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CARBON 4 SOIL QUALITY

Carbonica

ERATOSTHENES CENTRE OF EXCELLENCE

Integrating carbon farming practices in the Mediterranean region through the CARBONICA project: Case study of Cyprus pilot sites

S. Dimitriadi[1], M. Prantsidou[1], F. Charalambous[1], M. Christoforou[2],S. Efstathiou[2], D. Hadjimitsis[2], Z. Kouis[2], E. Nikolaou[1], G. Papadavid[3], M. Stavrinides[2], M.Tzouvaras[1],C.Papoutsa[1]

[1]Eratosthenes Centre of Excellence, Franklin Roosevelt 82, Limassol, Cyprus

[2]Cyprus University of Technology, Archiepiskopou Kyprianou 30, Limassol, Cyprus

[3]Agricultural Research Institute, Nicosia, 1516, Cyprus

Meeting 2
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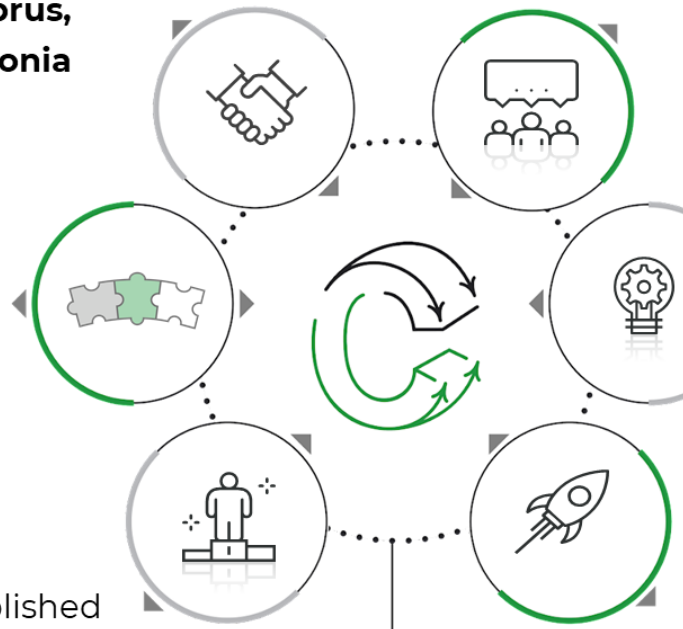
Institution: ERATOSTHENES Centre of Excellence
Name: Dr. MARIA Prantsidou

About the CARBONICA Project

14 project partners from **Cyprus, Greece & North Macedonia**

More than 1000 participants in the **training modules and workshops**

Map & enhance the 3 PBIES
Involvement of **policy, industry, academia & civil society**



20 experts participating in **brain gain activities**

1 Excellence Hub established in the **widening region**

More than **30 start-ups and SMEs** participating in Carbonica's **accelerator** and benefiting from **business development services**

What is the Carbonica Excellence Hub?

A joint strategic partnership aims to increase **knowledge** and **capacity** on **carbon farming solutions** and uptake.

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About the CARBONICA Pilot framework

North Macedonia Pilot Sites:
Annual crops: Barley, Chickpeas, Corn, Sunflowers
Permanent crops: Vine

Greece Pilot Sites:
Annual crops: Broccoli
Permanent crops: Apple, Peach, Olive, Vine

Cyprus Pilot Sites:
Annual crops: Cereals, Potatoes
Permanent crops: Vines, Olive, Citrus

- Field trials are implemented in **3 ecosystems: Cyprus, Greece, North Macedonia**
- Objective: **test, validate, and compare carbon farming practices across climates, soils & crops**.
- **5 high-value crops per country**. Grapevine is the common reference crop in all 3 regions.
- All pilots follow a harmonized methodology using **systematic soil sampling** (start-mid-end-of-season), with combined in field Toolbox measurements & lab analyses.

