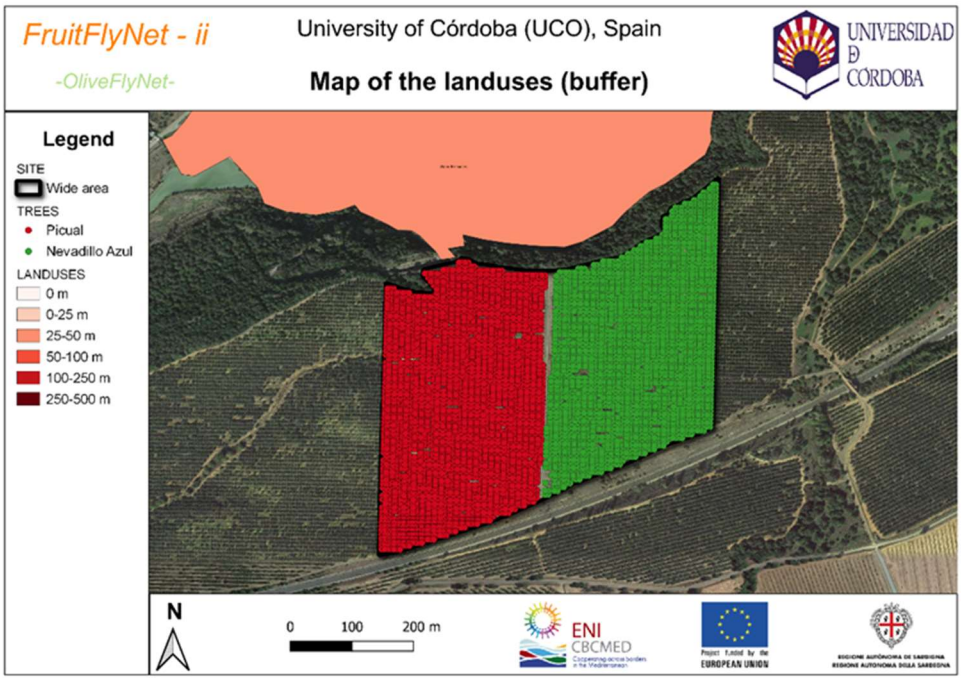


Figure 6.1. Land uses in the wide-area site

Trees of the experimental site are showing in the following figure.

Figure 6.2. Trees of the experimental site

6.8. PP1 OiveFlyNet: Digitized Field Data

The digitized field data of the *OliveFlyNet* wide-area site of PP1are given in maps. The maps have been generated by the geodatabase.

6.8.1. Experimental site

In the following map the outline of the experimental site is given.

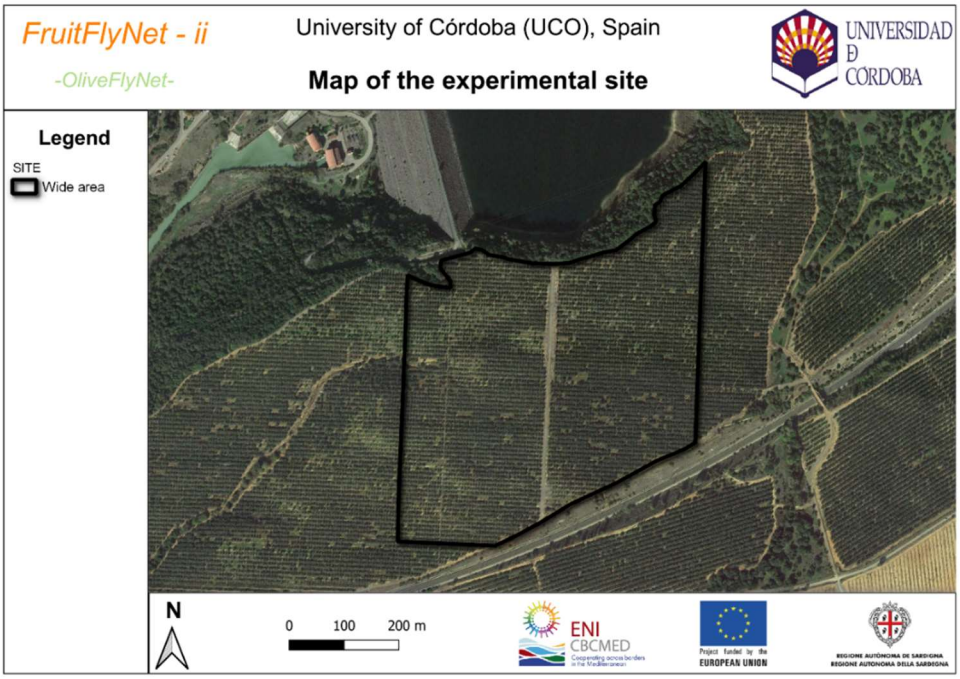


Figure 6.3. Map of the experimental site

6.8.2. Trees of the experimental site

The following map shows the layout of the digitized olive trees. There are two different varieties, Picual (red) and Nevadillo Azul (green).

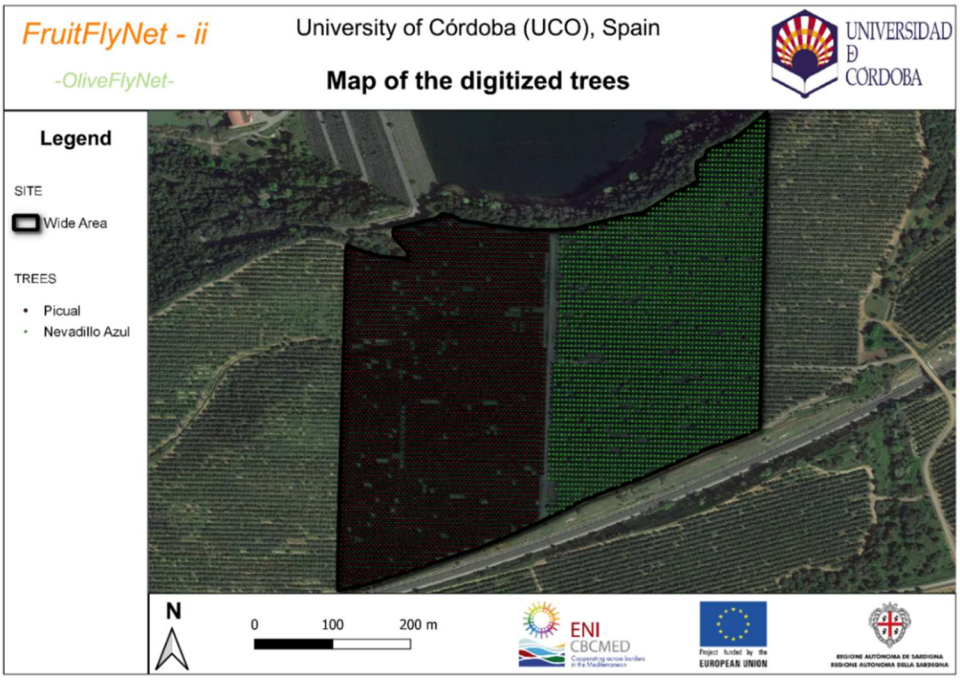


Figure 6.4. Map of the trees of the experimental site

6.8.3. Orchards of the experimental site

The purpose of this map is to show the different owners of the experimental site. In this case, the entire site is owned by a single owner.

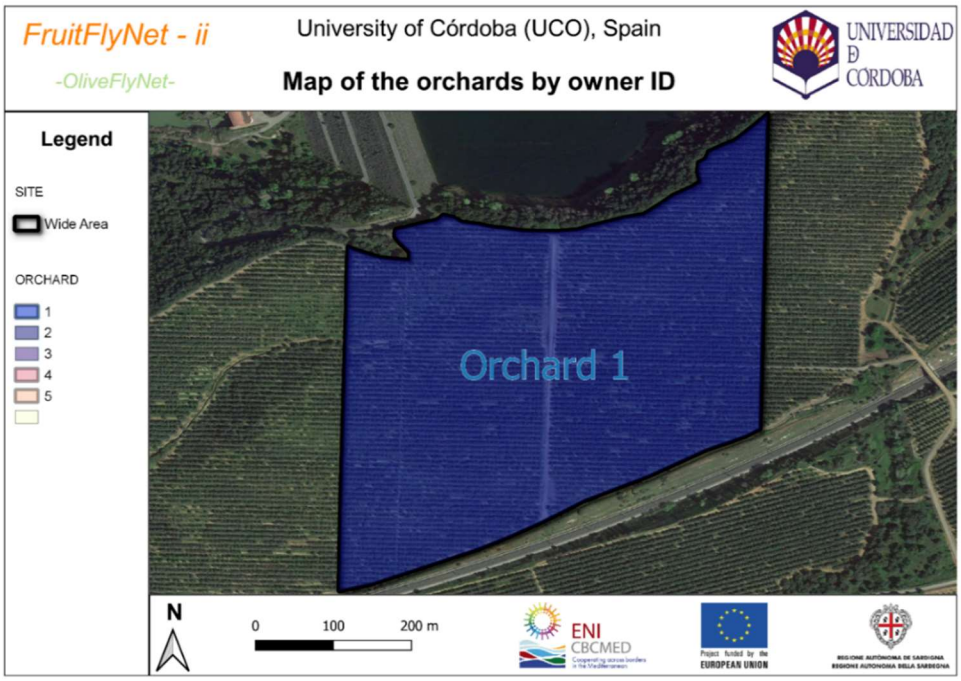


Figure 6.5. Map of the orchards of the experimental site

6.8.4. Land uses of the experimental site

The land uses map shows the site area and the irrigation dam to the north of it.

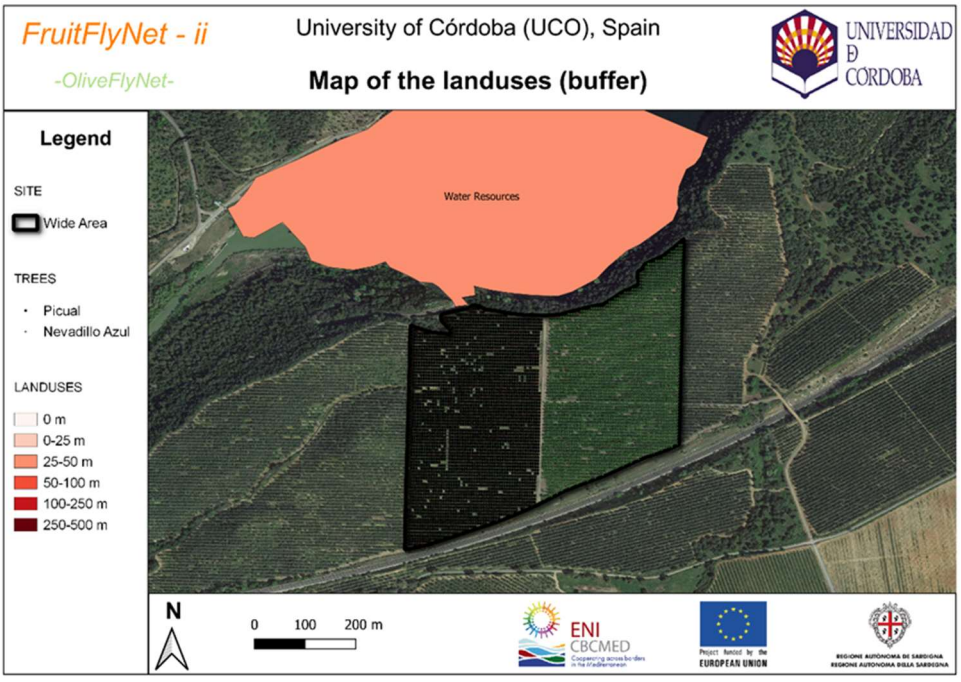


Figure 6.6. Map of the land uses of the experimental site

6.8.5. Sensors

In this map you can see the location of the weather station closest to the site. It consists of an air temperature sensor, an air humidity sensor, a wind sensor, and a precipitation sensor.

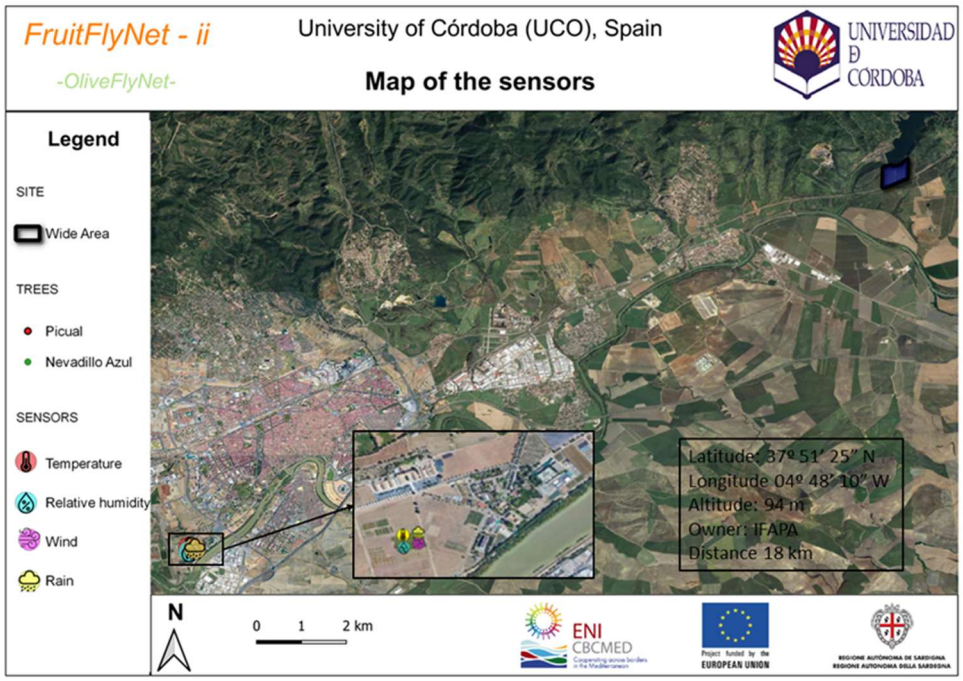


Figure 6.7. Map of the location of the sensors

6.8.6. Traps

The indicative position of the electronic traps that are going to be placed in the site is given in the following map.

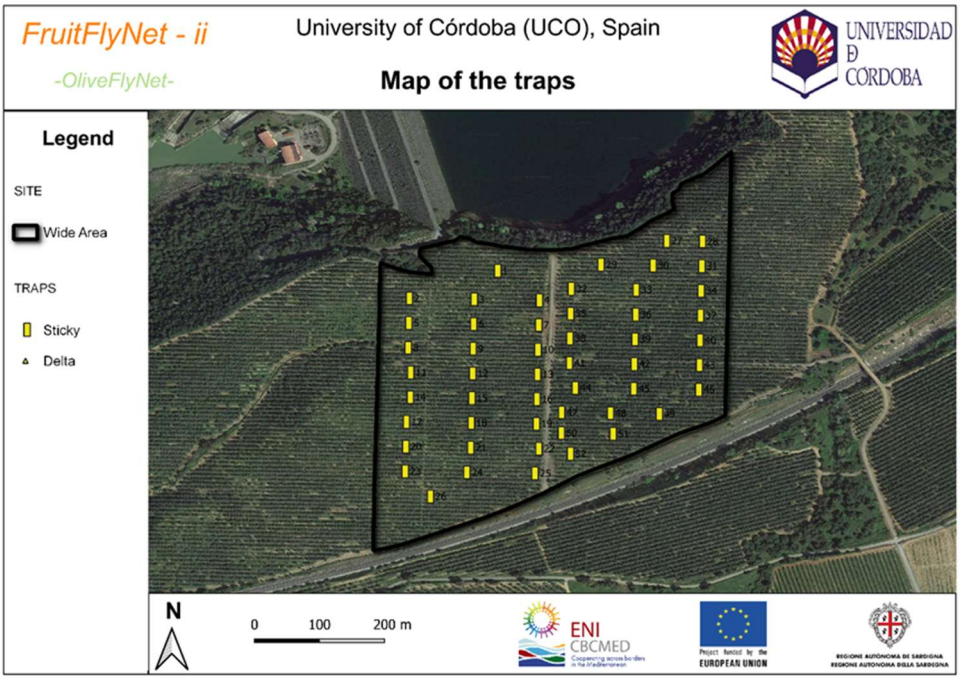


Figure 6.8. Map of the location of the traps

6.8.7. Protected zones

In this site there is only a single area (i.e. land use) that generates a buffer zone. According to Spanish regulations, a protection zone is established around the water reservoirs of 50 meters. The protected zones are showing in the following figure.

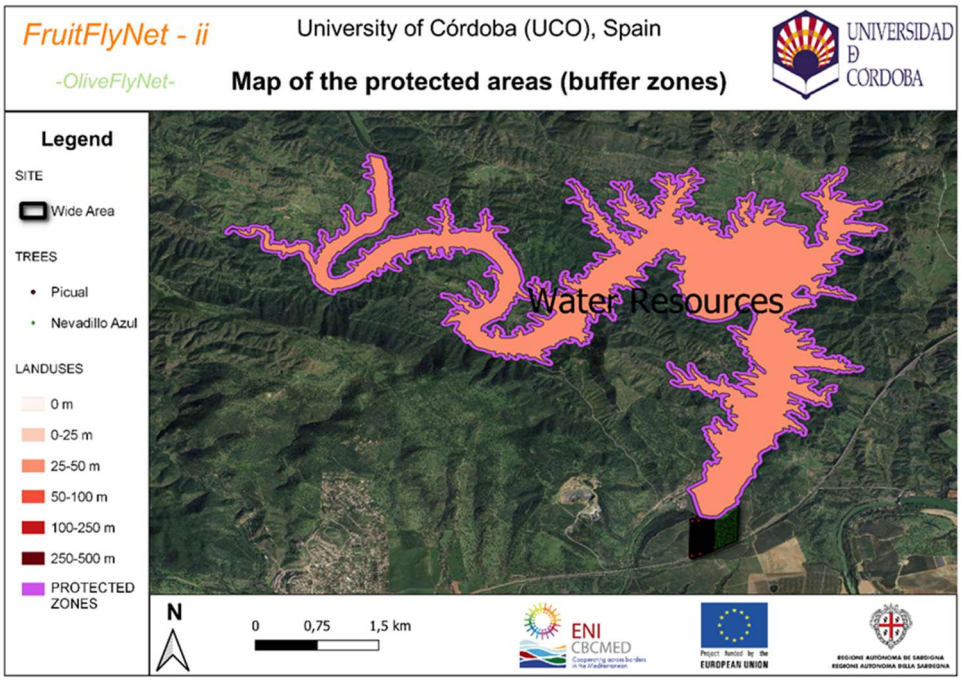


Figure 6.9. Map of the protected zones

.

7. PP2 OliveFlyNet

The crop and pest details and the digitized data of the *OliveFlyNet* wide-area of PP2 are described in this section.

7.1. PP2 Crop and Field data

7.1.1. Test site

An olive grove in full production, about 18 hectares, has been chosen for experimentation against the olive fly. There are two different cultivars. The growing conditions (fertilization, pruning, soil type) are uniform throughout the olive grove. In the area around the experimental area, there are other olive groves and few uncultivated and horticultural fields. The different sensitivity of the cultivars to the olive fly will be taken into account in the treatments. The details of the site are described in the following table.

Table 7.1. Crop data of the OliveFlyNet large site of PP2

1	Target pest	*Bactrocera oleae*
2	Name of the site area	*Zeoli, Larino (cb)*
3	Total site surface (ha)	*17.50 ha*
4	Dimensions of the site	*18.50 ha*
5	Number of different orchards included and type of owner(s) - describe	*1 commercial orchard*
6	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	*Longitude: 14.9333571* *Latitude: 41.8195* *Altitude: 250/290 m* *Exposure N/E* *Slight slope, 25 km from the sea*
7	Provide the map of the site, its borders and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*See respective figure*
8	Indicate in the map any areas to be protected within the site or close by (i.e., houses, water bodies, water pumps, etc)	*See respective figure*
9	Give information for the surrounding vegetation/crops of the site	*Vineyard and cereals*
10	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	*See respective figure*
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	*See respective figure*
12	Indicate sources of electricity or drinkable water, if any.	*There isn't an irrigation system*
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc)	*See respective figure*
14	Other information	

7.1.2. Trees and practices

Tree data and cultivation practices of the *OliveFlyNet* wide-area site of PP2 are given in the following table.

Table 7.2. Tree data and cultivation practices of the OliveFlyNet wide-area site of PP2

1.	Production system (IPM, organic etc.) (as applicable per orchard/field within the site)	*Organic*
2.	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	*See below*
3.	Tree age	*25/30 years and secular*
4.	Tree density (trees/ha)	*280-330/ha*
5.	Tree height	*5-7 m*
6.	Tree canopy diameter	*About 4 m*
7.	Planting system (i.e., linear)	*In square and rectangle*
8.	Distance between the trees (in the row and between the rows)	*6x6 m and 5x6 m*
9.	Tree shape - Pruning	*Monoconic*
10.	Fertilization method and its frequency	*Annual green manure and organic fertilizers*
11.	Irrigation method and its frequency	*Dry*
12.	Weed control	*Shredding*
13.	Neighboring fruit fly host crops – possible infestation sources	
14.	Foreseen fruit load for this year production	*About 35 kg/trees*
15.	Discuss other possible variation sources in infestation levels across the site (i.e., due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.).	*There is a slight slope in this olive grove. It is not irrigated, pruning and fertilization are applied uniformly throughout the olive grove. Cultivars are supposed to be the main source of variability.*
16.	Other information	
CULTIVAR	HARVESTING TIME	*FRUIT SUSCEPTIBILITY*
Gentile of Larino	Late October – Early November	*medium*
Peranzana	Late October	*high*

7.1.3. Target pest monitoring

The data for the target pest monitoring the *OliveFlyNet* wide-area site of PP2 are given in the following table.

Table 7.3. Data for the target pest monitoring of the PP2 OliveFlyNet wide-area site

1	Target pest	*Bactrocera oleae*
2	Period of monitoring i.e., per orchard/cultivar, as applicable	*From July for all cultures.*

3	Type(s) of traps	*Traditional traps (yellow sticky panels)*
4	Bait(s) used	*ammonium carbonate*
5	Trap density/ha for monitoring	
6	Time interval for trap captures monitoring	*Weekly*
7	Method for fruit damage monitoring	*Fruits sampling*
8	Infestation levels in the orchard in the previous years, data of pest levels/damages	*In 2014 > 25/30%: veryearly harvest.* *In recent years, lowerlevels of infestation.* *In 2022 the infestation caused an average damage of 30%.*
9	Other pests in the orchard, possible interference with sprayings against other pests - describe	
10	Common diseases	
11	Other information	

7.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *OliveFlyNet* wide-area site of PP2 are given in the following table.

