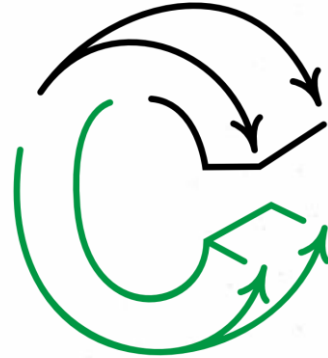




Funded by  
the European Union



Carbonica

**Carbon** Initiative for **C**limate-resilient **A**griculture –  
**CARBONICA** HORIZON EUROPE

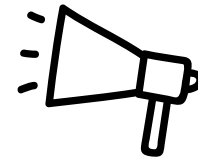
„КАРБОНИКА  
Јаглеродна иницијатива за климатски отпорно земјоделско  
производство“



Carbonica

## Horizon Europe Research and innovation funding program until 2027

Horizon Europe is the EU's key funding programme for research and innovation with a [budget of €95.5 billion](#)



It creates jobs, fully engages the EU's talent pool, boosts economic growth, promotes industrial competitiveness and optimizes investment impact within a strengthened European Research Area.

- The programme facilitates collaboration and strengthens the impact of research and innovation in developing, supporting and implementing EU policies while tackling global challenges.
- It supports creating and better dispersing of excellent knowledge and technologies.



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# European Research Executive Agency

[https://rea.ec.europa.eu/index\\_en](https://rea.ec.europa.eu/index_en)



REA's mission is to help build a greener Europe with prosperous, inclusive societies and economies that take full advantage of the digital age

## Funding and grants

EU Mission: A Soil Deal for Europe

Horizon Europe: Cluster "Culture, creativity and inclusive society"

Horizon Europe: Cluster "Civil security for society"

Horizon Europe: Cluster "Food, bioeconomy, natural resources, agriculture and environment"

Horizon Europe: Widening participation and spreading excellence

Horizon Europe: Reforming and enhancing the European R&I system

Horizon Europe: Research infrastructures

Horizon Europe: Marie Skłodowska-Curie Actions

Research fund for coal and steel

Promotion of agricultural products

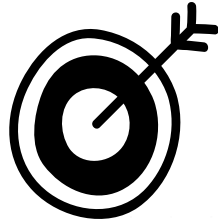


European Commission > European Research Executive Agency > Funding and grants

## Funding and grants

<https://carbonica-hub.eu>

The network of the CARBONICA Excellence Hub will also strengthen the regional innovation capacity guided by long-term joint R&I Strategy in the carbon farming field.



The purpose of the project is establishing a **CARBONICA Excellence Hub (CEH)**, by building and connecting the innovation ecosystems of the three participant Widening Countries: **Greece, North Macedonia, Cyprus**, while enhancing their technology readiness level as service providers based on cutting-edge technologies such as Earth Observation – EO, in situ data, digital agriculture, etc. in carbon farming

***Project duration 48 months, starts from 1<sup>st</sup> of January 2023***



# Carbonica

## **Carbon Initiative for Climate-resilient Agriculture** **– CARBONICA - HORIZON EUROPE**

### **Project Objectives**

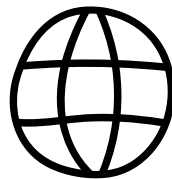
- **Objective 1:** Strengthen place-based innovation and excellence in Greece, North Macedonia, and Cyprus in carbon farming in order to achieve increased collective understanding and broad uptake.
- **Objective 2:** Foster long-term cross-border collaboration and strong viable linkages between the actors of the Quadruple helix in the involved Innovation Ecosystems to motivate knowledge transfer, sharpen entrepreneurial skills, and expand the collective capacity in carbon farming.
- **Objective 3:** Design, validate and plan for pilots and demonstrators to underpin the development of the long-term R&I Strategy and Action Plan.
- **Objective 4:** Create business opportunities in carbon farming by bridging the gap between science and industry and establishing poles of attraction for innovators and investors and improving the uptake.