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CARBONICA PILOT SITES - Cyprus

Cyprus CF practices per crop		
Grape	Acheleia, Paphos	Spontaneous cover crop
Cereals	Acheleia, Paphos	Compost, straw application
Potato	Acheleia, Paphos	Biochar, compost, biochar+compost
Olive	Acheleia, Paphos	Cover crop, pruning residue incorporation
Citrus	Phasouri, Limassol	Biochar, compost, biochar+compost

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Carbon Farming Practices Under Assessment

Biochar:

- Protects carbon from microbial breakdown, enhancing longevity in soil.
- Improves soil structure, aeration, water retention, and nutrient uptake in phosphorus deficient soils.

Compost:

- Boosts soil organic matter, quality, and soil microbiome.

Straw:

- Straw amendments promote microbial proliferation and enhance soil enzymatic activity, ultimately supporting overall crop health.

Pruning Residue Incorporation:

- Adds organic matter, supports carbon sequestration and soil fertility.

Cover Cropping:

- Protects soil, improves soil organic carbon and biodiversity, reduces erosion.

Potato pilot site

Experimental plots for potato carbon farming practices evaluation

Field Methodology

Study on potato cultivar LISETA evaluating soil amendments as carbon farming practices

Treatment 1:
Compost applied at 10 Mg/ha

Treatment 2:
Biochar applied at 0.48 Mg/ha

Treatment 3:
Combined biochar (0.122 Mg C/ha) and compost (1.104 Mg C/ha) at approx. 1:9 ratio

Control:
No soil amendments

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Cereals pilot site

Experimental plots for cereal carbon farming practices evaluation

Field Methodology

Evaluation of soil amendments effects on bulgur wheat cultivar OURANIA

Treatment 1:
Compost applied at 10 Mg/ha

Treatment 2a:
Straw applied at 0.7 Mg/ha

Treatment 2b:
Straw applied at 1.4 Mg/ha

Control:
No soil amendments

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Citrus pilot site

Experimental plots for citrus carbon farming practices evaluation

Field Methodology

Study on citrus cultivation MANDORA evaluating soil amendments as carbon farming practices

Treatment 1:
Compost applied at 9.61 Mg/ha

Treatment 2:
Biochar applied at 0.46 Mg/ha

Treatment 3:
Combined biochar (0.23 Mg/ha) and compost (8.65 Mg/ha)

Control:
No soil amendments

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Olive pilot site

Experimental plots for olive carbon farming practices evaluation

Field Methodology

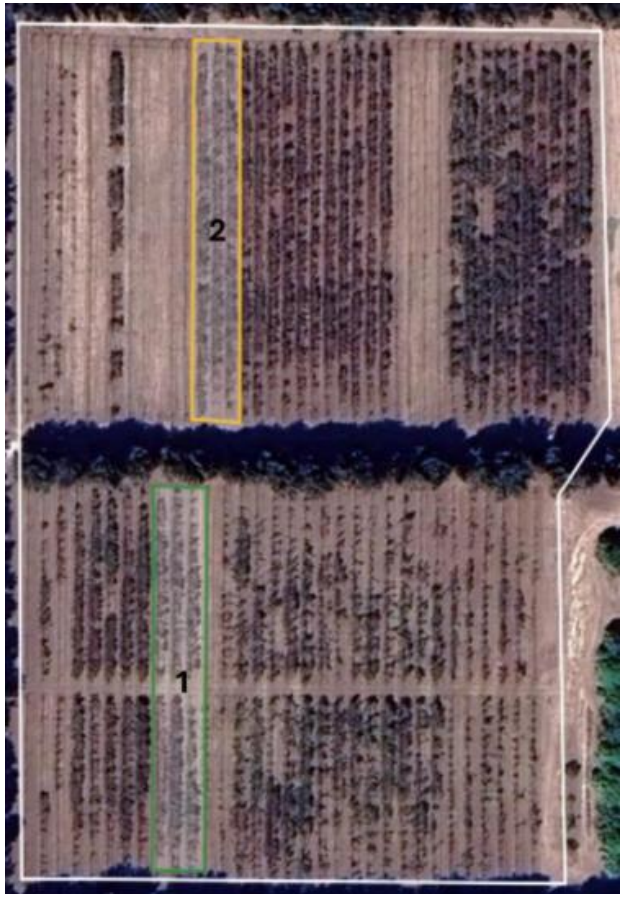
Study on KALAMON olives evaluating cover cropping and pruning incorporation as carbon farming practices