Table 7.4. Data for meteorological monitoring of the PP2 OliveFlyNet wide-area site

1	Add information about the climatic conditions of the area of the site in annual basis	*Temperate climate, normal rainfall and temperatures.*
2	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	*Temperature, RH, wind speed, precipitation.* *<u>For monitoring</u>* *Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction), precipitation per day.* *<u>For spraying</u>* *Temperature (at least every 60 minutes), RH (at least every 60 minutes), wind speed and direction (at least every 60 minutes)* *Precipitation per day*
3	Add information for any meteorological station in the area, if exist.	*There is a weather station in the olive grove.*
4	Other information	

7.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *OliveFlyNet* wide-area site of PP2 are given in the following table.

Table 7.5. Spraying decision rules for the target pest in the PP2 OliveFlyNet wide-area site

1	Describe the spraying decisionprocess	*Presence of captures in a trap or in the neighboring traps will be considered inthe DSS. Preventive treatments with copper.*
2	Pest capture critical densities during the season	*In fruit sampling, the critical density is 5drupes attacked per 10 harvests. In monitoring with traps, the critical density for intervention is 1-2 catches per trap/week.*
3	Fruit damage threshold during the season	*If there is a strong fly attack: harvest early.*
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*The "Peranzana" cultivar is attacked earlier and more than the others becausethe drupe is larger than the other cultivars.*
5	Models or prediction, if available	*Forecasting regional models are notavailable. Degree days will be calculated to establish the first annual emergence of adults and to follow the succession of generations during the season.*
6	Other information	*Interval time between veraison and harvesting is the most sensitive period for Olivefly.*

7.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *OliveFlyNet* wide-area site of PP2 are given in the following table.

Table 7.6. Bait spraying application procedures against the target pest in the PP2 OliveFlyNet wide-area site

1	Type of spraying used (cover spraying or bait spraying) (describe)	*Preventive treatments with copper; Spinosad; kaolin; Experimentation with wheat flour spraying.*
2	Concentration of bait in the spraying solution	*Label doses.*
3	Quantity of bait spraying solutionapplied per tree	*700/800 liters/ha About 2 liters per tree (350 trees/ha)*
4	Ratio of trees to be sprayed (pest risk level, if applicable)	
5	Means of spraying application (tractor or other, and their availability, describe)	*Tractors with atomizers*
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*Extreme climate condition during treatment will be: temperature > 30 °C, wind > 8 m/s, rain.*
7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	*Spinosad*

8	PHI for each a.i.	*Spinosad: 7 days*
9	Selectivity of a.i. for natural enemies and pollinators	
10	Other information	

7.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the *OliveFlyNet* wide-area site of PP2 is described in the following table.

Table 7.7. Beneficial insect monitoring in the OliveFlyNet large site of PP2

1	Data on natural enemies and pollinators and their abundance or their phenologyin the site or in the wider area (add references where available)	
2	Means and methods for beneficials'monitoring	*There are beneficial insects thanks tothe grass, especially ladybirds, but they aren't monitored.*
3	Other information	

Olive trees of the Zeoli farm are showing in the following figure.

Figure 7.1. Olive trees of the Zeoli farm

7.2. PP2 OiveFlyNet: Digitized Field Data

The digitized field data of the *OliveFlyNet* wide-area site of PP2 are given in the following maps. The maps have been generated by the geodatabase.

7.2.1. Experimental site

The outline of the site is shown in the following figure.

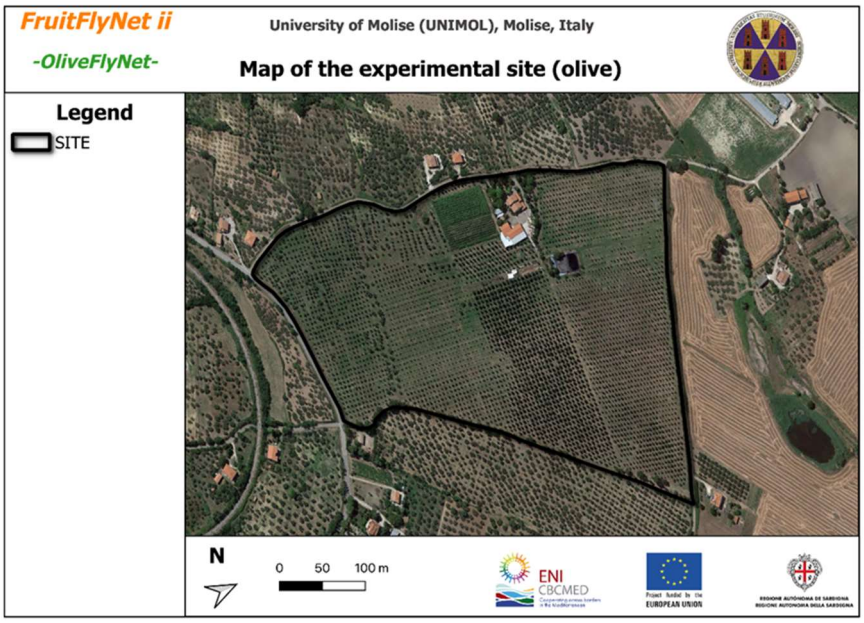


Figure 7.2. Map of the experimental site

7.2.2. Trees of the experimental site

The position of the trees in the orchards of the large site of *OliveFlyNet* of PP2 are shown in the following figure.

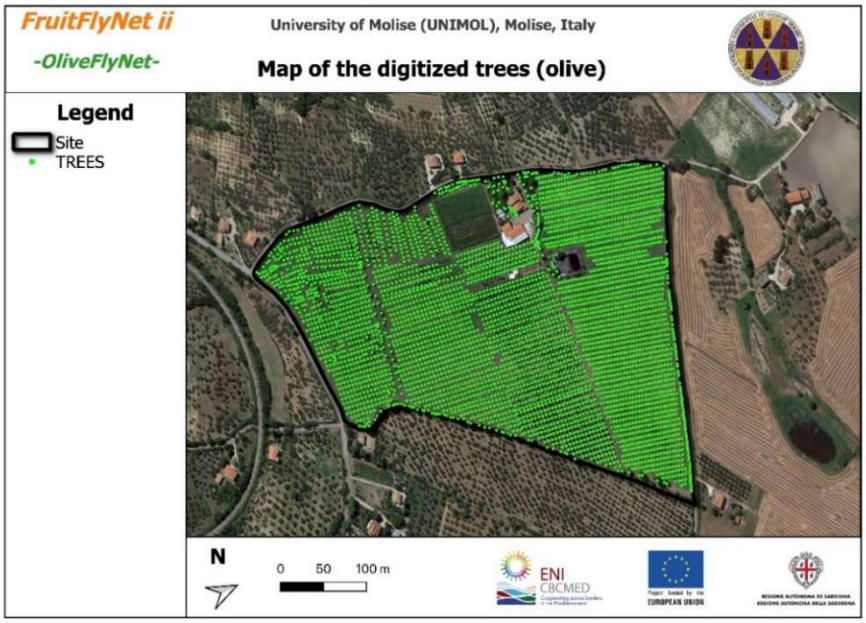


Figure 7.3. Map of the trees of the experimental site

7.2.3. Map of the position of cultivars

The position of the cultivars in the olive grove of the large PP2 *OliveFlyNet* site is shown in the figure below.

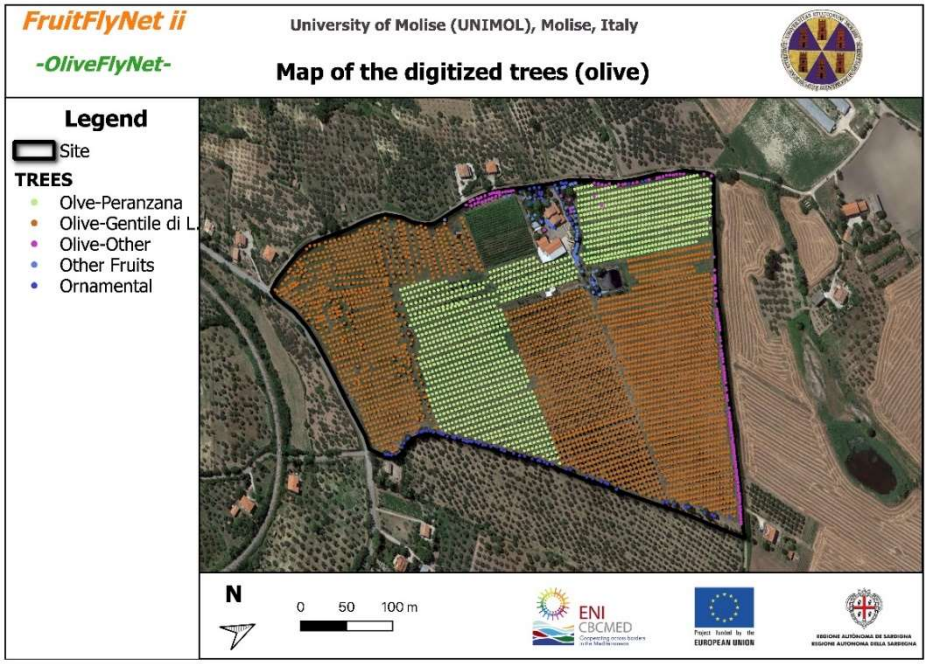


Figure 7.4. Map of the cultivars

7.2.4. Orchards of the experimental site

The different orchards of the PP2 *OliveFlyNet* wide-area site are shown in the following figure.

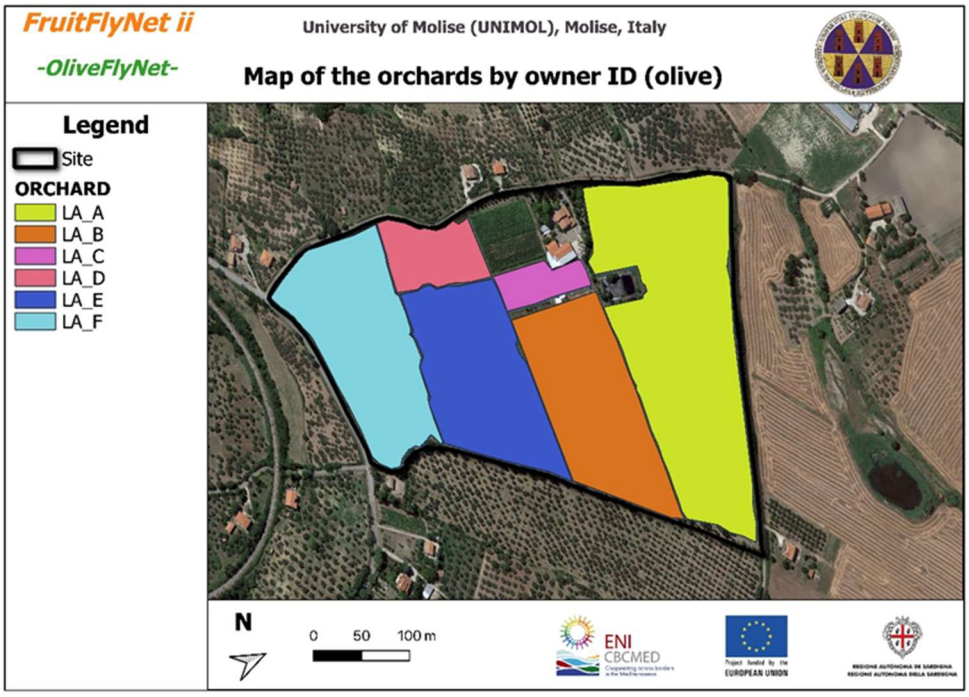


Figure 7.5. Map of the orchards of the experimental site

7.2.5. Land uses of the experimental site

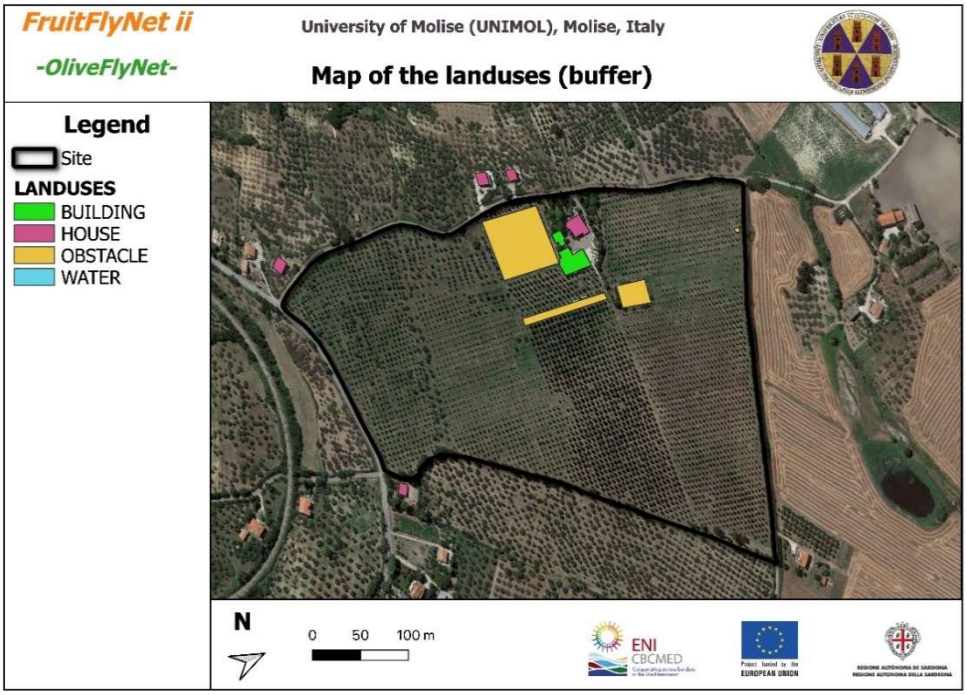


Figure 7.6. Map of the land uses of the experimental site

7.2.6. Sensors

A digital station will be placed in the center of the orchard to record the temperature (mean, minimum and maximum each day), relative humidity (mean, minimum, and maximum each day), wind speed (maximum for each direction), and daily rainfall. The map the location of the sensors is showing in the following figure.

Figure 7.7. Map of the location of the sensors

7.2.7. Traps

For the monitoring of *Bactrocera oleae*, around 50 sticky e-traps will be placed (to be accurately defined/updated in a later stage). The trap will be activated with a food-grade attractant in addition to the color of the panel. The map of the trap network is showing in the following figure.

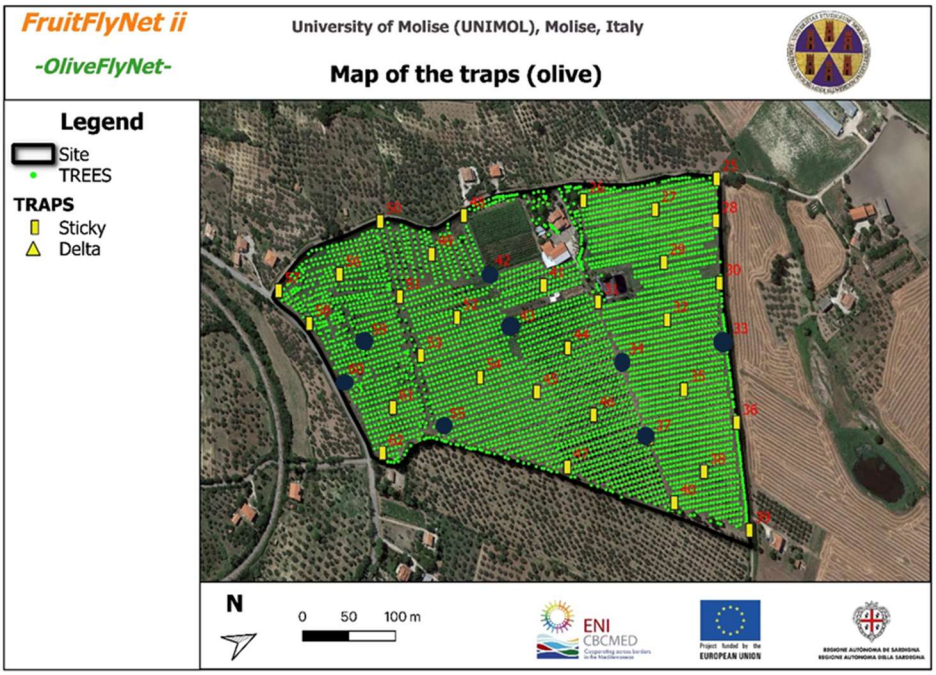


Figure 7.8. Map of the location of the traps

7.2.8. Protected zones

Within the olive grove all obstacles and buildings have been indicated. The areas to be protected (indicated in pink) are houses.

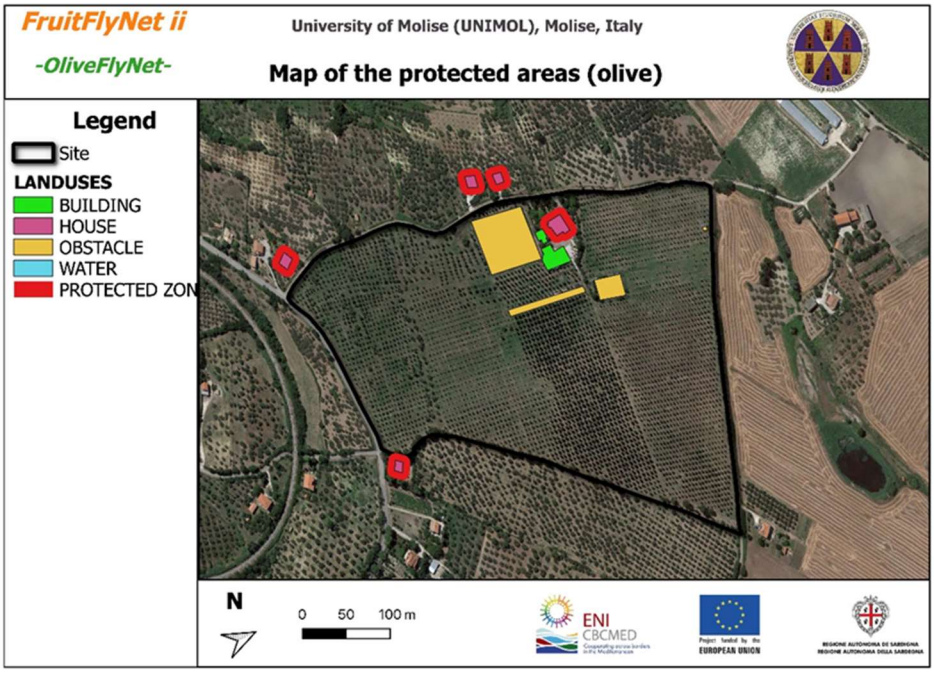


Figure 7.9. Map of the protected zones

8. PP2 MedFlyNet

In this section the information for the *MedFlyNet* large-scale site of PP2 is given.

8.1. PP2 MedFlyNet: Digitized Field Data

8.1.1. Test site

For the Medfly scenario, a single large multivarietal orchard of about 30 hectares will be used. A large part of the orchard is in full production, although there are new varieties that are not yet in full production.

Other fruit orchards (mainly peach cultivars) are at a short distance from the one chosen for the trial. Cultivation conditions (soil type, fertilization, pruning, and irrigation) are uniform throughout the orchard.

Table 8.1. Crop data of the MedFlyNet large site of PP2

1	Target pest	*Ceratitis capitata*
2	Name of the site area	*VERBESI*
3	Total site surface (ha)	*30ha*
4	Dimensions of the site	*400 x 700m (irregular shape)*
5	Number of different orchards included and type of owner(s) - describe	*1 commercial orchard*
6	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	*Longitude:12.746298* *Latitude: 41.923361* *Decimal Degrees* *Altitude: 70m*
7	Provide the map of the site, its borders and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*See respective figure*
8	Indicate in the map any areas to be protected within the site or close by (i.e., houses, water bodies, water pumps, etc)	*See respective figure*
9	Give information for the surrounding vegetation/crops of the site	*Fruit orchards (mainly peach cultivars) are at a short distance. Uncultivated and horticultural crop lands are also present*
10	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	*See respective figures*
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	*See respective figure*
12	Indicate sources of electricity or drinkable water, if any.	*Electricity was only available in one position at the center of the orchard*
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc)	*See respective figure*
14	Other information	

8.1.2. Trees and practices

Information for the trees and practices are shown in the following table.

Table 8.2. Tree data and cultivation practices of the MedFlyNet large site of PP2

1	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	*Traditional agriculture*
2	Tree species and their cultivars. Identities,harvest time, sensitivity level to the targetpest, protection period of each cultivar.	*Peach (26 ha)* *Kiwi (4 ha)*
3	Tree age	*16 yr; new planted cultivar:1-5 yr*

4	Tree density (trees/ha)	*1600/ha* *700/ha*
5	Tree height	*3-5 m*
6	Tree canopy diameter	*2-3 m in length;* *1-2 m in depth*
7	Planting system (i.e., linear)	*Linear (Espalier)*
8	Distance between the trees (in the row and between the rows)	*4x3.5 m;* *4x1.5 m*
9	Tree shape - Pruning	*One pruning during summer; 1 in autumn*
10	Fertilization method and its frequency	*Mineral fertilizers*
11	Irrigation method and its frequency	*Drip irrigation; daily*
12	Weed control	--------
13	Neighboring fruit fly host crops – possible infestation sources	*Peach orchard adjacent to the southern border*
14	Foreseen fruit load for this year production	*Not available*
15	Discuss other possible variation sources in infestation levels across the site (i.e., due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.).	*This is a flat orchard. So, it is not expected such variation to occur.* *Irrigation, pruning, fertilization is uniformly applied in the entire orchard.* *Cultivars are supposed to be the main source of variability*
16	Other information	
CULTIVAR	HARVESTING TIME	*FRUIT SUSCEPTIBILITY*
California	Mid-September	*high*
Crimson Lady	Late June	*low*
Esmeralda	Late August	*medium*
Extreme 486	Mid-September	*high*
Flamme Rouge	Mid-September	*low*
Kewea	Late August	*low*
Pesco 16-20	Late August	*medium*
Rich Lady	Late July	*low*
Royal Glory	Early July	*low*
Royal summer	Mid July	*low*
Royal Sweet	Late August	*medium*
Sagittaria	Early June	*low*
Star Red Gold	Early August	*low*
Sweet Dream	Mid-August	*medium*
Tarderina	Late August	*medium*
Tardi Red	Mid-September	*high*
Venus	Early August	*low*

8.1.3. Target pest monitoring

The data for the target pest monitoring the *MedFlyNet* wide-area site of PP2 are given in the following table.

Table 8.3. Data for the target pest monitoring of the MedFlyNet large site of PP2

1	Target pest	*Ceratitis capitata*
2	Period of monitoring i.e. per orchard/cultivar, as applicable	*June to December for adults July to September for larval activity*
3	Type(s) of traps	*Traditional traps (Jackson trap) and delta e-trap.*
4	Bait(s) used	*Trimedlure*
5	Trap density/ha for monitoring	*≈1.2 trap/ha; minimum 1trap/ cultivar Totals: 24 traps. (See figure 5)*
6	Time interval for trap captures monitoring	*LAS traps daily; conventional traps weekly*
7	Method for fruit damage monitoring	*In order to monitor the damage, fruit sampling was done: per cultivar, 100 fruits were collected and dissected (per plant).*
8	Infestation levels in the orchard in the previous years, data of pest levels/damages	*Low to high depending on cultivar*
9	Other pests in the orchard, possible interferencewith sprayings against other pests - describe	*Possibly with Cydia molesta and Anarsia lineatella pests: mating disruption is applied, but in some cases could be necessary additional treatments.*
10	Common diseases	
11	Other information	

8.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *MedFlyNet* wide-area site of PP2 are given in the following table.