# Carbonica

## CONSORCIUM



Objectives will be accomplished by engaging relevant stakeholders from four agriculture involved sectors:

### Academia-Industry-Government-Civil society



present a huge step forward towards EU's strategy for **climate neutrality** by 2050 according to the **European Green Deal**

#### PARTNERS



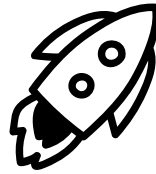
- [FOODSCALE HUB GREECE ASSOCIATION FOR ENTREPRENEURSHIP AND INNOVATION \(FSH\)](#), Greece
- [INTERBALKAN ENVIRONMENT CENTRE \(i-BEC\)](#), Greece
- [SCIENTACT AE SCI](#), Greece
- [MINISTRY OF ENVIRONMENT & ENERGY MEEN](#), Greece
- [AgFutura Technologies AGFT](#), North Macedonia
- [Green Growth Platform GGP](#), North Macedonia
- [Macedonian National Extension Agency MNEA](#), North Macedonia
- [University "Goce Delchev", Shtip UGD](#), North Macedonia
- [ERATOSTHENES Centre of Excellence ECoE](#), Cyprus
- [Agricultural Research Institute ARI](#), Cyprus
- [CELLOCK Ltd CLK](#), Cyprus
- [Cyprus University of Technology CUT](#), Cyprus
- [Hellenic Accreditation System HAS](#), Greece
- [PANAGROTIKOS SYNDESMOS KYPROU SOMATEIO PSK](#), Cyprus





# Carbonica

## CARBONICA START



- The network of the CARBONICA Excellence Hub will also strengthen the regional innovation capacity guided by long-term joint R&I Strategy in the carbon farming field.
- The solutions and practices in carbon farming that will emerge from the designed networking in the Carbonica project will be commercialized and made available to the general public which will be beneficial for the local economies.





Carbonica



# НАЦИОНАЛЕН КОНЗОРЦИУМ И АКТВНОСТИ NMK







# НАЦИОНАЛЕН КОНЗОРЦИУМ



<https://agfutura.com>

Компанија за поддршка на земјоделскиот сектор и прехранбената индустрија со иновативни решенија во областа на прецизно земјоделство, развој на бизнис и маркетинг во земјоделско-прехранбената индустрија.

Национален координатор  
на активностите



УНИВЕРЗИТЕТ  
„ГОЦЕ ДЕЛЧЕВ“  
ШТИП

ЗЕМЈОДЕЛСКИ  
ФАКУЛТЕТ





# Carbonica



**УНИВЕРЗИТЕТ  
„ГОЦЕ ДЕЛЧЕВ“  
ШТИП**

**ЗЕМЈОДЕЛСКИ  
ФАКУЛТЕТ**



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**UNILAB**

[www.unilab.mk](http://www.unilab.mk)



# Carbonica

3<sup>rd</sup> INTERNATIONAL MEETING AGRISCIENCE & PRACTICE (ASP 2023), 19<sup>th</sup> and 20<sup>th</sup> April 2023, Stip,

Republic of North Macedonia



**REDUCING GREENHOUSE GAS EMISSIONS IN AGRICULTURE: CHALLENGES AND POSSIBILITIES**  
 Biljana Balabanova, Verica Ilieva, Sasa Mitrev  
 Faculty of Agriculture, Goce Delchev University, Stip, Krste Misirkov, 10A, 2000 Stip, Republic of North Macedonia  
 e-mail: biljana.balabanova@ugd.edu.mk

**INTRODUCTION**  
 Global agriculture is affected by climate change that could significantly impact productivity. Large-scale afforestation and biomass for energy production as well as population and income growth will exacerbate the competition for land.  
 Agriculture is an important contributor to climate change, accounting directly for 10%–12% of anthropogenic greenhouse gas (GHG) emissions and also for around 70% of land use change emissions, mainly through deforestation.