Treatment 1:
Incorporation of pruning residue and Cover cropping: Spontaneous weeds as cover crops

Treatment 2:
Cover cropping: Spontaneous weeds as cover crops

Control:
Conventional agriculture practices (frequent termination of spontaneous cover crop with shallow tillage)

Vine pilot site



Experimental plots for vine carbon farming practices evaluation

Field Methodology

Study on vine evaluating cover cropping as carbon farming practices

1: Treatment
Cover cropping: Spontaneous weeds as cover crops

2: Control:
Conventional agriculture practices (frequent termination of spontaneous cover crop with shallow tillage)

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Plan for testing and validation

- Validate carbon-sequestering agricultural practices through the CARBONICA Toolbox and laboratory measurements.
- CARBONICA Toolbox is field diagnostic toolbox, developed by i-BEC to support the consultant agronomist, or the producer for the proper management of the field.
- Deliver science-based, practical solutions that farmers can confidently adopt.

Field measurements with CARBONICA toolbox

Laboratory soil analysis

- Enable farmers to monitor and assess their own fields using validated carbon-farming methodologies.
- Support farmers in generating and eventually commercialising their own carbon credits.

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CARBONICA Toolbox - Methodology

·Field deployment across three pilot ecosystems enables in-situ acquisition of soil physical parameters and carbon-related indicators.

·**Spectral reflectance** was recorded prior to sampling using the **DIONE spectrometer** to capture soil optical properties for subsequent modelling.

·Composite **soil samples** were created by collecting and homogenizing subsamples from each pilot plot, then sealed and transferred to the laboratory under controlled conditions.

·**Soil temperature**, **water content**, and **bulk electrical conductivity** were simultaneously acquired using the **TEROS 12 probe**.

·**Soil chemical parameters** (pH, EC) determined using dedicated CARBONICA Toolbox sensors.

·Soil **CO_2 efflux** (soil respiration) was measured directly after infiltration tests by positioning the **CARBONICA chamber** over the same soil surface to assess short-term carbon flux dynamics.

CARBONICA toolbox equipment.

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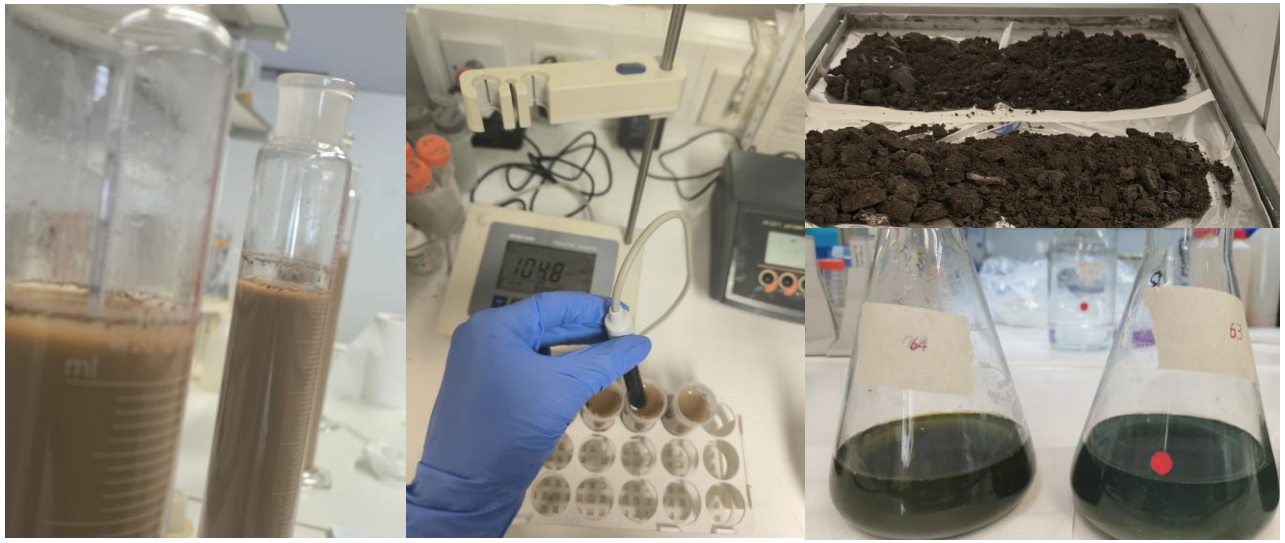
Laboratory Methodology