Table 8.4. Data for meteorological data monitoring of the MedFlyNet large site of PP2

1	Add information about the climatic conditions of the area of the site in annual basis	
2	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	*<u>For monitoring</u>* *Temperature (mean, max and min per day), RH (mean, max and min per day), wind speed (max for each direction) Precipitation per day* *<u>For spraying</u>* *Temperature (at least every 60 minutes), RH (at least every 60 minutes),* *Wind speed and direction (at least every 60 minutes)* *Precipitation per day*
3	Add information for any meteorological station in the area, if exist.	*One digital station in the orchard Verbesi, see See respective figure*
4	Other information	

8.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *MedFlyNet* wide-area site of PP2 are given in the following table.

8.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *MedFlyNet* wide-area site of PP2 are given in the following table.

Table 8.5. Bait spraying application procedures against the target pest in the PP2 MedFlyNet wide-area site

1	Describe the spraying decisionprocess	*Presence of captures in a trap or in the neighboring traps will be considered inthe DSS. Distributional maps will be prepared toidentify adult Medfly hot spot areas*
2	Pest capture critical densities during the season	*First catches in the traps will be set up asstarting point for management action. 1 adult/trap/week is the action threshold*
3	Fruit damage threshold during theseason	*The susceptibility of each cultivar will be evaluated on the basis of physical features of the fruits (i.e., tomentosity), period of harvesting, local experiences of farmers and historical data*
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*Interval time between veraison and harvesting is the most sensitive period for Medfly*
5	Models or prediction, if available	*Forecasting regional models are notavailable. Degree days will be calculated to establish the first annual emergence ofadults and to follow the succession of generations during the season*
6	Other information	-

Table 8.6. Bait spraying application procedures against the target pest in the PP2 MedFlyNet wide-area site

1	Type of spraying used (cover spraying or bait spraying) (describe)	*Cover spray with Trebon (etophenprox) and Decis(deltametrina)*
2	Concentration of bait in the spraying solution	*Trebon: 0.02% a.i. Decis: 0.002% a.i.*
3	Quantity of bait spraying solutionapplied per tree	*10 quintals/ha. Depending on the tree density: from 0.6lt to 1.5lt/tree*
4	Ratio of trees to be sprayed (pest risk level, if applicable)	*This will be related to all previously described variables to obtain a risk map over the experimental area. Inthe map, each cultivar will be considered as a treatment unit*

5	Means of spraying application (tractor or other, and their availability, describe)	*Tractor with atomizers*
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*Extreme temperatures (i.e., >40°C) will be considered.* *In presence of rainfalls or strong wind (>8m/s), the treatment will bepostponed.*
7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	
8	PHI for each a.i.	*Trebon: 7 days* *Decis: 3 days*
9	Selectivity of a.i. for natural enemies and pollinators	
10	Other information	-

8.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the *MedFlyNet* wide-area site of PP2 is described in the following table.

Table 8.7. Beneficial insect monitoring in the MedFlyNet wide-area site of PP2

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	
2.	Means and methods for beneficials' monitoring	
3.	Other information	

The orchard of fruit trees is showing in the following figure.

Figure 8.1. Fruit trees of the site

8.2. PP2 MedFlyNet: Digitized Field Data

The digitized field data of the *MedFlyNet* wide-area site of PP2 are given in the following maps.

8.2.1. Experimental site

The borders of the site are shown in the following figure.

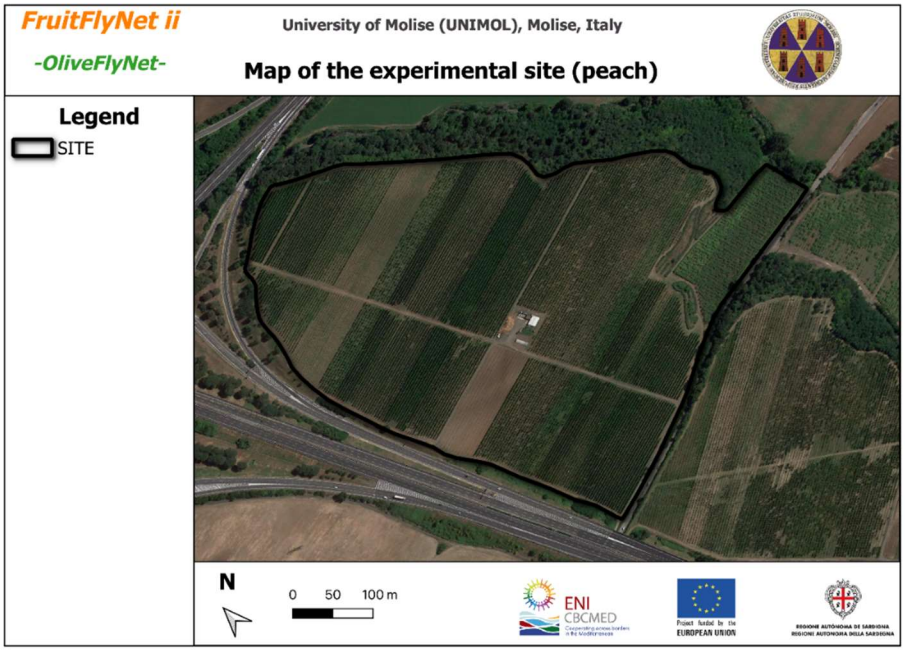


Figure 8.2. Map of the experimental site

8.2.2. Trees of the experimental site

The position of the trees in the orchards of the PP2 *MedFlyNet* wide-area are shown in the following figure.

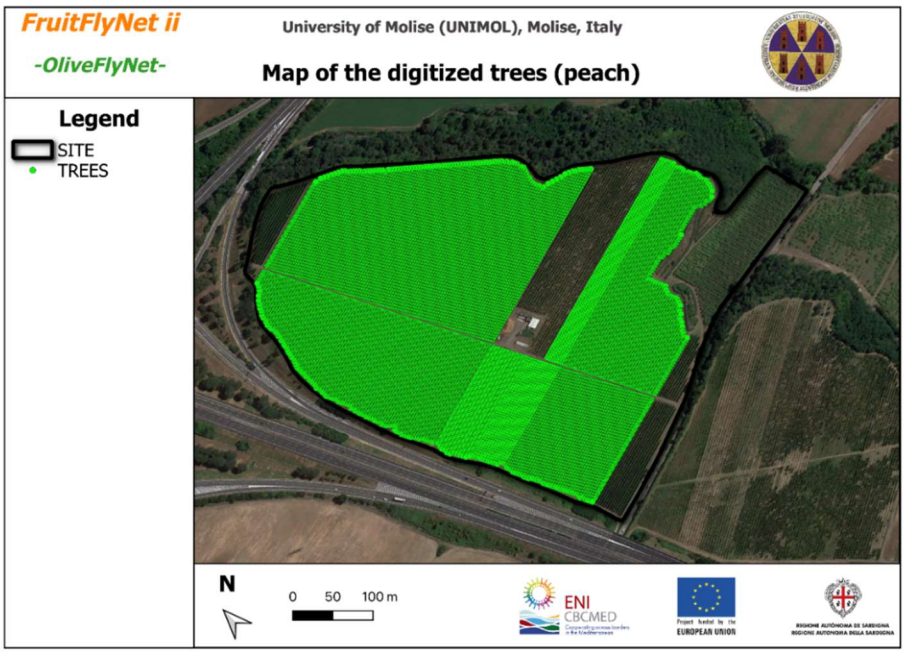


Figure 8.3. Map of the trees of the experimental site

8.2.3. Cultivars position

The position of the different cultivars in the orchard of the large PP2 MedFlyNet site is shown in the figure below.

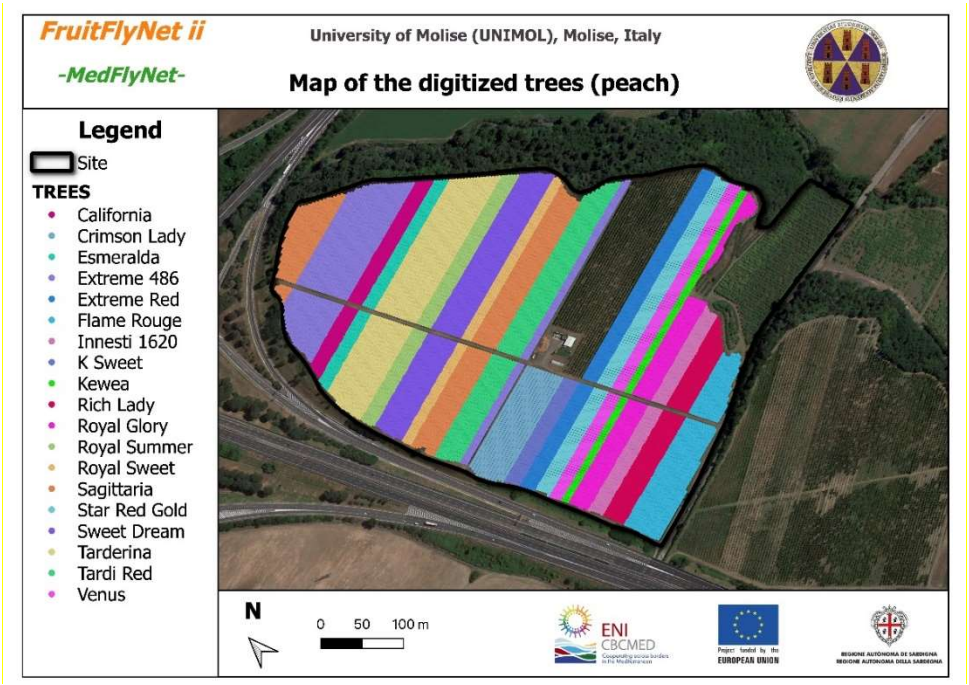


Figure 8.4. Map of the cultivars

8.2.4. Height of trees

The peaches' heights in the large site of PP2-MedFlyNet is shown in the figure below.

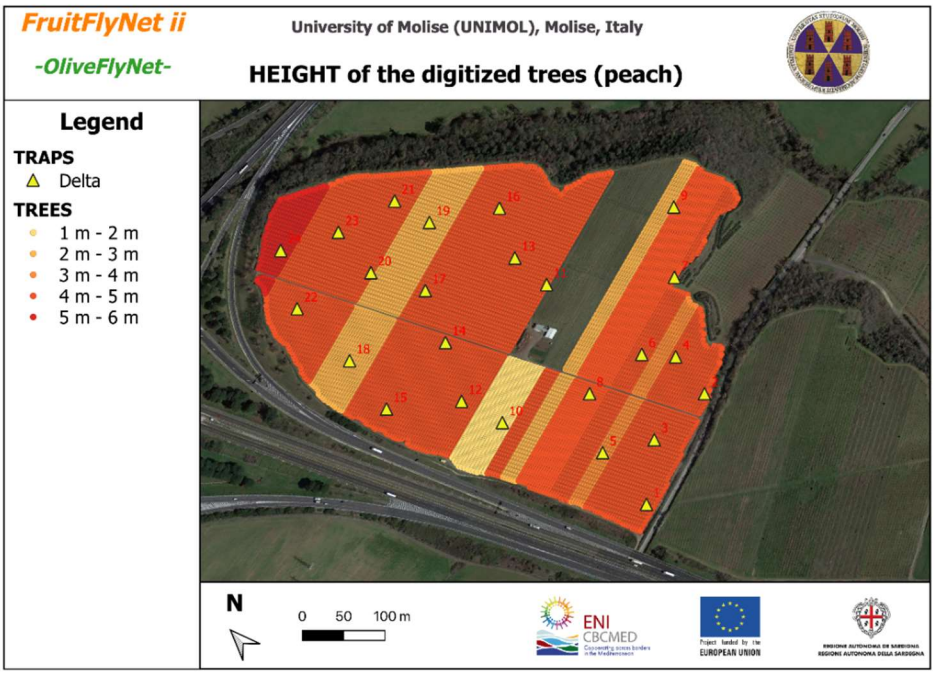


Figure 8.5. Map of the heights of the trees (peaches)

8.2.5. Orchards of the experimental site

The different orchards of the PP2 *MedFlyNet* wide-area are shown in the following figure.

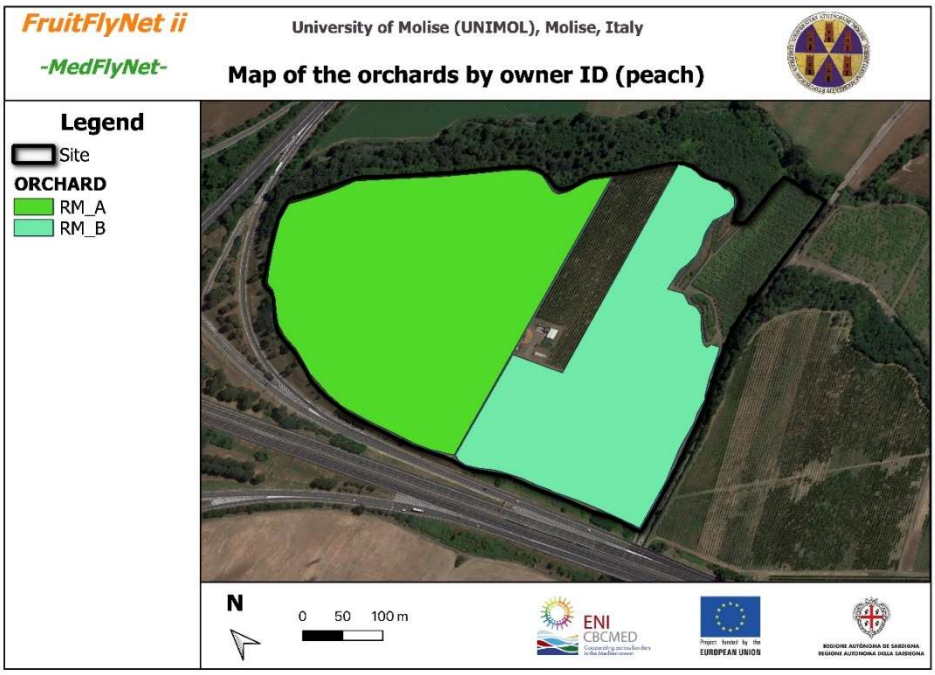


Figure 8.6. Map of the orchards of the experimental site

8.2.6. Land uses of the experimental site

The land uses the map of the PP2 OliveFlyNet wide-area site is shown in the figure below.

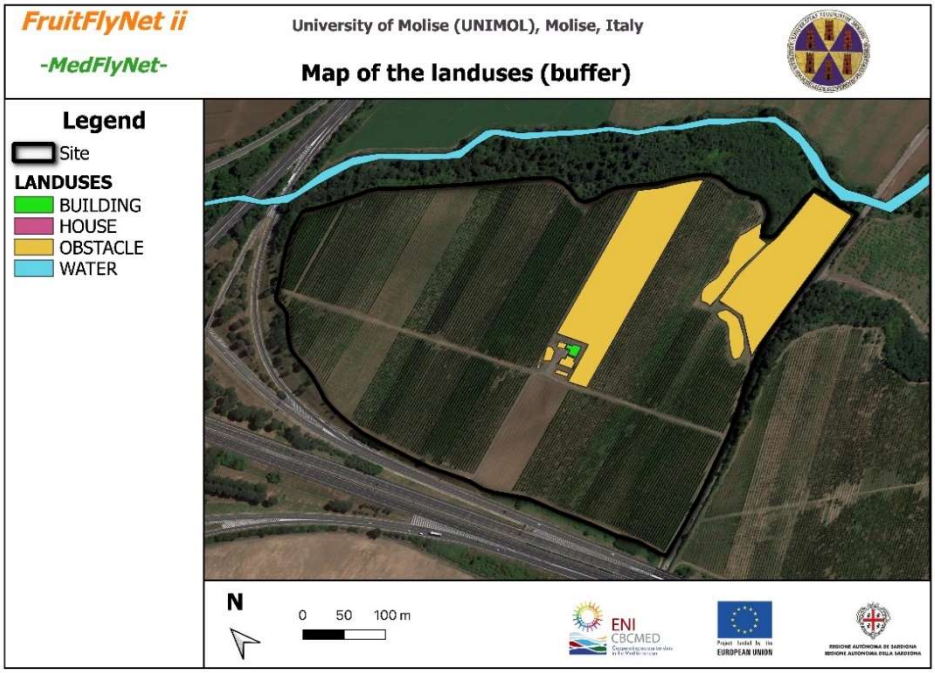


Figure 8.7. Map of the land uses of the experimental site

8.2.7. Sensors

A digital station will be placed in the center of the experimental site to record the temperature (mean, minimum and maximum each day), relative humidity (mean, minimum and maximum each day), wind speed (maximum for each direction) and daily rainfall. The map pf the location of the sensors is showing in the following figure.

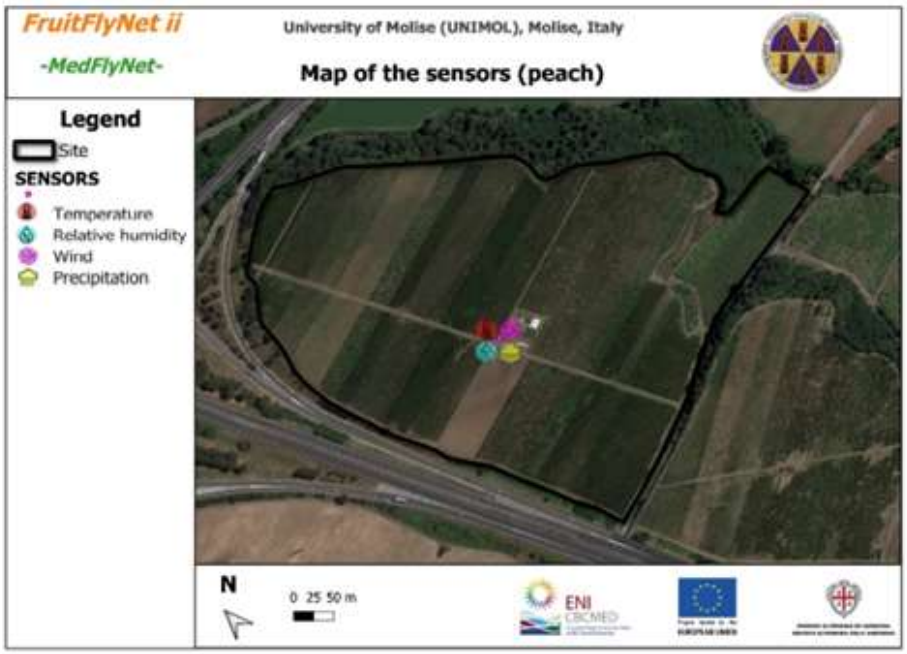


Figure 8.8. Map of the location of the sensors

8.2.8. Traps

For Medfly monitoring, 24 traps are placed. Each trap was hung from a tree branch. The suggested location is illustrated in the following figure.

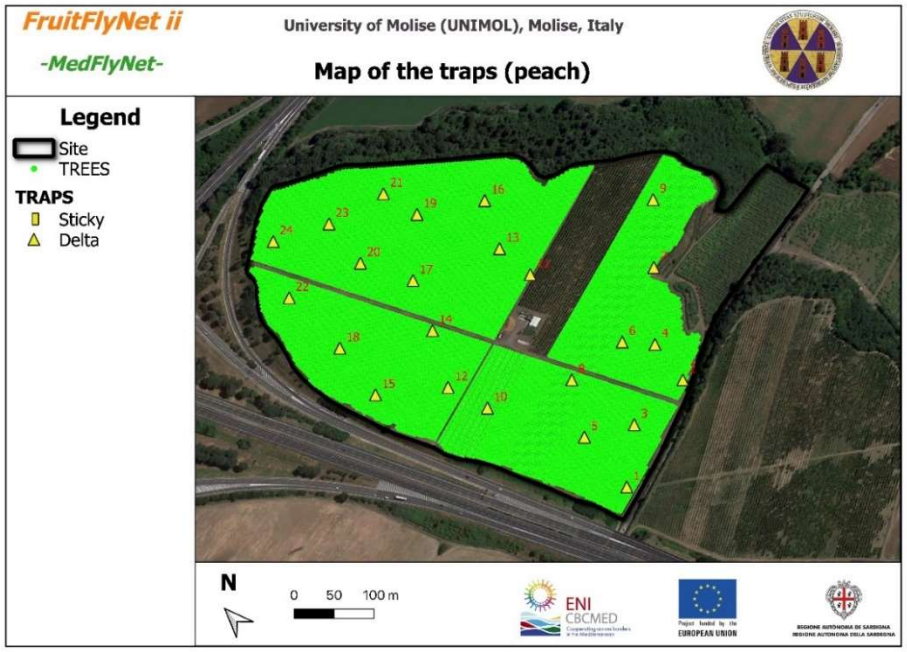


Figure 8.9. Map of the location of the traps

In 2022, 16 traditional traps (Jackson traps) and 8 electronic Delta traps (marked in blue) were used for monitoring.

8.2.9. Protected zones

Within the orchard all obstacles and buildings have been indicated. The area to be protected (indicated in pink) is a small stream. The map of the protected zones is shown in the following figure.

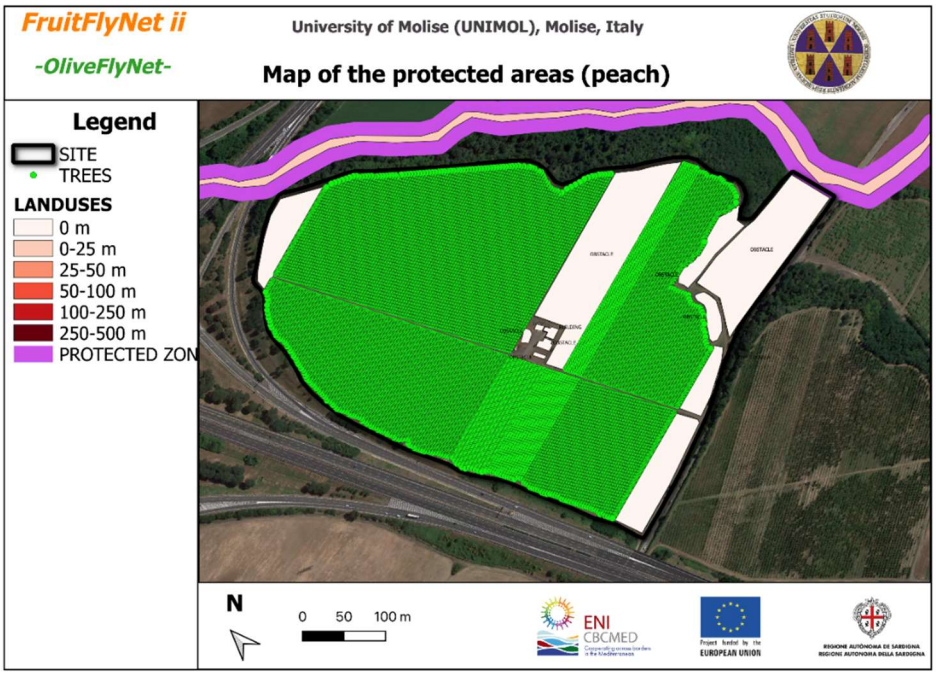


Figure 8.10. Map of the protected zones

9. PP3 OliveFlyNet

In this section, the data for the OliveFlyNet wide-area site of PP3 are given. In its first part, the details of the crops and their cultivation techniques, the information about the target pest and its control are shown, and in the second part, the maps of the digitized field elements.