**Humidity**

- Soil water content
- Water-filled pore space
- Desiccation/cracking (intensity, frequency)

**Temperature**

- Radiation
- Exposure (soil cover and exposition)
- Soil colour (biology; mineralogy)
- Wind flow

**Land use**

- Transformation
- Ecosystem resilience

**Land cover**

- Forestland, grassland, bare land, cropland, wetland, and other land cover

**Nutrients**

- C:N ratio
- Land-use management
- Atmospheric deposition
- Fertilization

**Vegetation**

- Age and type
- Distribution Leaf area index (LAI)

**SOIL (Safe Organic Irrigated Land)**

The increase in production is mostly attributable to a combination of factors such as:

- increased use of irrigation, pesticides and fertilizers, and to a lesser extent a larger cultivated area;
- other factors such as better farming practices and the use of high yield crop also play a role

**PLANT/planting (Planting and Annual Nutrient Flux)**

Satellite data

- Spatial data mapping
- MLP-ANN interpolation
- Ancillary data (soil type, slope, population, local agronomy statistics)

Model Land use choice

Crop change

Land use change

Impact model

- Parameter estimates for determinants of land use change
- Future commodity prices and rate of growth of crop areas
- Climate scenario: precipitation and temperature

Change in carbon stock and GHG emissions

- Economic trade-offs

**General conclusions and perspectives**

The following paragraph summarizes the measures that have been proposed for reducing GHG emissions at the agricultural and post-farm gate stages respectively and highlight some broader sustainability issues that these approaches raise. The potential for mitigation offered by both technological improvements and behavior change are examined. Here, we summarized most comprehensively and broadly falls into five sets of measures:

- Enhancing carbon removals: measures to restore degraded lands, afforestation, no or minimum tillage, the incorporation of organic matter;
- Optimising nutrient use: precise dosage and timing when applying organic and inorganic fertilizers; incorporating nitrogen-fixing legumes into rotations;
- Improving productivity: approaches that increase the yield of stable output per unit of emissions generated including: crop and animal breeding, feed optimization and dietary additives, pest and disease management
- Managing and benefiting from the outputs: including manure and plant biomass: composting, and the use of anaerobic digestion;
- Reducing the carbon intensity of fuel inputs through energy efficiency improvements and the use of alternative fuels such as biomass, biogas, wind and solar power.

**Acknowledgment:** Authors express their acknowledgment to the project: Carbon Initiative for Climate-resilient Agriculture - CARBONICA, HORIZON EUROPE

3<sup>rd</sup> INTERNATIONAL MEETING AGRISCIENCE & PRACTICE (ASP 2023), 19<sup>th</sup> and 20<sup>th</sup> April 2023, Stip, Republic of North Macedonia





# Carbonica

## Поставување на пилот истражување

### АгФутура Технологии:

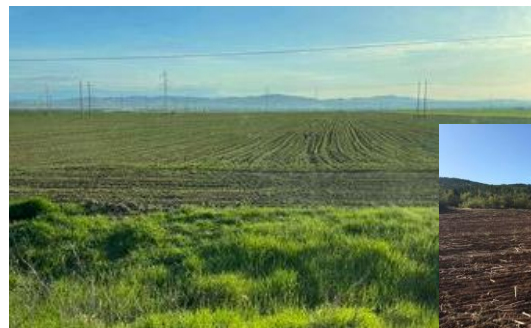
- Примена на современи технологии за прецизно земјоделие

### Земјоделски факултет - УГД :

- Примена на лабораториски анализи и валидација на лабораториски методи



- Пилот истражувањата ќе се спроведуваат во опитен центар во Амзабегово: Унисервис - Агро





# Carbonica

## Лабораторски истражувања и валидации на методи

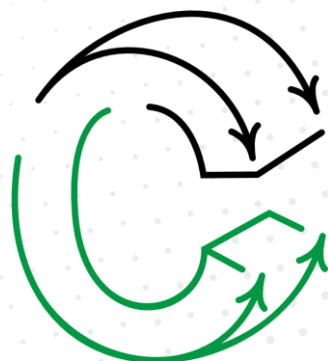


# УНИЛАБ

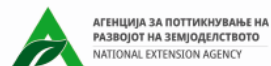


**Сертификат за акредитација за спроведен  
Стандард MKS EN ISO/IEC 17025 : 2006**





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