The following soil properties were determined in soil samples collected from the CARBONICA pilot sites:

- Soil preparation (air drying, grinding, 2 mm sieving)
- Granulometric composition (percentage of sand, silt and clay)
- pH
- Electrical conductivity (EC)
- Total organic carbon
- Total nitrogen(TN)
- Humus content



Laboratory workflow for soil characterization, including granulometric analysis, pH/EC measurements, organic carbon assessment.

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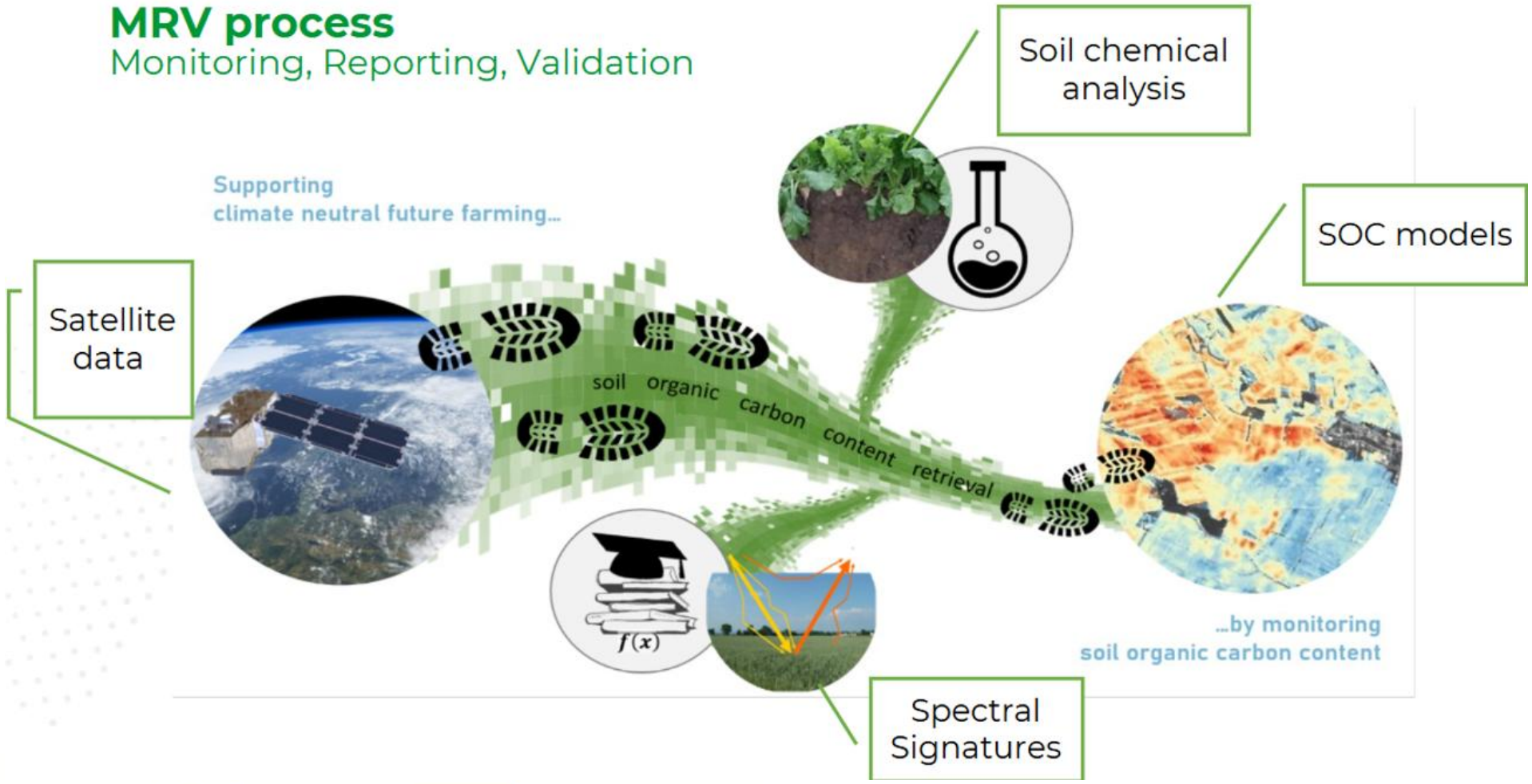
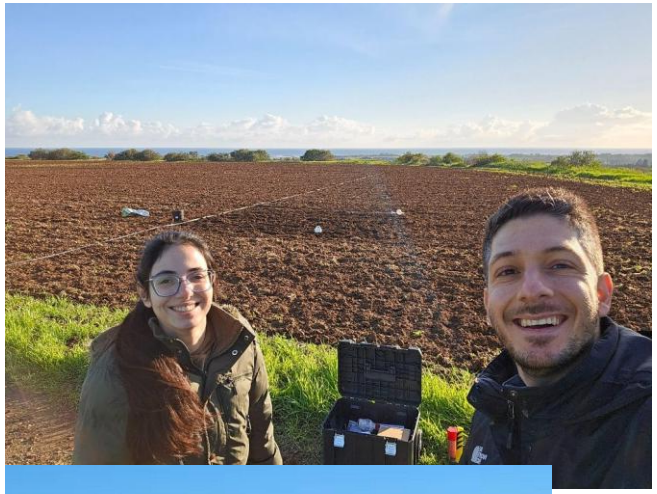
Monitoring, Reporting and Validation