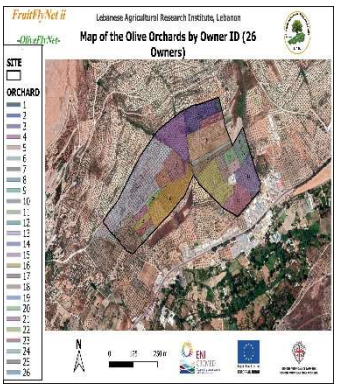
9.1. PP3 OliveFlyNet: Crop and pest field data

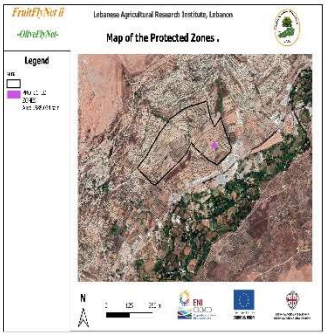
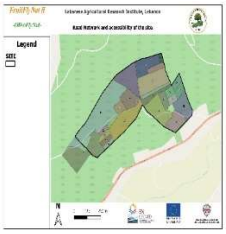
The wide-area site of BEN is consisting of olive orchards of 28 ha located in Hasbaya - Al Sahl, Lebanon area where olives, are cultivated.

9.1.1. Test site

The crop data of the OliveFlyNet large site of PP3 is showing in the following table.

Table 9.1. Crop data of the OliveFlyNet large site of PP3

1	Target pest	*Bactrocera oleae*
2	Name of the site area	Hasbaya - Al Sahl
3	Total site surface (ha)	About 28 hectares
4	Dimensions of the site	
5	Number of different orchards included and type of owner(s) - describe	About 26 non- irrigated Olive Baladi Cultivar Groves owned mostly by farmers and part by the Bayada endowment
6	Location (Geographic Coordinate System: GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	*Coordinates* *33°23'57"N 35°39'23"E 550 masl* *33°24'11"N 35°39'17"E 595 masl* *&* *33°24'05"N 35°39'22"E 568 masl* *33°23'48"N 35°38'54"E 572 masl* *Terras area with slight slope*
7	Provide the map of the site, its borders and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*The site includes only land that is being cultivated with Olive* 

8	Indicate in the map any areas to be protected within the site or close by (i.e. houses, water bodies, water pumps, etc)	 *the protected area is about 1585.034 sqm it is presented in violet color and representes a factory for building material (building blocks and cement).*
9	Give information for the surrounding vegetation/crops of the site	*All the area is cultivated with olives with a limited number of grapevine, pine trees and cactus plants. One land is cultivated with summer seasonal crops (mentioned in item 7).*
10	Indicate the position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	 *The orchards are for Olive trees.* *The land of all location is cultivated with Olive.*
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	 *The routes are marked in White.*
12	Indicate sources of electricity or drinkable water, if any.	*The area is above the main road where Electricity lines are available and can be easily reachable in the lower part of the area.*
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc.).	  
14	Other information	

9.1.2. Trees and practices

Table 9.2. Tree data and cultivation practices of the OliveFlyNet wide-area site of PP3

1.	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	*Owners of olive orchards usually use copper sulfate products to control peacock's eye disease. Traps based on levels of infestation were used.*
2.	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar.	• *Olive trees mostly of different clones of Baladi cultivar. Harvest starts from late October till Late November.* • *Baladi cultivar is more resistant than central Mediterranean cultivars planted in the area toward the Bactrocera oleae.*
3.	Tree age	*Different ages newly planted trees exist as well as centennials. However trees between 20 and 70 years old are frequent*
4.	Tree density (trees/ha)	*300 -350 trees/ha*
5.	Tree height	*Ranging from 3 to 7 m*
6.	Tree canopy diameter	*Ranging from 4x4 m to 7x7.5 m*
7.	Planting system (i.e. linear)	*Linear system*
8.	Distance between the trees (in the row and between the rows)	*In Modern orchards less than 5 meters between rows.* *However, in old orchards the distance exceeds 6 meters*
9.	Tree shape - Pruning	*Most of trees have spreading growth habit*
10.	Fertilization method and its frequency	*The lands are not irrigated. Chemical fertilizers are manually distributed around trees when rain is expected once a year*
11.	Irrigation method and its frequency	*Mostly not irrigated - rain fed*
12.	Weed control	*Most orchards are ploughed* *Mechanical control, most often are tillage and mowing.*
13.	Neighboring fruit fly host crops – possible infestation sources	*The Hasbani river is very close to the studied area (less than 500m far. The area is rich with fruit trees like orange, pomegranate, pear and different other trees along side with some seasonal vegetable crops.*
14.	Foreseen fruit load for this year production	*Moderate*
15.	Discuss other possible variation sources in infestation levels across the site (i.e. due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc)	*The site has a heterogeneous topography. However, the close fruit orchards might form a possible source for fruit fly infestation. Knowing that fruit orchards are not on borders of the studied area but they are not far.* *Pruning residues can be also a source of infestation*
16.	Other information	

9.1.3. Target pest monitoring

The data for the target pest monitoring of the PP3 OliveFlyNet wide-area site is showing in the following table.

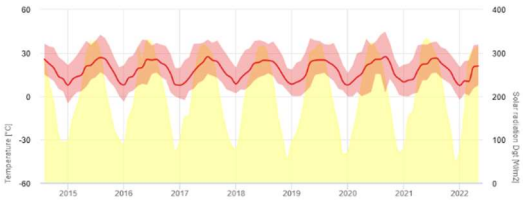
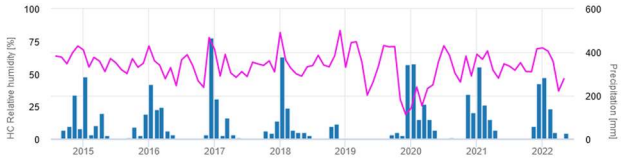
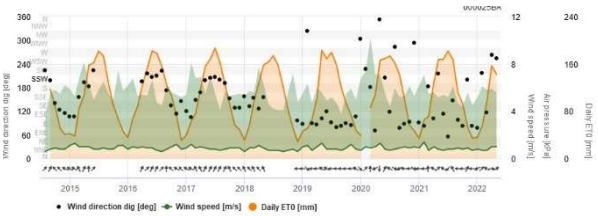
Table 9.3. Data for the target pest monitoring of the PP3 OliveFlyNet wide-area site

1	Target pest	*Bactrocera Oleae*
2	Period of monitoring i.e. per orchard/cultivar, as applicable	*Ministry of Agriculture has monitored the area over a period of nine years starting from 2010 till 2019, after which some farmers have resumed the work individually. Monitoring usually takes place between May and June - during the life cycle of the fly.* *From August to harvesting farmers do the work individually*
3	Type(s) of traps	*Yellow Sticky, pheromone and food traps*
4	Bait(s) used	*Pheromone with fish and chicken residues alone or with toxic compound*
5	Trap density/ha for monitoring	*5/ha if the site is not homogeneous*
6	Time interval for trap captures monitoring	*Starting from May at 400 masl until June at higher altitudes (≤1200masl)*
7	Method for fruit damage monitoring	*Randomly collecting 50 to 100 fruits from around the tree at 1.5 m height. Then individually cut the fruits and count the infested ones to calculate the percentage of infestation.*
8	Infestation levels in the orchard in the previous years, data of pest levels/damages	*During the 9 years of monitoring the percentage of infestation varied between 5 and 20% based on the climatic conditions and levels of production, sun exposure and altitude asl.*
9	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Peacock's eye disease is frequent and was sprayed with copper sulfate products.*
10	Common diseases	*Peacock eye disease- olive knot disease*
11	Other information	*Peacock's eye disease is monitored by collecting 50 olive leaves and using 20g NaOH dissolved in 1 liters of water, the leaves are placed in the solution for 10 sec during October to check the percentage of infestation and consequently to decide interference* *Olive knot disease is available but not common and is controlled by removing infected pruned branches and cleaning the orchards and using copper sulfates products (86%)*

9.1.4. Meteorological Data Monitoring

The data for meteorological monitoring of the PP3 OliveFlyNet wide-area site is showing in the following table.

Table 9.4. Data for meteorological monitoring of the PP3 OliveFlyNet wide-area site

1	Add information about the climatic conditions of the area of the site in annual basis	 *Red color is minimum/maximum temperature range, the middle red curve is average temperature; Yellow area is the Solar radiation in W/m^2)*  *Magenta curve is the relative humidity (%), Blue bars are precipitation in mm.* 
2	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	*Summer temperatures during day and night, Humidity level and annual Precipitation.*
3	Add information for any meteorological station in the area, if exist.	*Hasbaya station of LARI has a meteorological station nearby* *Coordinates of the weather station* *35.6772606* *33.4009732* *Elevation 873m* *Parameters: Wind direction/speed; precipitation, Solar Radiation, Min/Max air temperature; Relative humidity, Atmospheric pressure*
4	Other information	-

9.1.5. Spraying Decision in the area

The Spraying decision rules for the target pest in the PP3 OliveFlyNet wide-area site are showing in the following table.

Table 9.5. Spraying decision rules for the target pest in the PP3 OliveFlyNet wide-area site

1	Describe the spraying decision process	*The farmers usually take the initiative to do the spraying. Often, they spray twice per growing season at max if the fruit loads are moderate.* *Copper sulfate products can be applied twice in case of high incidence of peacock's eye disease.* *Spraying against Fruit fly may occur once taking into consideration infestation densities and fruit load or not at all otherwise.* *Sometimes they rely on MOA regional office instructions if monitoring was applied by their side.*
2	Pest capture critical densities during the season	*>20% during some seasons on the fruits*
3	Fruit damage threshold during the season	*10 – 15% and based on production levels to avoid high cost*
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*Cultivar type (Baladi is more resistant than other cultivars like newly introduced cultivars from central Mediterranean*
5	Models or prediction, if available	*Previous year's data. However, there are no models*
6	Other information	*For three years, official monitoring in the area was neither efficient nor sufficient.*

9.1.6. Bait Spraying Application

The Bait spraying application procedures against the target pest in the PP3 OliveFlyNet wide-area site are showing in the following table.

Table 9.6. Bait spraying application procedures against the target pest in the PP3 OliveFlyNet wide-area site

1	Type of spraying used (cover spraying or bait spraying) (describe)	*Cover spraying is usually applied. However, handmade traps of plastic bottles with meat and toxin inside is also used by some farmers instead of bait spraying to control the fly.*
2	Concentration of bait in the spraying solution	*(not used)*
3	Quantity of bait spraying solution applied per tree	
4	Ratio of trees to be sprayed (pest risk level, if applicable)	*All orchard*
5	Means of spraying application (tractor or other, and their availability, describe)	*Tractor with sprayer or manual spraying (by lens)*
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*Wind speed is usually considered to do the spraying. Temperatures are usually less than 40°C*

7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	*IPM: Thiacloprid 48%* *Deltamethrine 1.5 %* *Imidacloprid 200 g/L ou 20%* *Lambdacyhalothrin 50g/L ou 5%*
8	PHI for each a.i.	*Thiacloprid 48%. PHI=14D* *Deltamethrine 1.5%. PHI = 7 D* *Imidacloprid PHI=7D* *Lambdacyhalothrin 5% PHI=7D*
9	Selectivity of a.i. for natural enemies and pollinators	*Thiacloprid: will have a moderate sub-lethal effect on bees. In addition, thiacloprid toxicity is unlike other neonicotinoid insecticides* *Deltamethrine: not harm against bees in field studies (EPA) & variable or differed effect on beneficial insect.*
10	Other information	*Cacti in orchad relevant to point 1 are sprayed every 15 days*

9.1.7. Beneficial insect monitoring

The . Beneficial insect monitoring in the OliveFlyNet large site of PP3 is showing in the following table.

Table 9.7. Beneficial insect monitoring in the OliveFlyNet large site of PP3

1	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	***Eventually:*** ***1-Predators:*** *Chrysopa, Neutoptera, ants, spiders, Coccinellidae Carabidae, Staphilinidae, Syrphidae* ***2-Parasitoids:*** *Eulophidae (Pnigalio mediterraneus), Eupelmidae (Eupelmus urozonus), Braconidae (Psyttalia concolor), Eurytomidae (Eyrytoma martelli)* ***3-Pollinators &*** *Bees (Honey & Wild).*
2	Means and methods for beneficials' monitoring	*Visual Traps mainly Yellow Sticky Traps*
3	Other information	***Eventually:*** *Other Pests i.e. Saissetia oleae, Prays oleae, Euzophera pinguis etc…*

9.2. P03 OiveFlyNet: Digitized Field Data

9.2.1. Experimental site

The map of the Experimental Site is shown in the following figure.

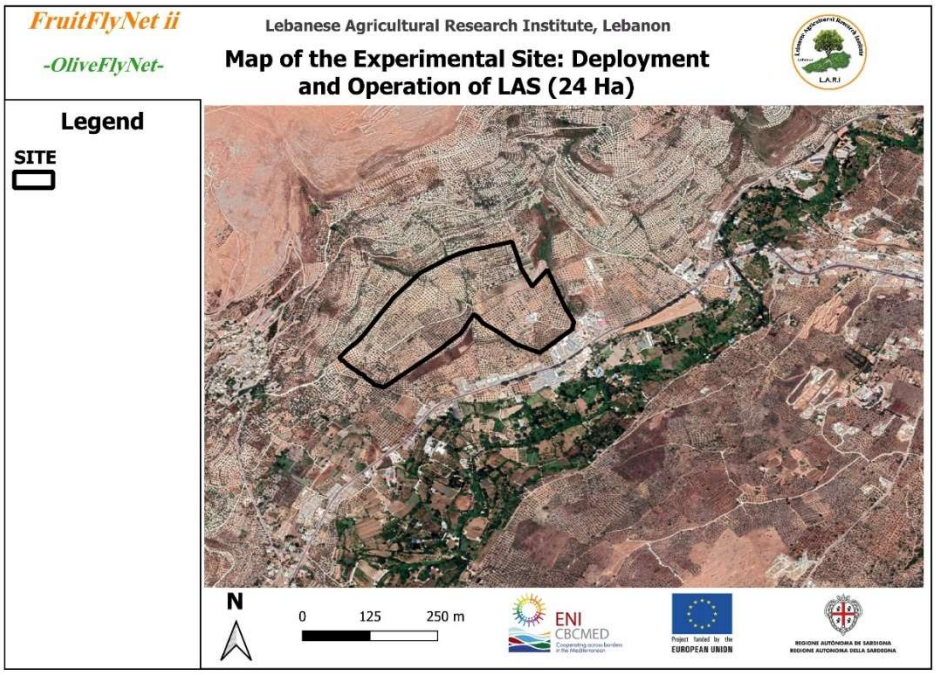


Figure 9.1. Map of the Experimental Site

9.2.2. Trees of the experimental site

The digitalization of the site was realized on the trees, the canopy and the altitude. Figure 2 is representing the digitized trees of 5353 of non-irrigated Olive Baladi trees composing the Deployment and operation site of LAS (24.3 Ha).

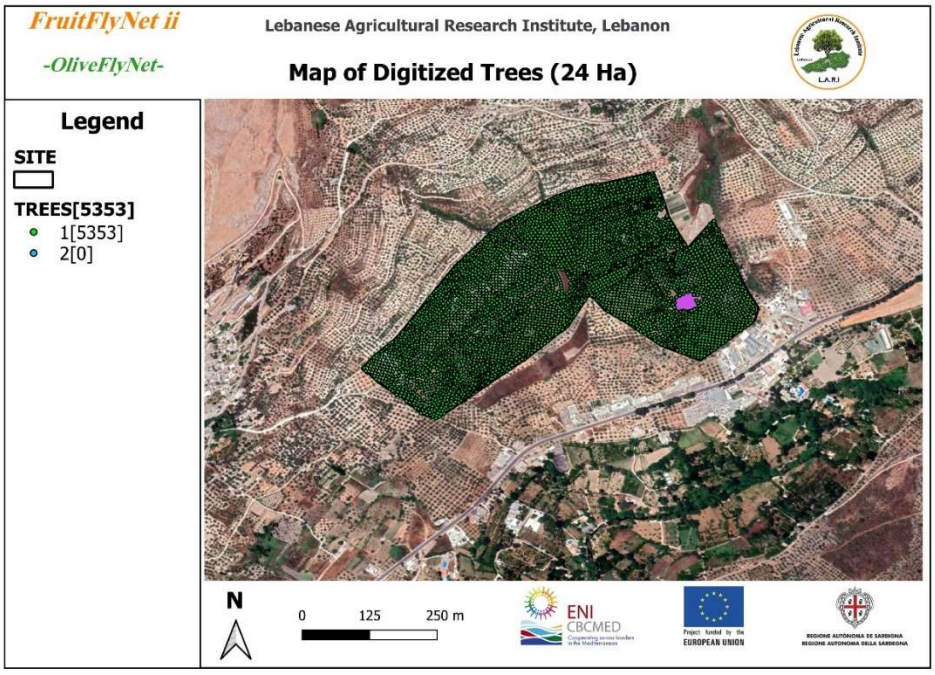


Figure 9.2. Map of Digitized Trees

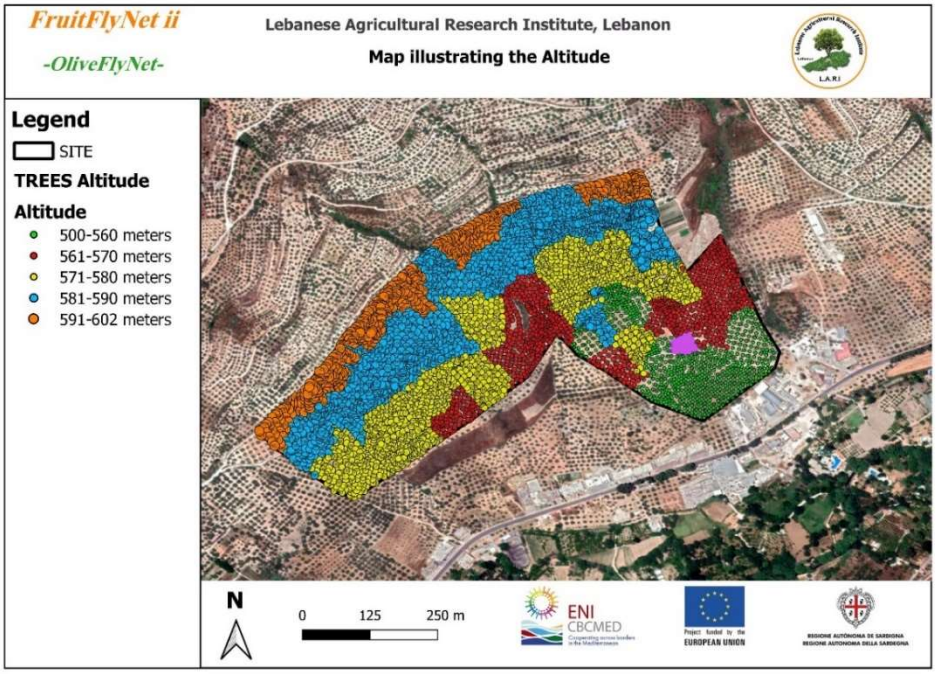


Figure 9.3. Map illustrating the altitude

The variation in altitude the (75 m at max.) from tree to tree, and then from trap to trap, represented by this map, underline the heterogenous land of the site (slope and Hills).

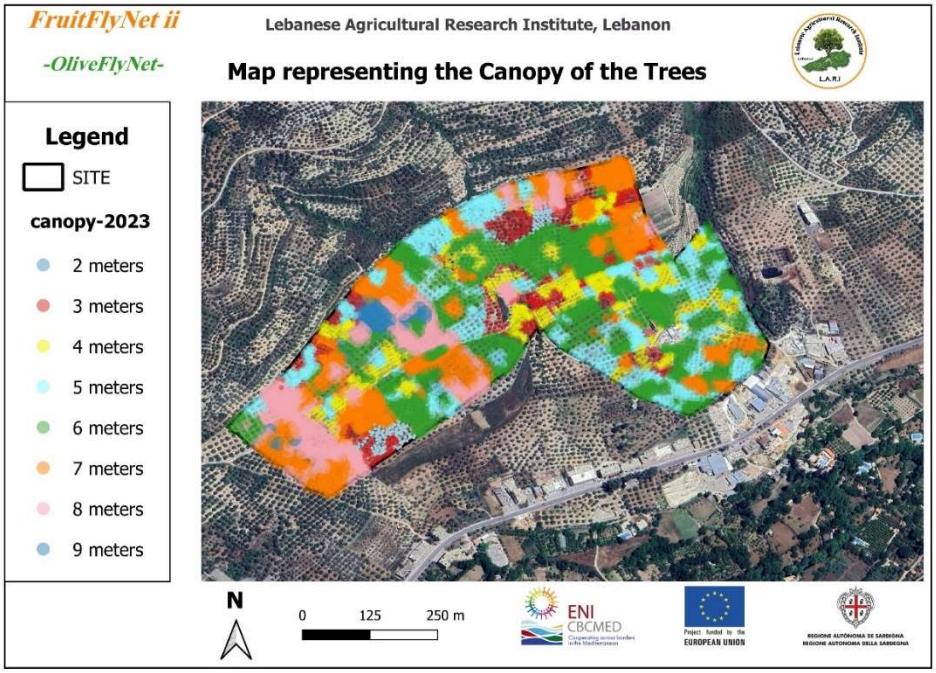


Figure 9.4. Map representing canopy of the trees

The map shows the variation in term of canopy diameter underlying the variability in the size of the trees in the same orchard and from orchard to another.

9.2.3. Orchards of the experimental site

The Experimental Site is owned by 26 Farmers. All the components of the Implementation and Operation Site of LAS were digitized (orchards by Owner ID, Trees with all their parameters, protected zones, Weather Station (Sensors were not applicable) and Traps. The map of the Experimental Site is shown in the following figure.

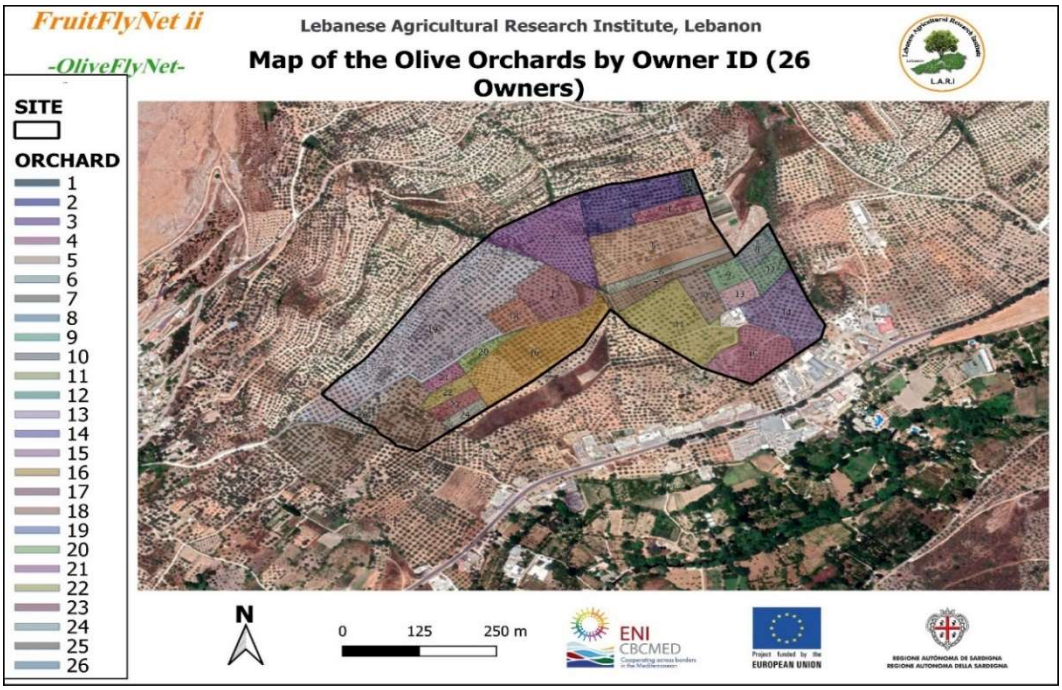


Figure 9.5. Map of the Deployment and Operation of LAS Site Owned by 26 Farmers

The site is owned by 26 farmers like its delimitated in the map above. The site is not flat: there are many hills and valleys. It is composed by non-irrigated Baladi cultivar groves with different clones. This cultivar is characterized by a high tolerance to the drought and moderate tolerance to the OFF. The vegetative growth begins from mid-March till early April; the full bloom is on early April to mid-May and the pit hardening is between mid-June and late June. The fruit turning begin from September – October depending on the weather of the year.

The tree ages are between 20 and 70 years old. The distance between trees is ranging between 5 and 8 m giving a density of 250 to 350 trees by ha. Tree height is ranging between 3 and 7 m, with canopy diameter between 3×3 m and 7×7.5 m. Planting distance in row are variable from owner to another.

The orchards had almost undergone the same agricultural practices. The lands are not irrigated. Most of the trees' shape have spreading growth habit. Chemical fertilizers are manually distributed around trees when rain is expected once a year. Most orchards are ploughed. In fact, the weed control is realized mechanically (tillage and mowing).

9.2.4. Sensors

The sensors in our Deployment and operation of LAS experiment were not applicable. Therefore, we referred to the weather station installed by LARI in this Region and which is far 3 km from the site, to register all the climatic data during the whole experiment. The map of the Meteological Station of Hasbaya is shown in the following figure.

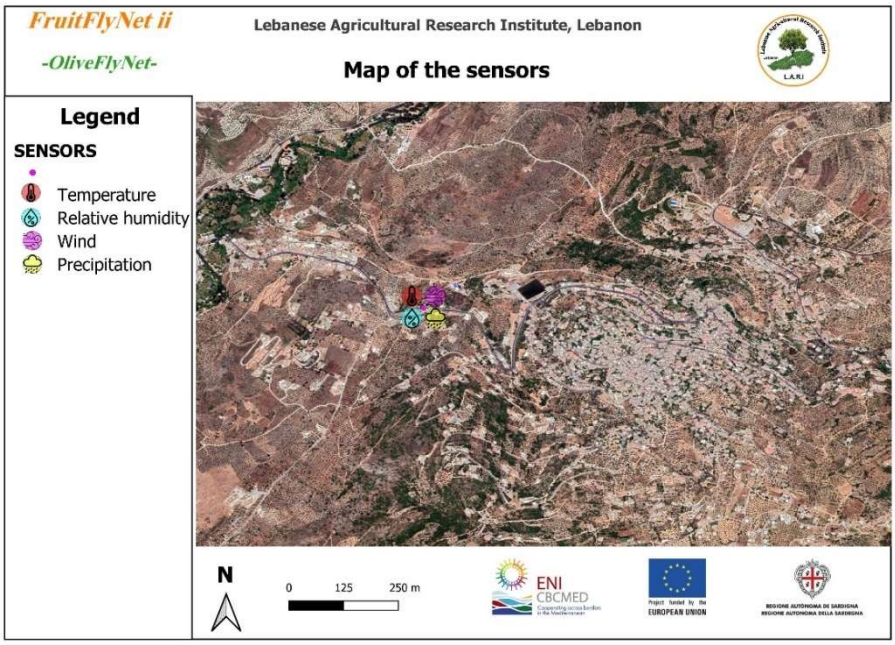


Figure 9.6. Map of the Meteological Station of Hasbaya

9.2.5. Traps

We placed 49 Traps with ammonium bicarbonate (10g) by 24 Ha at 100 m distance between each other. The map of Traps in the Deployment and Operation of LAS site is shown in the following figure.

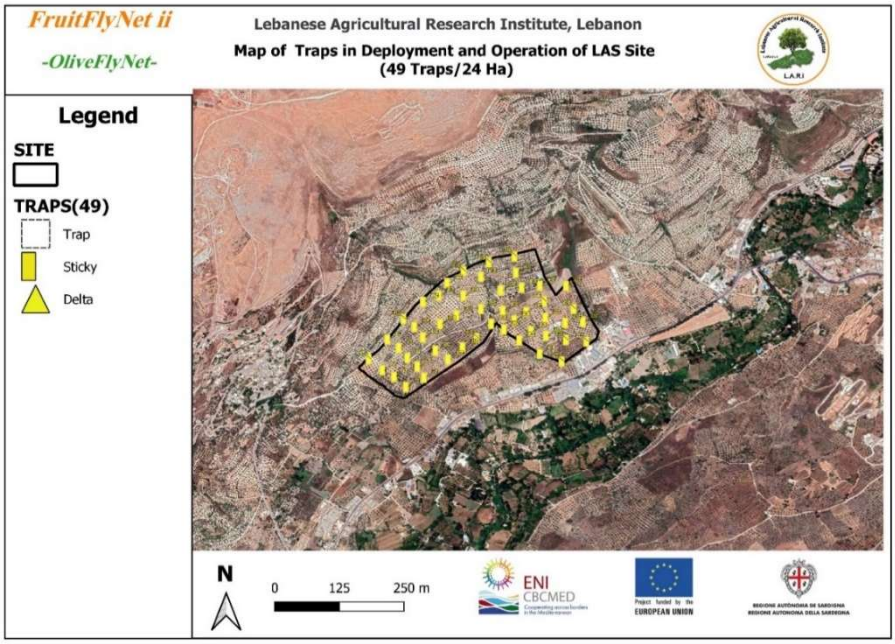


Figure 9.7. Map of Traps in the Deployment and Operation of LAS site

9.2.6. Protected zones

The protected crops area was about 158.34 m^2. Represented by Purple (violet) color was covered a factory building material construction (Cement blocks manufacturing). The map of the Protected zone is showing in the following figure.

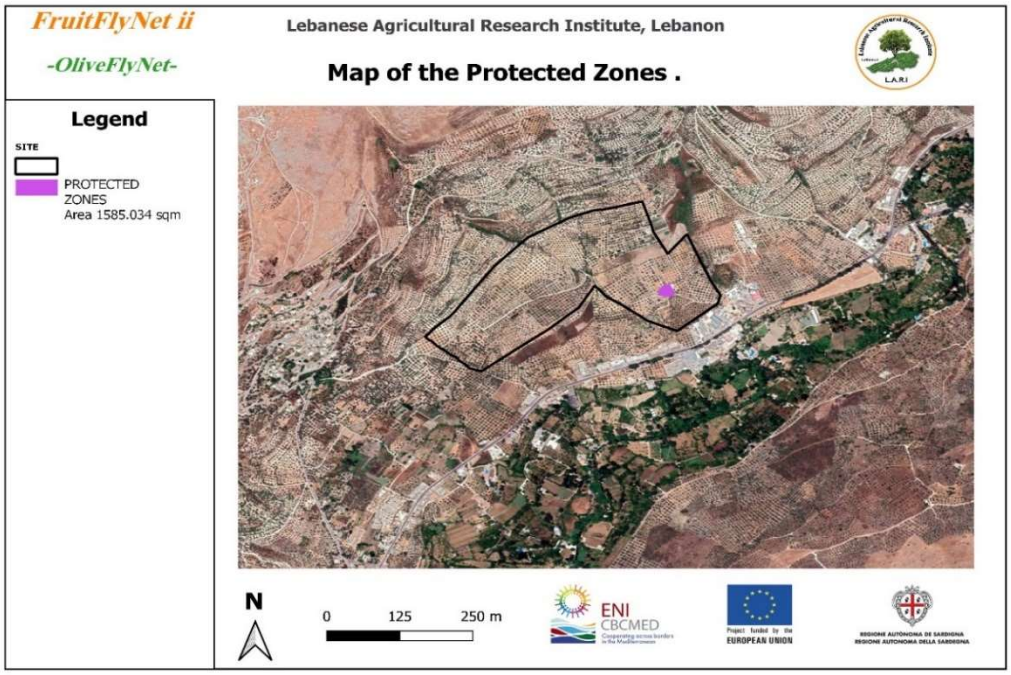


Figure 9.8. Map of the Protected zone

10. PP4 OliveFlyNet

In this section, the data for the *OliveFlyNet* wide-area site of BEN are given. In its first part, the details of the crops and their cultivation techniques, the information about the target pest and its control are shown, and in the second part, the maps of the digitized field elements.

10.1. PP4 OliveFlyNet: Crop and pest field data

In this section the crop/pest data and the digitized data for the *OliveFlyNet* large-scale site of the Tunisian Olive Institute are given. The details of the crop, the cultivation practices, the severity of the pest, the practices used in the monitoring and control of the pest, and the registered insecticides are given in a table format. Then, the maps of the digitized field data such as the borders, the trees, the orchards, the protected areas, the indicative positions of the e-trap, etc., that are required to operate the LAS services in the *OliveFlyNet* site are given. Each map has been produced by the geodatabase.

10.1.1. Test site, MoU

The *OliveFlyNet* large-scale site of Tunisian Olive Institute consists of olive groves belonging to the same owner. This experimental site is located 26.22 km far from the coast in Sfax. In the wider area of the site, olive groves dominate. The olive fruit fly is considered the most serious pest of olives in that area and farmers spray usually every year to control it. The details for the crop and pest data are given in the following tables. The details of the site are described in the following table.

Table 10.1. Crop data of the OliveFlyNet large-scale site of Tunisian Olive Institute

1	Target pest	*Bactrocera oleae (olive fruit fly)*
2	Name of the site area	*Experimental field of Taoues (Champ Expérimental de Taoues)*
3	Total site surface (ha)	*Domain: 126 Ha* ** Rainforest: 108 Ha* ** Irrigated: 16.5 Ha* ** Other (construction and land): 1.5 Ha*
4	Dimensions of the site	*Perimeter: 6.83km (See the map)*
5	Number of different orchards included and type of owner(s) - describe	*-Olive trees* *-Pistachio trees* *-Almond trees* *same owner (The Olive Tree Institute)*
6	Location (Geographic Coordinate System:GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude	*34º56´02"N10º36´50"E* *(Situated 26.22 km far from the coast)*
	Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc.	*Flat Area*
7	Provide the map of the site, its borders, and the different orchards within it. Give information for other orchards or uncultivated land within the site, if applicable.	*See the map of the experimental site (figure 7.2.1b) and the map of the orchards (figure 7.2.3)*
8	Indicate in the map any areas to be protected within the site or close by	*See the map of the protected areas (figure 7.2.7)*

	(i.e., houses, water bodies, water pumps, etc.).	
9	Give information for the surrounding vegetation/crops of the site	*Pistachio, Almond, olive and pomegrante trees present in neighbors orchards*
10	Indicate the position of different tree species, their cultivars, irrigated orchards, or other relevant details in the map of the site.	*See the map of the digitized trees*
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	*See the map of the road network and accessibility in the respective figure*
12	Indicate sources of electricity or drinkable water, if any.	*Electricity is available in the administration and the mill, with a possible extension to the plot* *Water is available via a well*
13	Provide a few representative photos of the orchard elements (a tree, a row of trees etc.).	*See figure 10.1*
14	Other information	-

Rows of trees in the *OliveFlyNet* large-scale site of Tunisian olive Institute is shown in the following figure.

Figure 10.1. Rows of trees in the OliveFlyNet large-scale site of Tunisian olive Institute

10.1.2. Trees and practices

Tree data and cultivation practices of the *OliveFlyNet* large-scale site of Tunisian Institute are given in the following table.

Table 10.2. Tree data and cultivation practices of the OliveFlyNet large-scale site

1	Production system (IPM, organic etc.) (as applicable per orchard/field within the site)	*IPM in the whole site*
2	Tree species and their cultivars. Identities,	** the main variety is Chemlali* **It is a rainfed area* ** the distance between trees is 24*24*
	harvest time	*At the end of December to March*
	sensitivity level to the target pest,	*Sensitive to the pest*
	Protection period of each cultivar.	*June to November*
3	Tree age	*Around 100 years*
4	Tree density (trees/ha)	*17 trees/ ha*
5	Tree height	*2-3-4-5 meters (depending on the variety and the irrigation mode)*
6	Tree canopy diameter	*1-2-3 meters; 5-6 meters (depending on the variety and the irrigation mode)*
7	Planting system (i.e. linear)	*linear*
8	Distance between the trees (in the row and between the rows)	*The distance between the Chemlali variety is 24*24m* *For the other varieties (hybrids), it can be 6*6, 7*7 or 2*4.*
9	Tree shape - Pruning	*Gobelet pruning*
10	Fertilization method and its frequency	*Once a year: ammonium* *Or 50m3/ha of olive mill wastewater once every two years in one experimental area of the plot*
11	Irrigation method and its frequency	*Dripping, every day (hyper-intensive), every two days (intensive)* *Or rainfed (chemlali Variety)*
12	Weed control	*Plowing 5 times/year* *Once in two years, use of a cultivator with 6 tines*
13	Neighboring fruit fly host crops – possible infestation sources	*Olive trees grown under extensive and intensive ways in the neighboring orchards*
14	Foreseen fruit load for this year production	
15	Discuss other possible variation sources in infestation levels across the site (i.e., due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.)	*Possible decrease in infestation levels after persistent drought*
16	Other information	

10.1.3. Target pest monitoring

The data for the target pest monitoring the *OliveFlyNet* large-scale site of Tunisian olive Institute are given in the following table.

Table 10.3. Data for the target pest monitoring of the OliveFlyNet wide-area site

1	Target pest	*The Olive fly Bactrocera oleae*
2	Period of monitoring i.e., per orchard/cultivar, as applicable	*The olive fruit fly is monitored from June to November.*
3	Type(s) of traps	*McPhail*
4	Bait(s) used	*Di-ammonium phosphate*
5	Trap density/ha for monitoring	*5 traps/Ha*
6	Time interval for trap captures monitoring	*Once or twice a week*
7	Method for fruit damage monitoring	*Fruit sampling (100 fruit/tree. 10 trees/plot)*
8	Infestation levels in the orchard in the previous years, data of pest levels/damages	*Huge infestation in the previous year. A record of an average of 798.6 adults/trap/week was noticed in March 2020. In June 2021, captures were high (FTD=13) In September 2021, climatic conditions were unfavorable for fly development, due to high summer temperatures that increase fly mortality and decrease reproduction.*
9	Other pests in the orchard, possible interference with sprayings against other pests - describe	*Prays oleae: possible interference in sprayings against the second generation of Prays oleae*
10	Common diseases	*Nothing to report*
11	Other information	-

10.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *OliveFlyNet* large-scale site of Tunisian Olive Institute are given in the following table.

Table 10.4. Data for meteorological data monitoring of OliveFlyNet large-scale site

1	Add information about the climatic conditions of the area of the site in annual basis	*Semi-arid conditions. The annual average temperature in Sfax is 19.4 °C. The annual average precipitation reaches 196 mm.*
2	Suggest meteorological parameters to be monitored according to pest monitoring and control methods	*Daily and monthly Temperatures (Max and Min) Pluviometry*
3	Add information for any meteorological station in the area, if exist.	*Presence of a Meteorological Station at the Experimental Station*
4	Other information	

10.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *OliveFlyNet* large-scale site of Tunisian Olive Institute are given in the following table.

Table 10.5. Spraying decision rules for the target pest in the OliveFlyNet wide-area site

1	Describe the spraying decision process	*The spraying decision process depends on the following parameters:* *If there is:* *-an important number of captured olive fruit flies* *-the female ovaries are mature* *- the Fruits are susceptible for oviposition* *- with absence of fruit infestation* *=>A localized mixture of insecticide 100 cc of dimethoate and 300cc of protein hydrolysate in 100 liters of water is applied to every fourth line of olive trees* *The Volume is around 20 liters/tree (according to canopy volume)* *If there is:* *-Fruit infestation the spraying is decided according to the threshold* ** For oil olives the threshold is around 10-12% of infestation* ** For table olives the threshold is 1-2 % of fruit infestation* *=> a systemic insecticide 'Dimethoate' is applied to the entire tree* ** The latest date for applying chemical treatments is in July or at the beginning of August*
2	Pest capture critical densities during the season	*3 fly/trap/week*
3	Fruit damage threshold during the season	** for oil olives the threshold is around 10-12% of infestation with alive larvae* ** for table olives the threshold is 1-2 % of fruit infestation with alive larvae*
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	*Fruit Diameter= 6.5 mm for Chemlali variety*
5	Models or prediction, if available	*Prediction via sampling, Temperature, fruit availability and diameter, females' ovaries composition* *For instance, no mathematical models yet.*
6	Other information	-

10.1.6. Bait Spraying Application

The bait spraying application procedures against the target pest in the *OliveFlyNet* large-scale site of Tunisian Olive Institute are given in the following table.

Table 10.6. Bait spraying application procedures against the target pest in the OliveFlyNet large-scale site

1	Type of spraying used (cover spraying or bait spraying) (describe)	*Bait spraying with insecticide*
2	Concentration of bait in the spraying solution	*100 cc insecticide* *300 cc bait* *in 100 liters of water*
3	Quantity of bait spraying solution applied per tree	*5 l/ tree*
4	Ratio of trees to be sprayed (pest risk level, if applicable)	**The bait spraying with insecticide is applied to every fourth line of olive trees If there is :* *-an important number of captured olive fruit flies* *-the female ovaries are mature* *- the Fruits are susceptible for oviposition* *- with absence of fruit infestation* ** the cover spraying with systemic insecticide 'Dimethoate' is applied to the entire tree If there is fruit infestation*
5	Means of spraying application (tractor or other, and their availability, describe)	*Usually by Tractor* *The plane is used when the access is difficult*
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	*The air temperature and wind speed limits are empirically considered during sprayings (There is no legislative text for climatic conditions during spraying)*
	Registered insecticides (a.i.) against the target pest in IPM and organic crops	*Dimethoate is the main used insecticide* *Spinosad for organic farm*
8	PHI for each a.i.	**The latest date for applying chemical treatments is in July or at the beginning of August* => PHI = 4 months
9	Selectivity of a.i. for natural enemies and pollinators	*Not Selectif*
10	Other information	

10.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the *OliveFlyNet* large site of Tunisian olive Institute is described in the following table.

Table 10.7. Beneficial insect monitoring in the OliveFlyNet large-scale site of the experimental site Taous

1	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	*The main parasitoids found in our country are:* *Eupelmus urozonus* *Eurytoma martellii* *Pnigalio mediterranus* *Opius concolor* *References :* *Jarraya, A et al,1986. La mouche de l'olivier Dacus Oleae et son impact sur la production oleicole dans la region de sfax* *Arambourg,Y (1964). Caractéristiques du peuplement entomologique de l'olivier dans le sahel de Sfax.*
2	Means and methods for beneficials' monitoring	*Pitfall traps and glue traps.*
3	Other information	-

10.2. BEN OiveFlyNet: Digitized Field Data

The digitized field data of the *OliveFlyNet* large-scale site of Tunisian Olive Institute are given in maps. The maps have been generated by the geodatabase. The map of location of the experimental site Taous, Tunisia IO is showing in the following figure.

10.2.1. Experimental site

The map of location of the experimental site Taous, Tunisia IO is showing in the following figure.

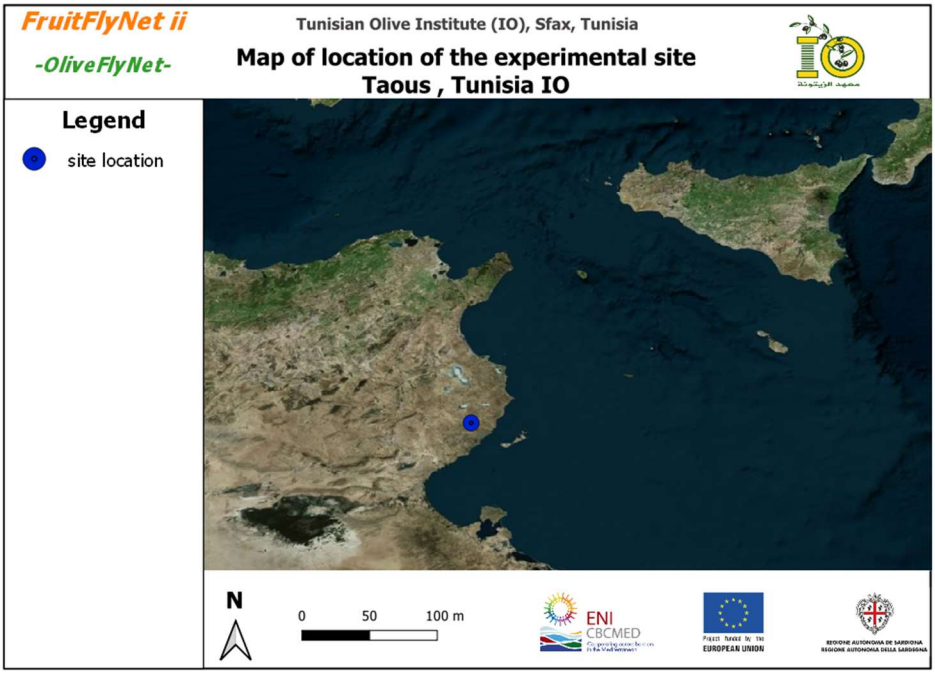


Figure 10.2. Map of location of the experimental site Taous, Tunisia IO

The map of the borders of the site are shown in the following figure.