The actual work in the field

Biochar addition in citrus

Pruning incorporation in olives chard



Incorporation compost and straw in cereals field

Biochar and compost addition in potato field

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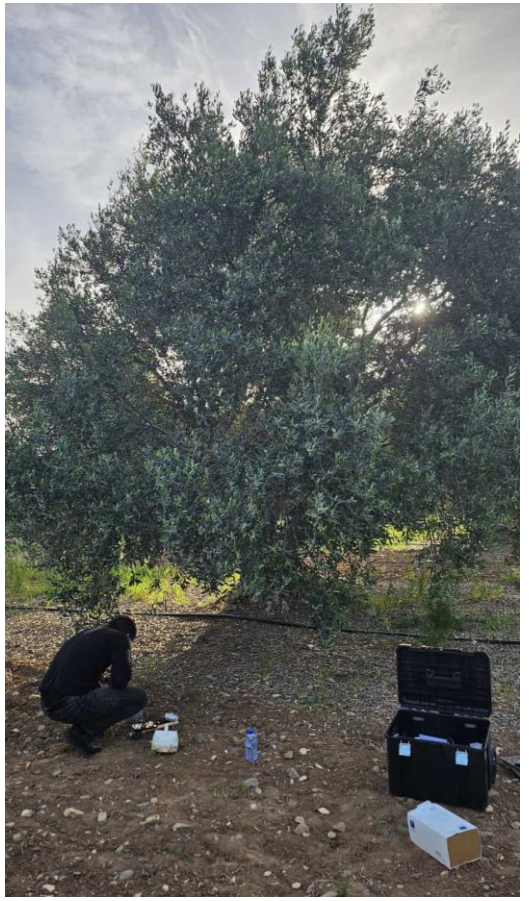
Field Measurements with CARBONICA toolbox

Quantification of CO_2 respiration using a chamber in vine plot

Soil sampling in potato plot

Cereals plot

Measurements with soil sensor in citrus plot



Spectral signature sampling with a spectrometer in an olive plot

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Pilot Site Field Visits: Farmer Awareness and Engagement



Field visit & workshop on using the CARBONICA Toolbox, at Olive pilot site in Paphos, Cyprus.
Audience: >68, farmers, industry, civil society

Next Steps

- Extensive field samples collected for all 5 crops for the first vegetation period, on-going lab analysis.
- Preliminary results available for the first carbon farming vegetation period, but second vegetation period essential for seasonal comparison
- Joint data evaluation underway across partners
- Consolidated results will follow after multi-season analysis.

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Acknowledgments

Thank you for your attention!

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"Carbon Initiative for Climate-resilient Agriculture"