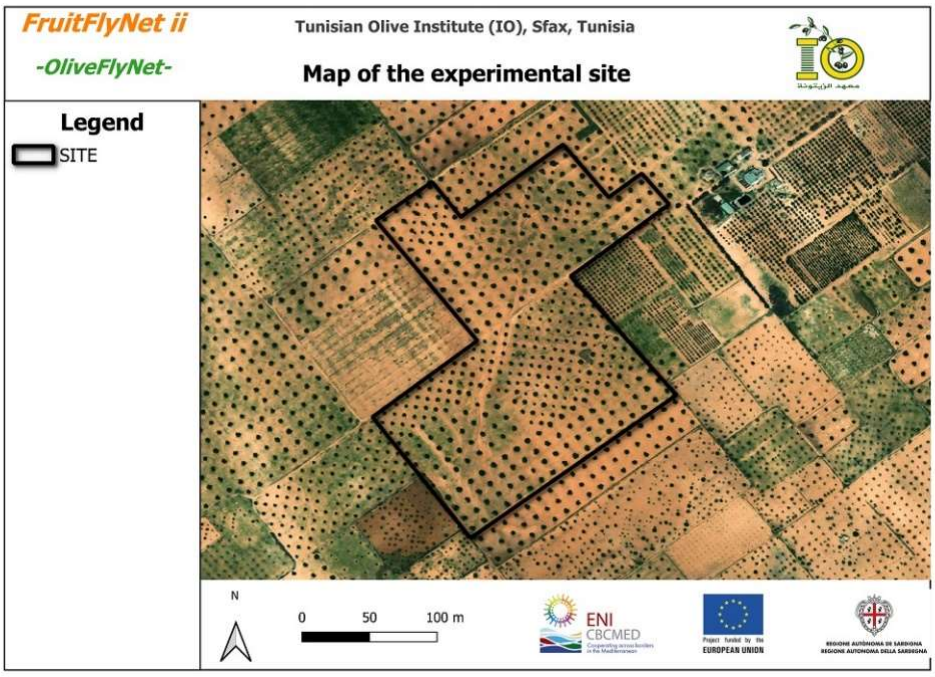


Figure 10.3. Map of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.2. Trees of the experimental site

The position of the trees in the olive grove of the *OliveFlyNet* large-scale Tunisian olive Institute is shown in the following figure.

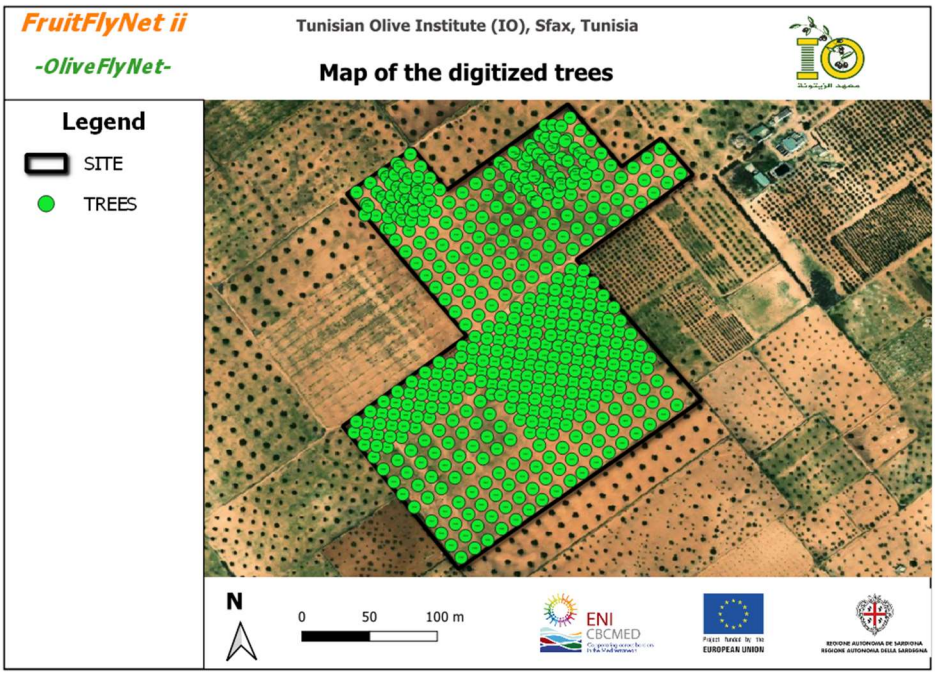


Figure 10.4. Map of the trees of the OliveFlyNet large-scale site of Tunisian Olive Institute (trees as points)

The plot is a mixture of old trees of the Chemlali variety and other young trees of different varieties, which are grafted on the old trees and indicated, on the map, by irregular dots close to each other. The canopy diameters of the trees are shown in the following figure.

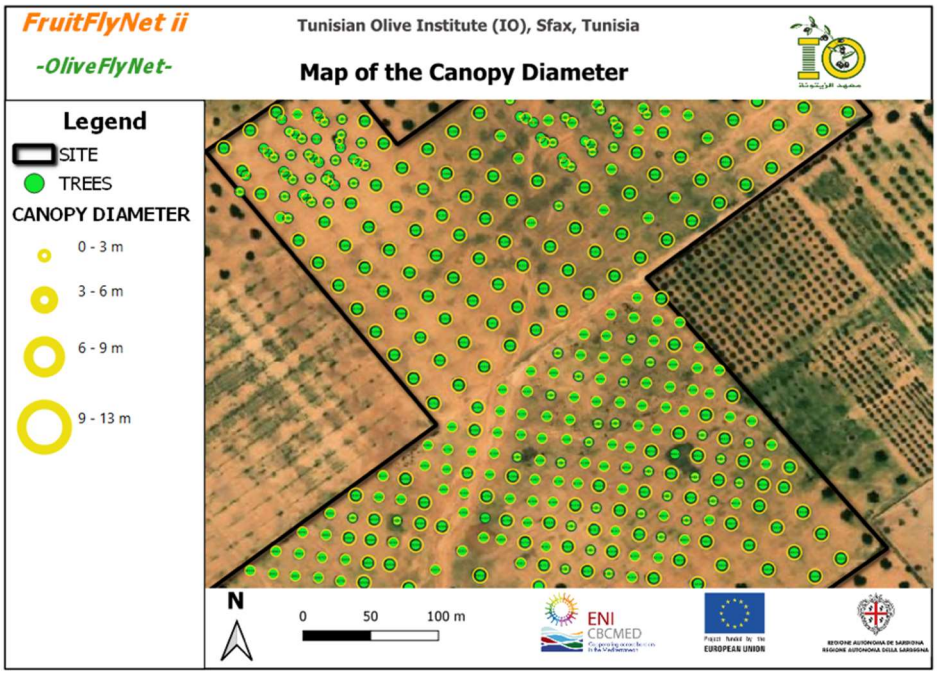


Figure 10.5. Map of the canopy diameter of the OliveFlyNet large-scale site of Tunisian Olive Institute

The map of the different cultivar of the OliveFlyNet large-scale site of Tunisian Olive Institute is showing in the following figure.

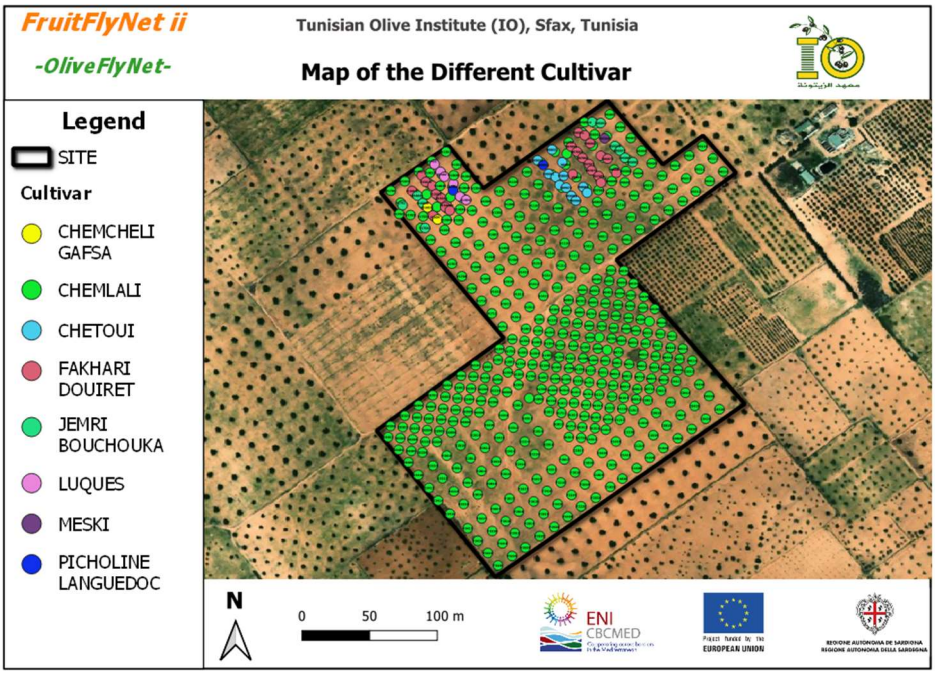


Figure 10.6. Map of the different cultivar of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.3. Orchards of the experimental site

The different olive groves of the *OliveFlyNet* large-scale of Tunisian Olive Institute are shown in the following figure.

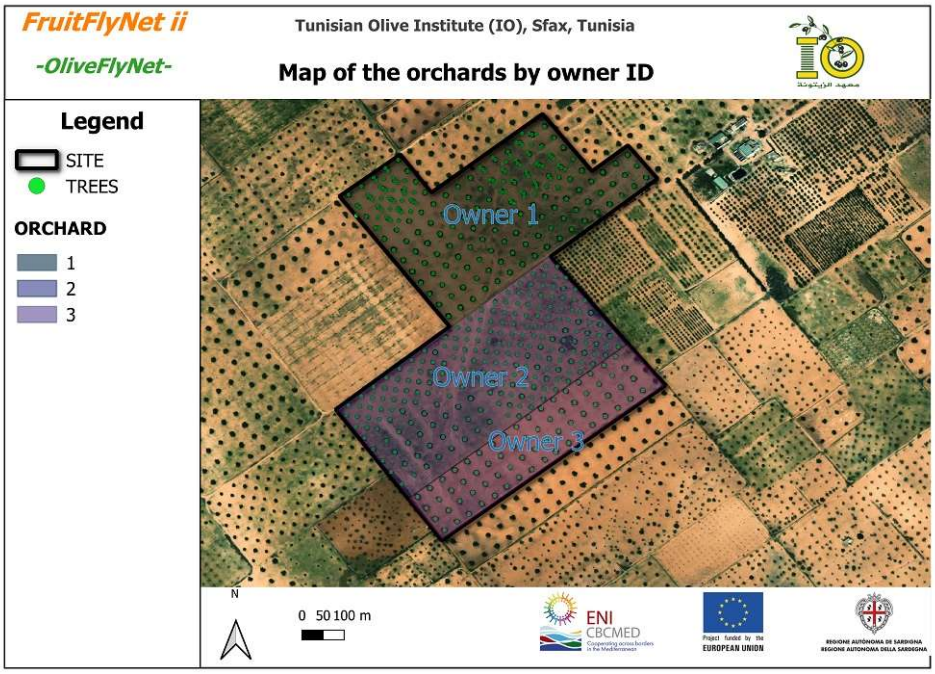


Figure 10.7. Map of the olive groves of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.4. Land uses of the experimental site

The land uses and their description of the *OliveFlyNet* large-scale of Tunisian Olive Institute are shown in the following figure.

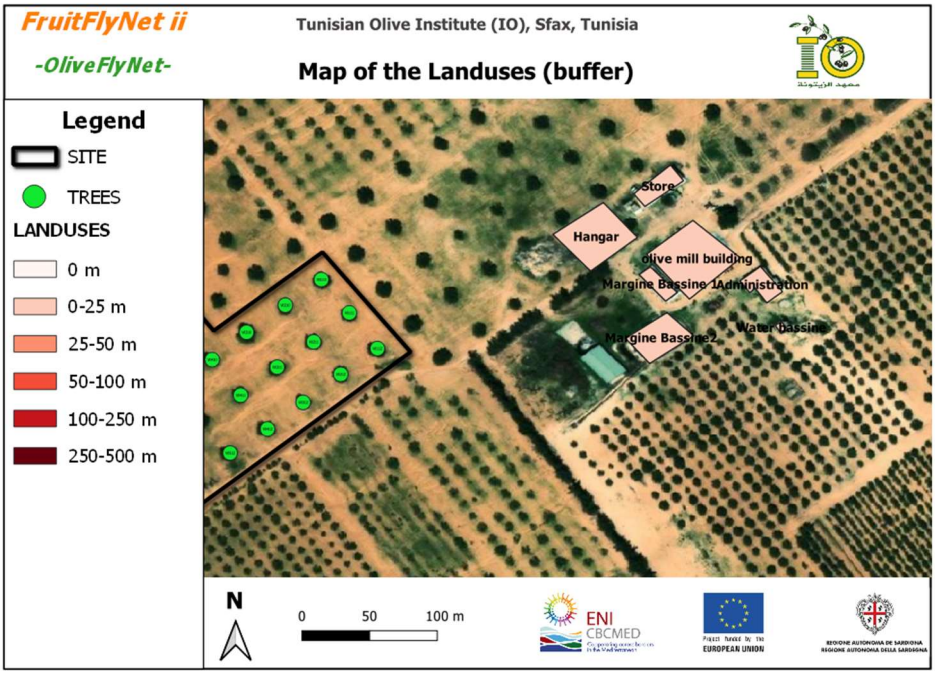


Figure 10.8. Map of the land uses of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.5. Sensors

The map of the location of the meteorological sensors of the OliveFlyNet large-scale site of Tunisian Olive Institute is showing in the following figure.

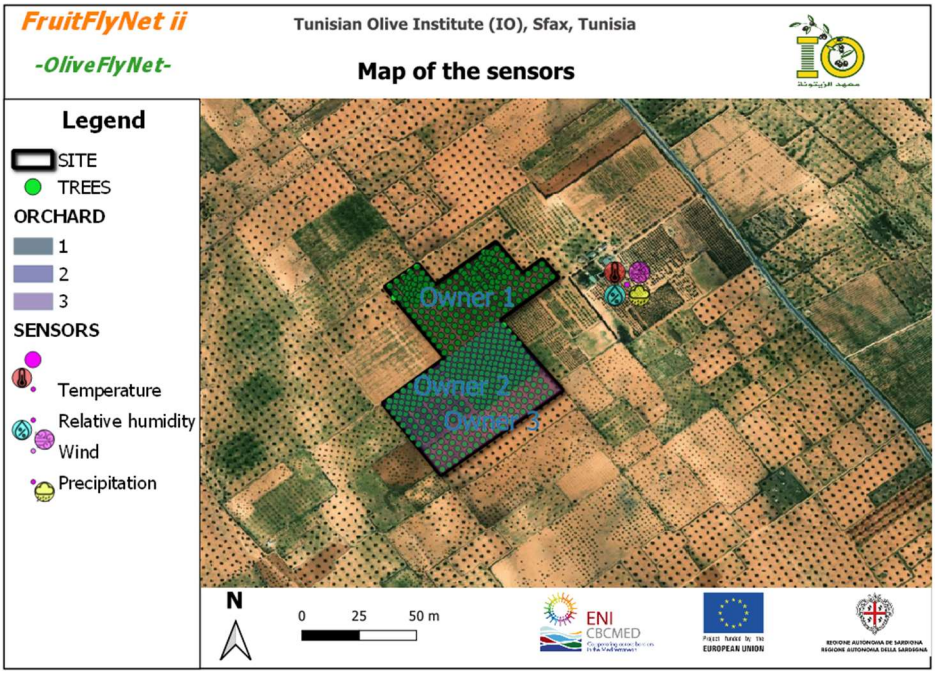


Figure 10.9. Map of the location of the meteorological sensors of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.6. Traps

The indicative position of the yellow sticky e-traps to be established in the large-scale site of *OliveFlyNet* of the Experimental site Taous are shown in the following figure.

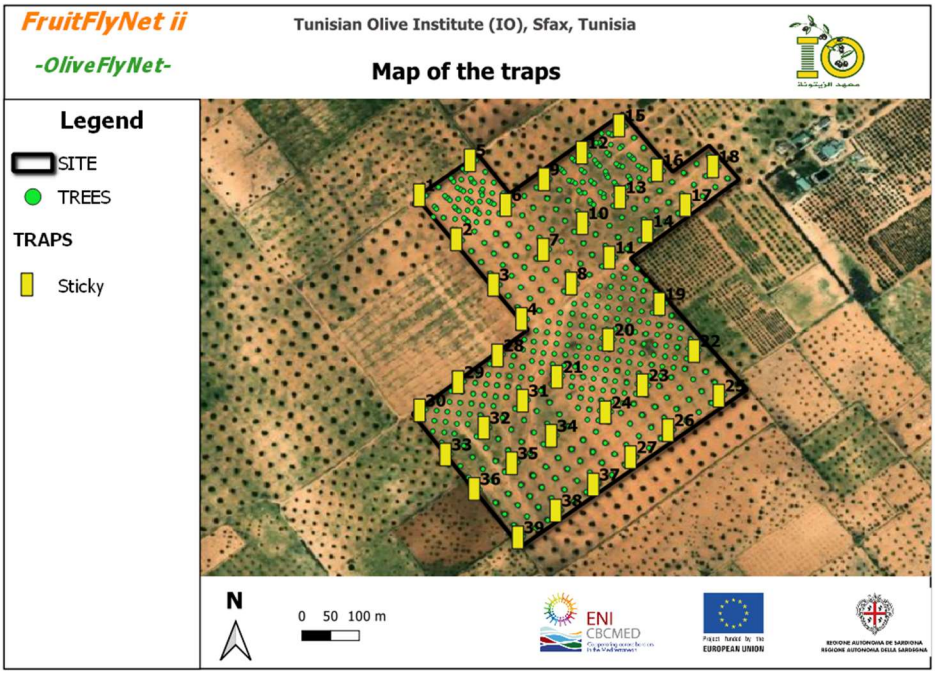


Figure 10.10. Map of the location of the traps of the OliveFlyNet large-scale site of Tunisian Olive Institute

10.2.7. Protected zones

The protected areas are nearby the *OliveFlyNet* large-scale site of the Tunisian Olive Institute. The distance from these areas is about 150 m. The map of the protected zones of the OliveFlyNet large-scale site of Tunisian Olive Institute is showing in the following figure.

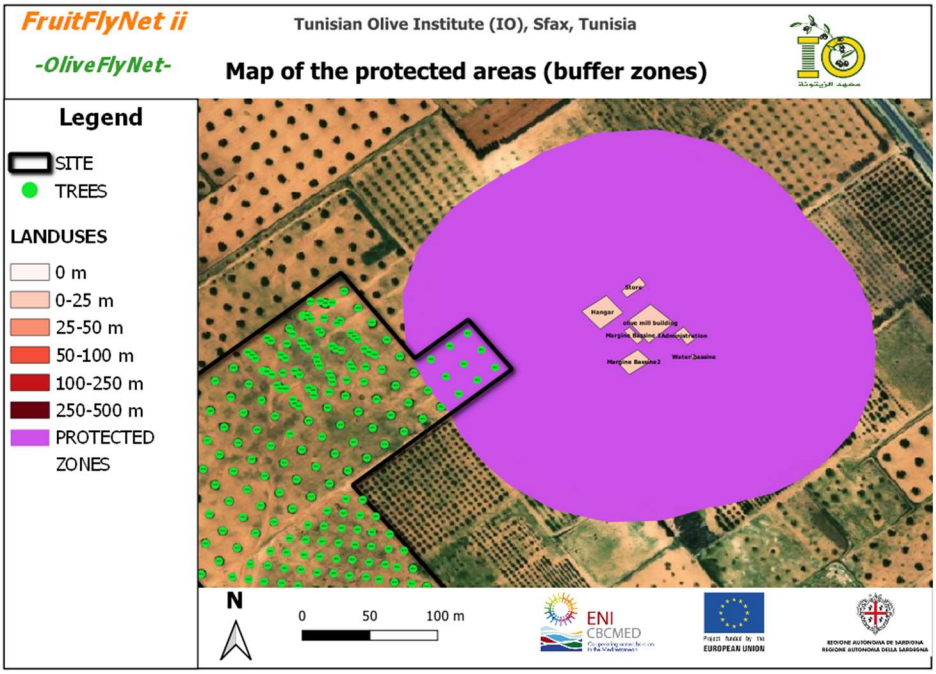


Figure 10.11. Map of the protected zones of the OliveFlyNet large-scale site of Tunisian Olive Institute

11. PP5 MedFlyNet

In this section the data for the *MedFlyNet* wide-area-scale site of PP5 are given. In the first part, the details of the crops and their cultivation practices, the information about the target pest, and its control are given in a table format. In the second part, the maps of the digitized field elements needed for the operation of the LAS services on the site are given. Each map has been produced by the geodatabase.

11.1. PP5 MedFlyNet: Crop and pest field data

11.1.1. Test site, Plant production seedling (Mabrouka company), Tunisia

The test site of PP5 (CRRHAB Chott Mariem, Tunisia)consists of seven peach orchards. The orchards are located at the delegation of Khlidia belonging to the Ben Arous prefecture in the northeast of Tunisia, at about 20 kilometers the south of the capital Tunis. The owner of these orchards is a company that specialized in the production of fruits for consumption and fruits trees seedlings for plantation. A memorandum of understanding between Partner 5 and the company was signed on October 6, 2021. The cultivation practices are the same in all orchards. According to the manager of this company, MedFly is a serious pest on peach orchards causing heavy losses. For its control, chemical sprays are done. Two types of peach cultivars are cultivated: early and late ripening cultivars. Ripening starts from the end of May until the month of September. This should be taken into consideration in the management of MedFly.

The details of the site are described in the following Table.

Table 11.1. Crop data of the MedFlyNettest site of PP5 (Mabrouka, Tunisia)

1	Target pest	*Ceratitis capitata* (MedFly)
2	Name of the site area	Mabrouka, Khlidia.
3	Total site surface (ha)	28.4 Ha (18.25 ha cultivated in peaches). The total surface of the site is 28.4 ha in which 18.25 ha are cultivated with peaches and the remaining are un-cultivated area (6.8 ha), different Citrus scion varieties used for grafting (0.3 ha) ornamental canary palm (1 ha), Peach new plantation (K9, 1.9 ha)
4	Dimensions of the site	Area: 284000 m^2. Irregular shape site Perimeter : 2770 m
5	Number of different orchards included, and type of owner(s) describe	Seven commercial orchards. The owner of these orchards is a private agricultural company specialized in the production of fruits for consumption and fruit tree seedlings for plantation. The cultivation practices are the same in all orchards
6	Location (Geographic Coordinate System:	Longitude: 10.20358

	GCS_WGS_1984 (EPSG:4326), Datum: D_WGS_1984, Prime Meridian: Greenwich, Angular Unit: Degree) Altitude Describe any irregularities of the land surface, slope, terrain, elevation, distance from the sea etc	Latitude: 36.65857 Decimal Degrees Altitude: ranging from 43 m to 96 m. Distance from the sea 14.3 km
7	Map of the site, its borders and the different orchards within it and information for other orchards or uncultivated land within the site, if applicable.	The site is divided into 7 orchards. The first is cultivated with PM2 cultivar, the second with 2 cultivars: Extreme 460 and Extreme 568, the third with2 cultivars: PM12 and Sagittaria, the fourth with two cultivars: PM17 and PM9, the fifth and sixth with PM14 and PM7 cultivars respectively and the last one with PM10 cultivar (*See respective figure*). Within the site, there are uncultivated area located between orchards 1 and 2, extending to an area limited by Orchard 2 in the east, Orchard 3 in the west and orchard 4 in the south (*See respective figures*). There is also a several species of Citrus plants cultivated only for the production of citrus rootstocks and scions to the south of orchard 3 (*See respective figures*). It exists also an area cultivated with ornamental palms trees bordered by the species and varieties of Citrus used as rootstocks and scions in the north, olive orchard in the south, orchard 6 in the east and orchard 7 in the west (*See respective figures*). An area cultivated with K9 peach cultivar is located just western of orchard 7 (*See respective figures*).
8	Map of areas to be protected within the site or close by (i.e., houses, water bodies, water pumps, etc)	There are two water reservoirs to be protected: the first located at the northeastern part of orchard 3 (water reservoir 2: Figure 11.2) and the second close to orchard 5 just in the corner at South part (Reservoir 1: figure 11.2). A water canal below orchard 7 is present and needs to be protected. The Medjerda-Cap Bon canal (120 km) is an open-air water canal bringing raw water from the Laroussia dam (the north-west of Tunisia) to the cap bon and sahel regions to be used for irrigation and drinking water and so considered as a protected zone (figure 11.2). There are buildings hosting engines of energy necessary to deliver water from reservoir to crops (protected zones). Residential buildings (houses) far from the site are present (*See respective figure*).
9	Surrounding vegetation/crops of the site	Olive and bitter orange orchards are at short distance as well as uncultivated area. Some trees of fig, *Ficus carica* are present between orchards cultivated with

		PM7 and PM14 cultivars and a row of newly planted figs in the northern side of PM12 exist. There are also citrus, pomegranate, apricot, olive orchards far from 800 to 2000 meters from the wide-area site (*See respective figures*).
10	Position of different tree species, their cultivars, irrigated orchards or other relevant details in the map of the site.	*See respective figures*
11	Indicate the road network and accessibility of the site and each orchard, as applicable.	Each orchard in the experimental site can be accessed through roads from the 3-4 sides. The width of path varied from 3 to 5 meters, except between PM9 and PM17 in the middle there is no road (*See respective figure*).
12	Sources of electricity or drinkable water, if any.	Drinkable water and electricity furnished by the National Societies of Water and Electricity respectively are available in administrative buildings at about 2-3 km from the experimental site.
13	Representative photos of the orchard elements (a tree, a row of trees etc)	*See respective figure*
14	Other information	-

11.1.2. Trees and practices

Information for the trees and practices are given in the following table.

Table 11.2. Trees data and cultivation practices in the MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

1	Production system (IPM, organic etc) (as applicable per orchard/field within the site)	Conventional agriculture.
2	Tree species and their cultivars. Identities, harvest time, sensitivity level to the target pest, protection period of each cultivar (updated data)	*Prunus persica* (Peach) with the following cultivars (Cultivar: harvest time/ first insecticide spray in 2022): • Sagittaria: May 20-May 30/June 18 • PM12: May 14-May 28/June 18 • PM14: May 30-June 06/May 25 • PM9: June 06-June 16/ May 18 • PM7: June 01- June 16/May 25 • PM2:June 14- June 23/ May 25 • PM17: June 23- June 30/May 25

		• K9: end of May- Beginning of June/End of May • Extreme 460: August 20-31 August/ non treated in 2022 against MedFly. • Extreme 568: August 20- 29 August/ non treated in 2022 against MedFly. • PM10: August 08-August 15/June 17. • Regarding fruit sensitivity, late ripening cultivars (PM10, Extreme 460, Extreme 568) are more susceptible to MedFly attack (*See respective figure*).
3	Tree age	New planted cultivars. New peach cultivars (1-5 years old) were planted in replacement of old varieties that are no more appreciated by the consumer. Plantation years were as follow: • Sagittaria: 2017 • PM12: 2017 • PM14: 2017 • PM9: 2017 • PM7: 2017 • PM2: 2017 • PM17: 2017 • K9: 2021 • Extreme 460: 2019 • Extreme 568: 2019 • PM10: 2019.
4	Tree density (trees/ha)	660 trees/ha.
5	Tree height	1.5-3.5m.
6	Tree canopy diameter	0.5-3m.
7	Planting system (i.e. linear)	Linear.
8	Distance between the trees (in the row and between the rows)	3X5m.
9	Tree shape – Pruning	Open centre training system (Gobelet).
10	Fertilization method and its frequency	Standard fertigation (NPK along with micronutrients) mainly in spring and summer-early autumn.

11	Irrigation method and its frequency	Drip irrigation system with a frequency variable depending on temperature and rainfall.
12	Weed control	Mechanical and chemical.
13	Neighboring fruit fly host crops – possible infestation sources	Some trees of figs exist between orchards cultivated with PM7 and PM14 cultivars. Bitter orange crop is located near orchard cultivated with PM12 cultivar. Citrus, apricot, pomegranate crops are also cultivated in the same area but at a distance between 300 to 500 meters from the wide-area site (*See respective figures*).
14	Actual fruit load for this year production (2022)	Depending on cultivars as follow (Tons/ha): • PM12 : 20T/ha • Sagittaria : 20T/ha • PM14 : 20T/ha • PM9 : 15T/ha • PM2 : 20T/ha • PM17 : 20T/ha • PM7 : 20T/ha • PM10 : 10T/ha • Extreme 568 : 7.5T/ha • Extreme 460 : 7.5T/ha.
15	Variation sources in infestation levels across the site (i.e., due to the variation of height and slope, irrigation, pruning, fertilization, other species of trees that host fruit flies etc.).	The sources of infestation depend on the availability of other host plants of the pest and their fruit load, insecticide frequencies, orchard sanitation, climatic data. But each year the infestation is high due to high susceptibility of peach fruits (many varieties which ripe at different times). Due to the presence of many *C. capitata* hosts in the study site (Citrus, peach, figs, pomegranate), the insect is present year round except in January-February and is mainly active in Spring, Summer and Autumn jumping from ripening host to another. Usually, infestation begins in the early peach varieties. It is important to point out that after the harvest of early peach cultivars, dropped fruits are not collected and remained on the soil which may lead to important infestation in late maturing varieties.
16	Other information	-

11.1.3. Target pest monitoring

The data for the target pest monitoring of the *MedFlyNet* test site of PP5 are given in the following table.

Table 11.3. Data for the target pest monitoring in the MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

1.	Target pest	*Ceratitis capitata*
2.	Period of monitoring i.e. per orchard/cultivar, as applicable	No monitoring done by the owners in the last two seasons
3.	Type(s) of traps	No trapping devices were used
4.	Bait(s) used	-
5.	Trap density/hafor monitoring	-
6.	Time interval for trap captures monitoring	-
7.	Method for fruit damage monitoring	Visual observation of the fruit color
8.	Infestation levels in the orchard in the previous years, data of pest levels/damages	Around 5 to 10 % of fruits are infested in spite of insecticide sprays
9.	Other pests in the orchard, possible interference with sprayings against other pests – describe	Aphids in April-early June Mites species occur occasionally
10.	Common diseases	*Taphrina deformans,* fruit rot
11.	Other information	

Usually, the Mabrouka company do not use traps for the monitoring of the Medfly. This year we implemented the trapping grid.

11.1.4. Meteorological Data Monitoring

The means for the meteorological data monitoring of the *MedFlyNet* ii test site of PP5 are given in Table 11.4.

Table 11.4. Data for the meteorological data monitoring in the *MedFlyNet* ii test site of PP5 (Mabrouka, Tunisia) (updated data)

1	Information about the climatic conditions of the area of the site in annual basis	In 2022, the average daily temperature varies between 4.4°C and 37.06°C. The total annual precipitation is 200.99 mm (Meteorological station of Mabrouka company, Khlidia) (Data from January to September 2022).

2	Meteorological parameters monitored according to pest monitoring and control methods	Temperature, relative humidity, wind speed and precipitation were monitored.
3	Information about meteorological station in the area, if exist.	The meteorological station belonging to Mabrouka company situated at 1 km from the experimental site.
4	Other information	Real climatic data are provided in D.4.3

11.1.5. Spraying Decision in the area

The spraying decision rules for the target pest in the *MedFlyNet* ii test site of PP5 are given in Table 8.5.

Table 11.5. Spraying decision rules for the target pest in the *MedFlyNet* ii test site of PP5 (Mabrouka, Tunisia)

1	Spraying decision process	Spraying decision is taken generally at calendar dates and the color changing of peach fruits.
2	Pest capture critical densities during the season	2 adults/trap/week as a general rule when trapping grid is used but generally treatments were done at regular interval
3	Fruit damage threshold during the season	Very low (spraying is undertaken at calendar basis).Usually, spraying interval is 15 days and in the season and 21 to 30 days before harvest)
4	Fruit color or other fruit characteristics (BBCH) that are related to the damage or the pest control decisions	Changing fruit color and temperature increase induce the beginning of sprayings.
5	Models or prediction, if available	No model is available
6	Other information	

11.1.6. Bait Spraying Application

The spraying application procedures against the target pest in the *MedFlyNet* ii test site of PP5 are given in the Table 11.6.

Table 11.6. Bait spraying application procedures against the target pest in the PP5 *MedFlyNet* test site (Mabrouka, Tunisia)

1	Type of spraying used (cover spraying or bait spraying) (describe)	Cover spraying is used

2	Concentration of bait in the spraying solution	Decis Expert based on Deltamethrin: 15cc/hl Daphène Fort EC based on Dimethoate: 100cc/hl.
3	Quantity of bait spraying solution applied per tree	About 0.2 liter but it is depending on tree density.
4	Ratio of trees to be sprayed (pest risk level, if applicable)	It is not applicable.
5	Means of spraying application (tractor or other, and their availability, describe)	Tractor.
6	Critical climatic conditions during spraying (temperature, wind speed, RH, precipitation, etc) for the area or country (add reference if available)	In general sprays were undertaken early in the morning and at low level wind speed. Before deciding to spray, we can consider the weather forecasting the day before spraying by consulting climatic data provided by the meteorological station of Mabrouka company.
7	Registered insecticides (a.i.) against the target pest in IPM and organic crops	Insecticides registered in IPM cultivation: Deltamethrin at 25 g/liter a.i at 100 ml of formulated product per 100 liter water, Dimethoate at 400 mg/liter a.i, at 100 ml of formulated product per 100 liter water. Lambda Cyhalothrin at 5% ai at 100 cc/ha, Malathion at 500g/liter a.i at 500 cc/ha The following insecticides are authorized to be used in organic crops: Success Appât and Spintor based on Spinosad at 0.24 g/liter of a.i. at 1 liter per ha
8	PHI for each a.i.	Deltamethrin, PHI= 15 days; Dimethoate, PHI= 21 days; Lambda Cyhalothrin, PHI= 14 days; Malathion, PHI = 7 days; Spinosad, PHI= 7 days
9	Selectivity of a.i. for natural enemies and pollinators	No particular attention is given to natural enemies but when spraying beehives were removed.
10	Other information	

11.1.7. Beneficial insect monitoring

The beneficial insect monitoring in the MedFlyNet ii test site of PP5 is described in table 11.7.

Table 11.7. Beneficial insect monitoring in the MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

1.	Data on natural enemies and pollinators and their abundance or their phenology in the area of the site or in the wider area (add references where available)	No data on natural enemies activity and scooting
2.	Means and methods for beneficials' monitoring	NO
3.	Other information	

Figure 11.1. Rows of the trees in MedFlyNet-ii test site of PP5 (Mabrouka, Tunisia)

11.2. PP5 *MedFlyNet*: Digitized Field Data

11.2.1. Experimental site

Mabrouka site is located in Khlidia, a delegation in Ben Arous prefecture in Northern Tunisia at about 20 km south of the capital Tunis and 130 km north of the capital Sousse prefecture where CRRHAB is located. The map of location of the MedFlyNet test site of PP5 (Mabrouka, Tunisia) is shown in the following figure.

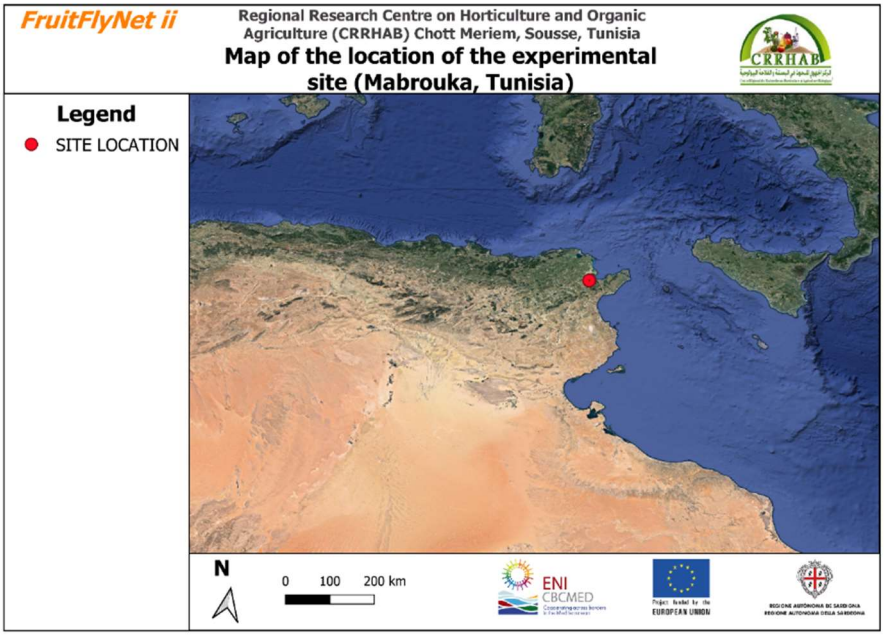


Figure 11.2. Map of location of the MedFlyNet test site of PP5 (Mabrouka, Tunisia)

The map of location of the MedFlyNet test site of PP5 (Mabrouka, Tunisia) and of the CRRHAB (Regional Research Centre on Horticulture and Biological Agriculture at Chott Meriem, Sousse) is shown in the following figure.

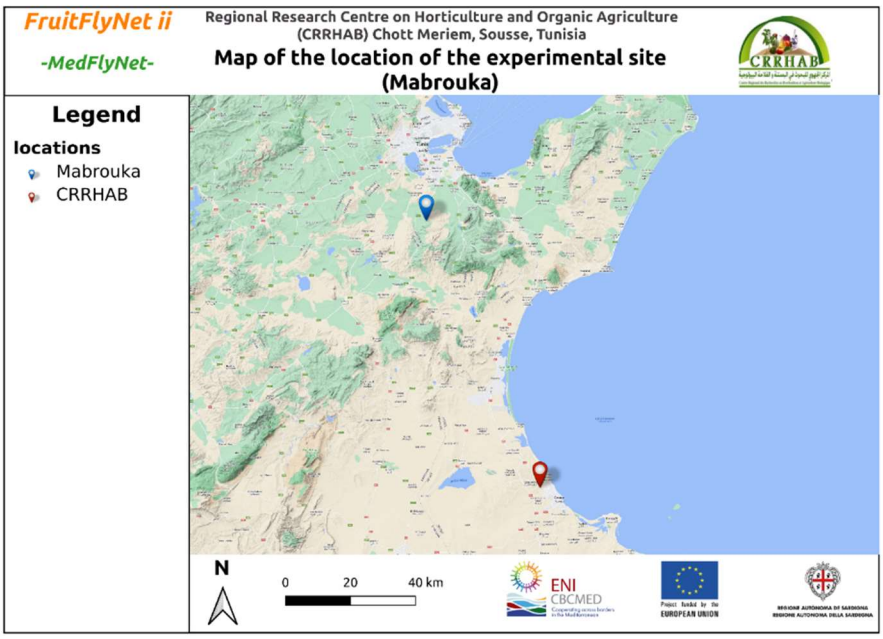


Figure 11.3. Map of location of the MedFlyNettest site of PP5 (Mabrouka, Tunisia) and of the CRRHAB (Regional Research Centre on Horticulture and Biological Agriculture at Chott Meriem, Sousse)

The map of the MedFlyNet ii test site of PP5 (Mabrouka, Tunisia) is shown in the following figure.

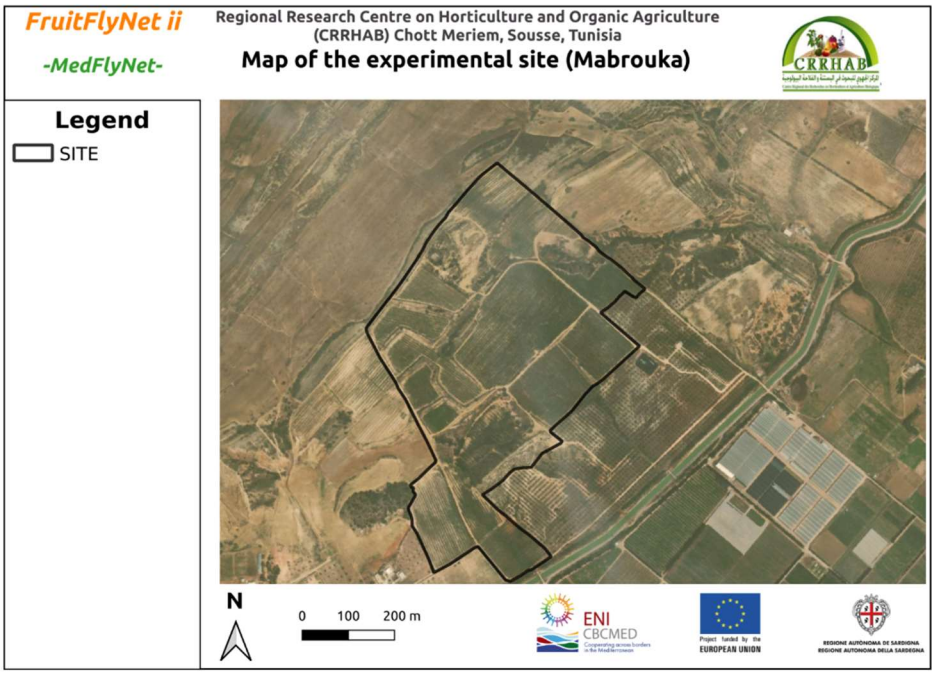


Figure 11.4. Map of the MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

11.2.2. Trees of the experimental site

The position of the trees in the orchards of the PP5 *MedFlyNet-ii* test site is shown in the following Figure.

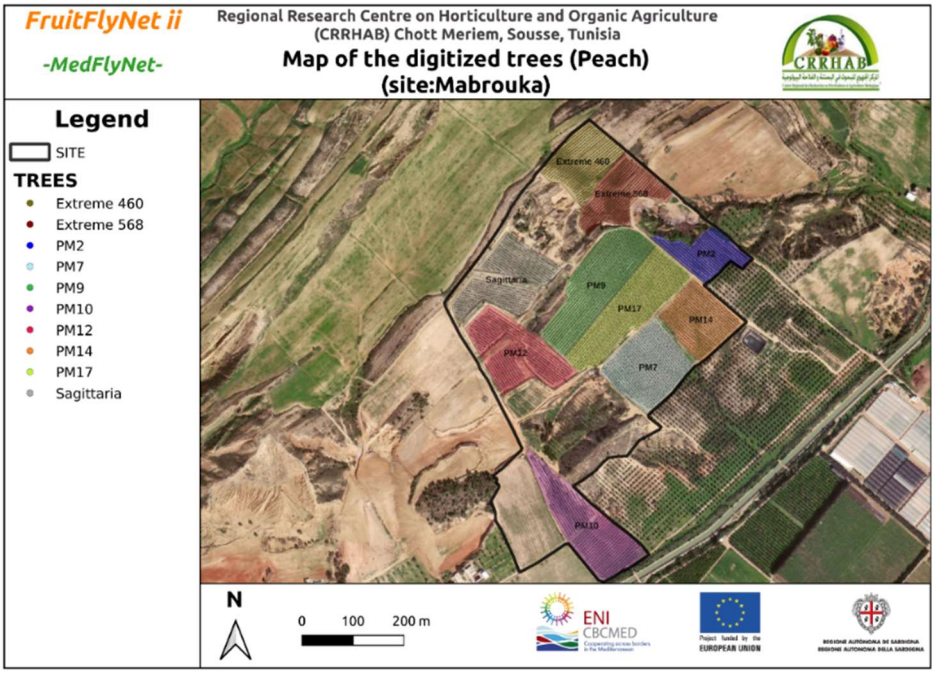


Figure 11.5. Map of the trees in MedFlyNet-ii test site of PP5 (Mabrouka, Tunisia)

Diameters of peach trees and of host or other plants inside the experimental site in some orchards are highlighted. The map of diameters of trees (cultivars PM12, PM7, PM14, PM17, figs) in MedFlyNet ii test site of PP5 (Mabrouka, Tunisia) is shown in the following Figure.

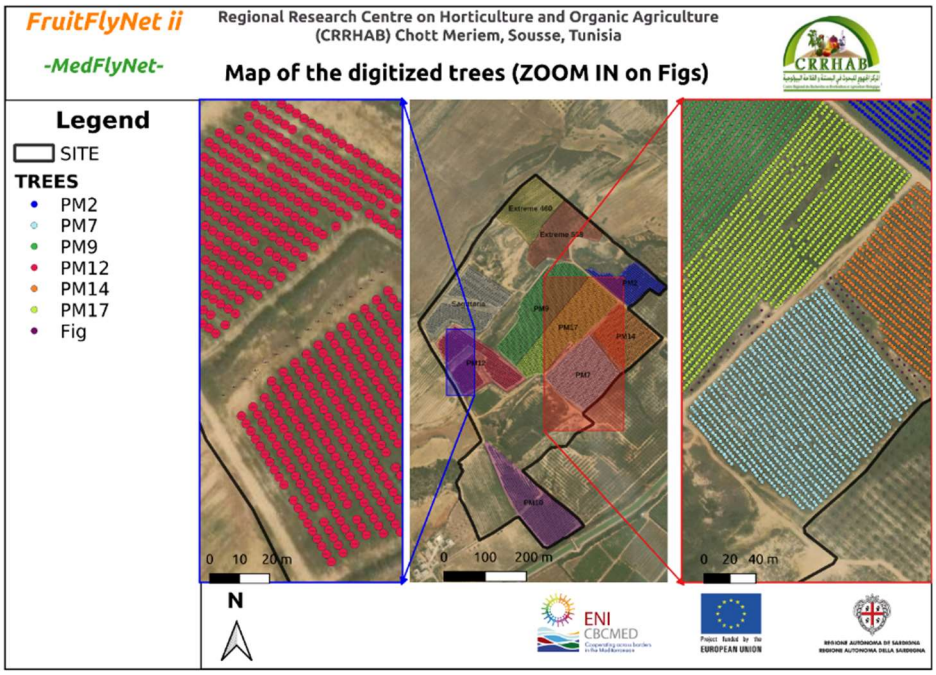


Figure 11.6. Map of diameters of trees (cultivars PM12, PM7, PM14, PM17, figs) in MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

Between orchards cultivated with PM14 (Owner) and with PM7 (Owner), there are two rows planted with fig trees which are considered hot plants for *Ceratitis capitata*. The map of diameters of trees (cultivars PM9, apricot, and almond) in MedFlyNetii test siteof PP5 (Mabrouka, Tunisia) is shown in the following figure.

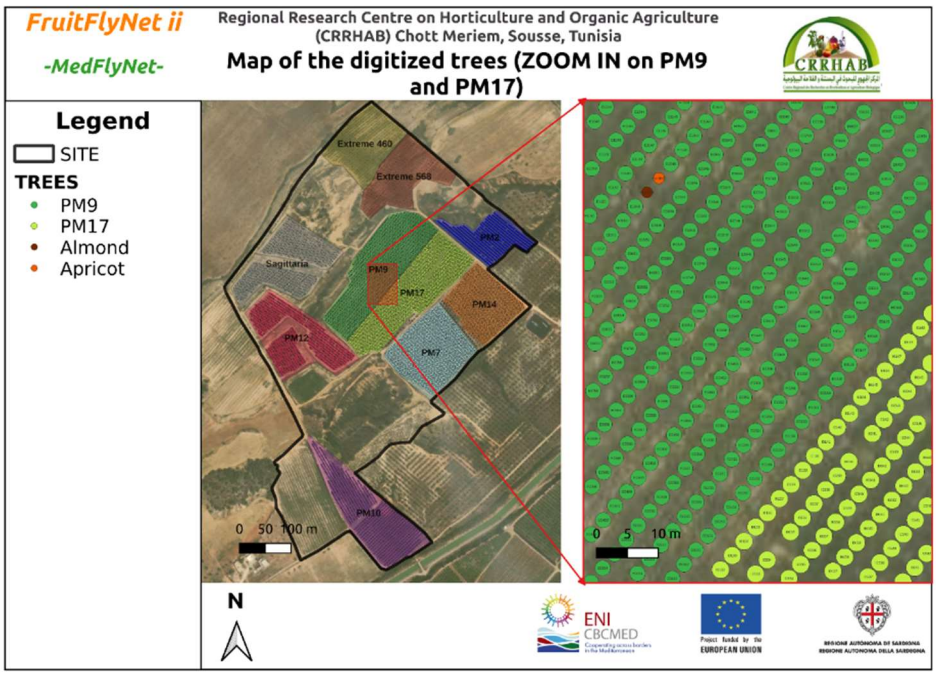


Figure 11.7. Map of diameters of trees (cultivars PM9, apricot, and almond) in MedFlyNetiitest siteof PP5 (Mabrouka, Tunisia)

In the orchard cultivated with PM9cultivar (Owner 4), there are two trees in the middle one apricot and the second almond. The map of diameters of trees (cultivars PM12, newly planted

figs, and almonds) in MedFlyNetii test site of PP5 (Mabrouka, Tunisia) is shown in the following figure.

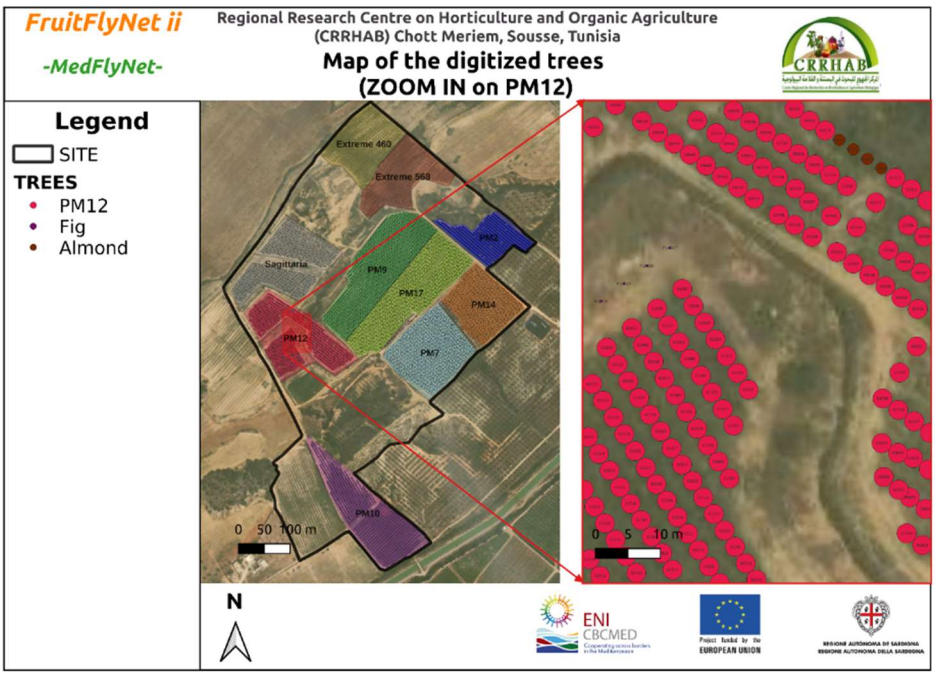


Figure 11.8. Map of diameters of trees (cultivars PM12, newly planted figs, and almonds) in MedFlyNetii test site of PP5 (Mabrouka, Tunisia)

In the orchard cultivated with PM12 cultivar (Owner 3), there are 4 almond trees in the north East of this orchard. A newly planted figs tree is on the north side of this orchard.

11.2.3. Orchards of the experimental site

The map of the orchards of the PP5 *MedFlyNet ii* test site are shown in the following figure.

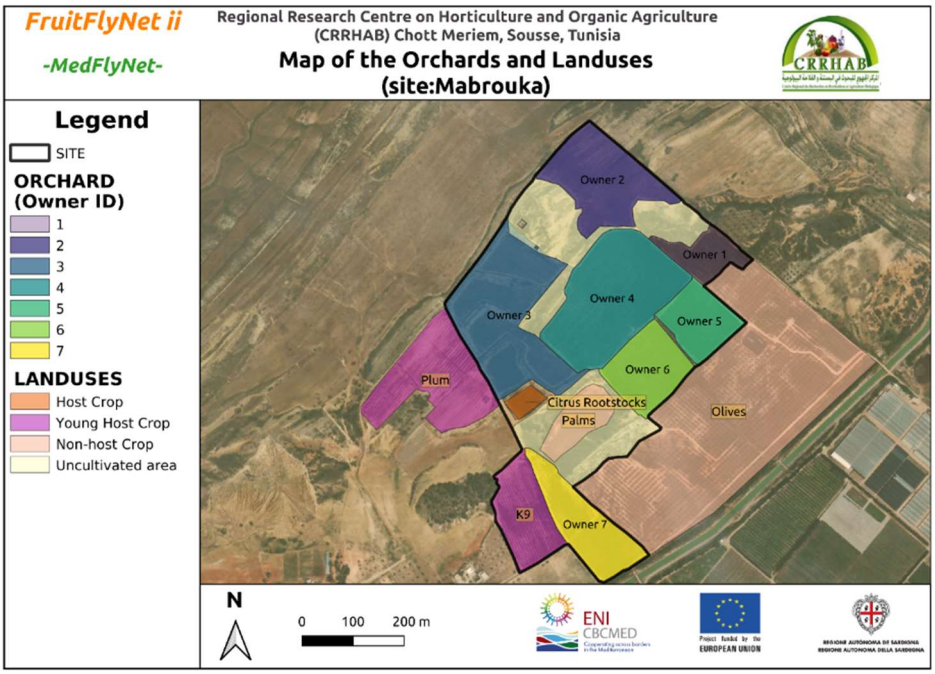


Figure 11.9. Map of orchards in MedFlyNet ii test site of PP5 (Mabrouka, Tunisia)

We selected the late maturing varieties (extreme 460 and extreme 568) in the same orchards due to their proximity (closeness) (Owner 2). It is the same for the cultivars PM17 and PM9 which are grouped in the same orchard (Owner 4). The cultivars Sagittaria and PM12 were bring together in a single orchard (Owner 3) because they ripe at the same time. The map of maturation periods of cultivars cultivated in orchards in MedFlyNet test site of PP5 (Mabrouka, Tunisia). Maturation periods of each cultivar in all orchards is shown in the following figure.

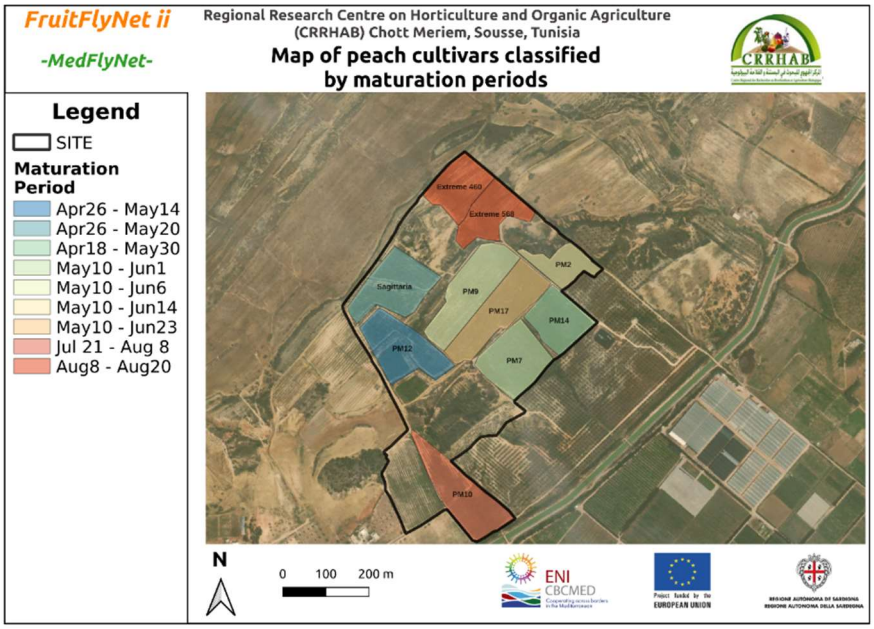


Figure 11.10. Map of maturation periods of cultivars cultivated in orchards in MedFlyNet test site of PP5 (Mabrouka, Tunisia)

Our experiment is surrounded by some other host plants such as plums newly planted in 2022, and apricot, pomegranate, and citrus far from the experimental site at about 800 to 2000 meters from the wide-area site. The map of surrounding vegetation in MedFlyNet test site of PP5 (Mabrouka, Tunisia) is showing in the following figure.

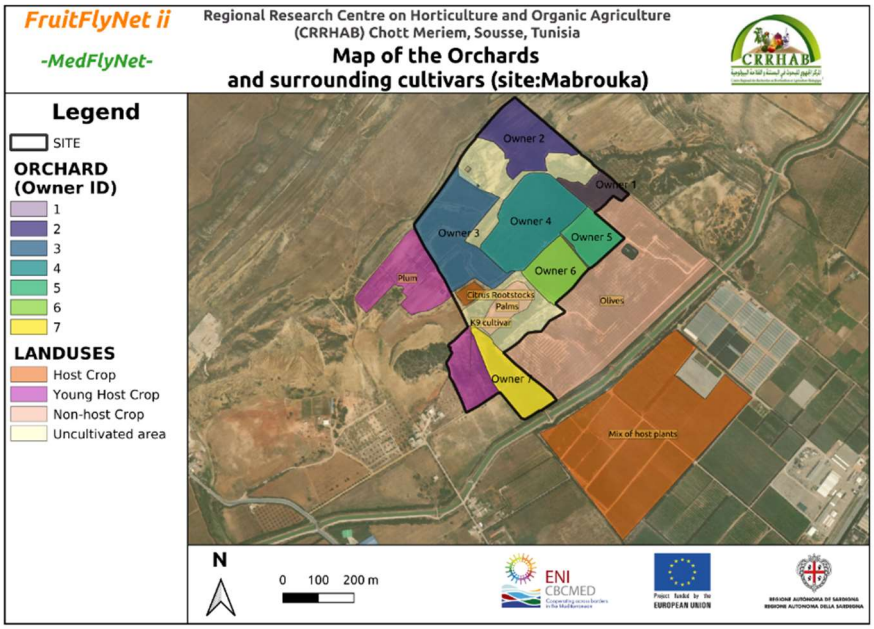


Figure 11.11. Map of surrounding vegetation in MedFlyNet test site of PP5 (Mabrouka, Tunisia)

11.2.4. Land uses of the experimental site

Land uses such as cultivated and uncultivated areas, water reservoirs, and roads are shown in the following figure.

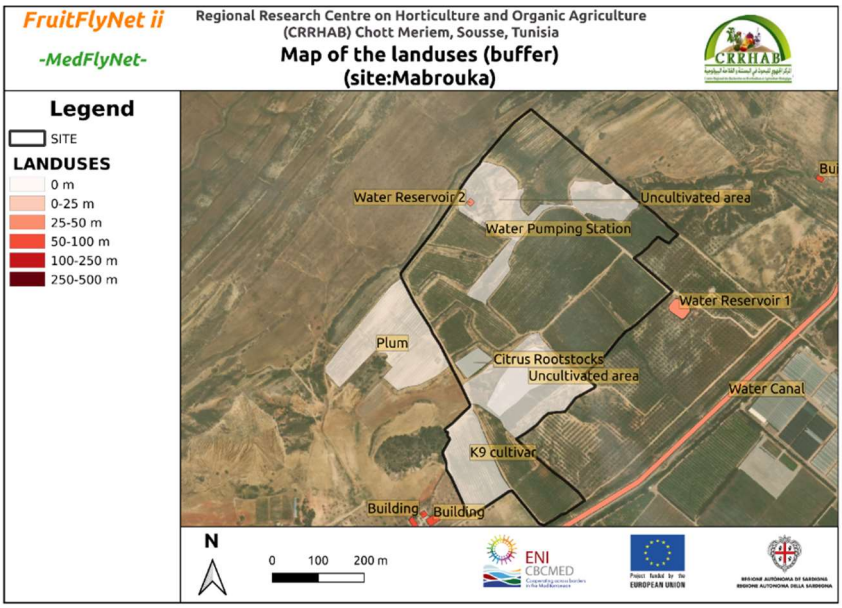


Figure 11.12. Map of the land uses in MedFlyNet test site of PP5 (Mabrouka, Tunisia)

In our experimental site two water reservoirs, a water canal, two host plants (Plum located near the experimental site), K9 peach cultivar), Citrus plants used for scion production, two uncultivated area, a water pumping station and some buildings close to the experimental site are present.

11.2.5. Sensors

Indicative positions of the location of sensors to monitor temperature, relative humidity, wind, and precipitation in the wide-area site are shown in the following figure.

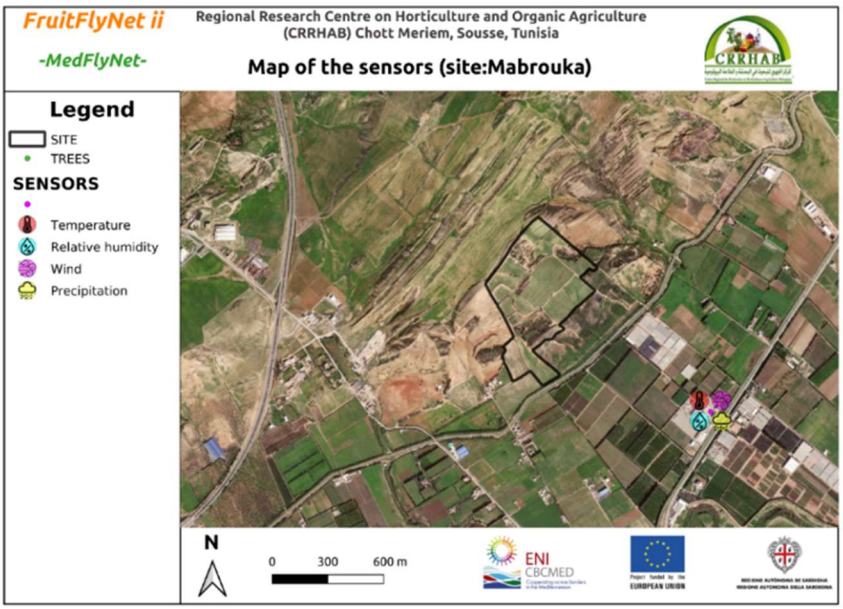


Figure 11.13. Map of the location of the sensors in MedFlyNettestsiteof PP5 (Mabrouka, Tunisia)

The meteorological station belonging to Mabrouka company is situated 1 km from the experimental site.

11.2.6. Traps

The indicative position of e-traps placed in the test site is shown in the following figure.

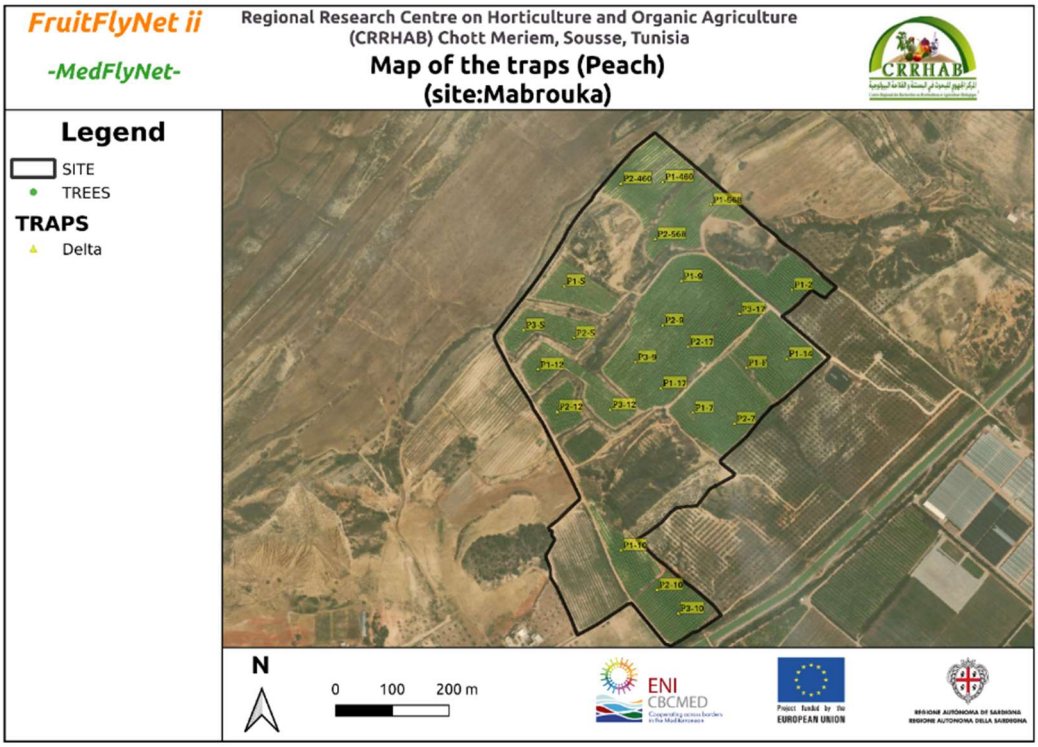


Figure 11.14. Map of the location of the e-traps in MedFlyNettestsiteof PP5 (Mabrouka, Tunisia)

We placed 24 traps in the whole experimental site as follows: three traps in PM10 (P1-10,P2-10, P3-10); two traps in Extreme 460 (P1-460, P2-460); two traps in Extreme 568 (P1-568, P2-568); three traps in PM17 (P-17, P2-17, P3-17); three traps in PM9 (P1-9, P2-9, P3-9); two traps in PM7 (P1-7, P2-7); one trap in PM14 (P1-14); one trap in figs row between PM7 and PM14 (P1-F); three traps in PM12 (P1-12, P2-12, P3-12), three traps in Sagittaria (P1-S, P2-S, P3-S) and one trap in PM2 (P1-2).

11.2.7. Protected zones

Protected zones within the test site are presented in the following figure.

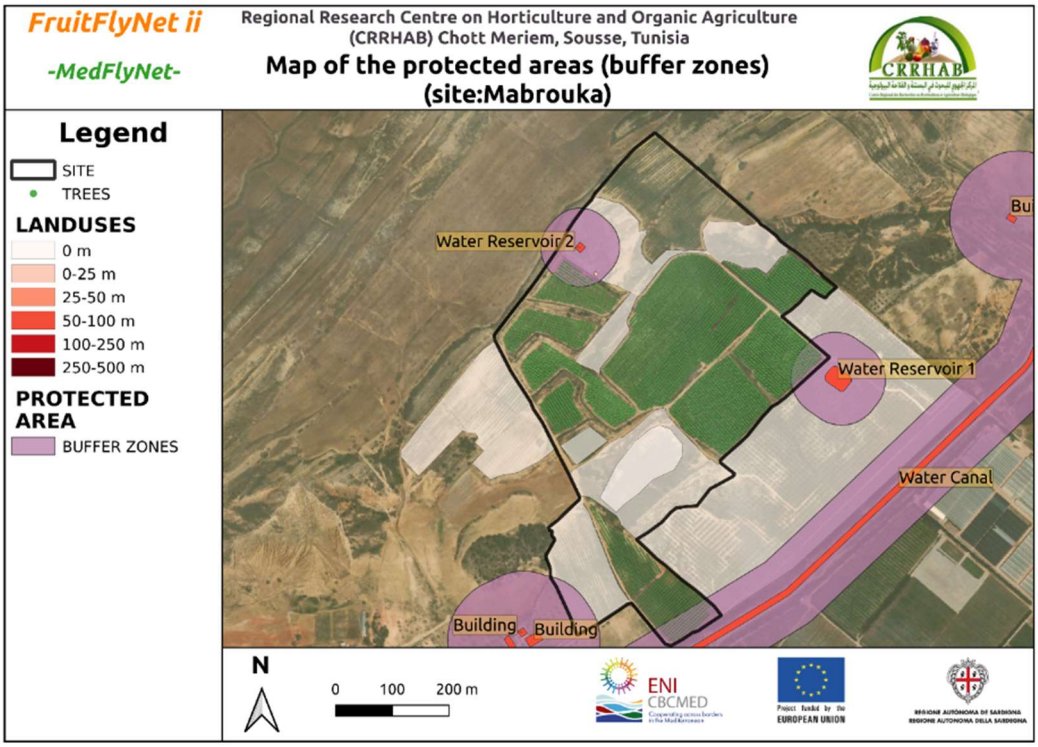


Figure 11.15. Map of the protected zones in MedFlyNettestsite of PP5 (Mabrouka, Tunisia)

There are no clear Tunisian legislations regarding buffer zone. When spraying with aircraft, maps were provided to the pilot to avoid water reservoirs, roads, and building.

With conventional sprayings, the tractor driver is aware of protected zones. The spraying concerns only the cultivation species and pay attention to pesticide drift according to wind direction and speed. The spraying is stopped by the medium wind.