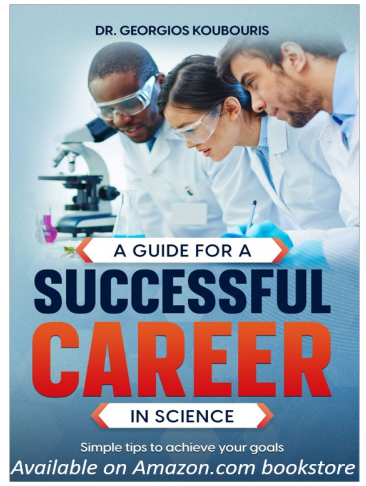
ELGO - DIMITRA
HELLENIC AGRICULTURAL ORGANIZATION - DIMITRA

TAIEX TSI Workshop

Enhancing disaster risk management and climate change adaptation in Cyprus



Making Mediterranean agriculture biodiversity-friendly and resilient to climate change: The experience of Olivares Vivos+ LIFE project

Georgios Koubouris

Freeclimb PRIMA IN THE MEDITERRANEAN AREA

PRIMA PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA
SUSTAIN OLIVE

GEN4 OLIVE
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000427

LIFE AgroClimaWater

OLIVE CLIMA

RECONCILIADOS CON LA VIDA · OLIVARES VIVOS

Life

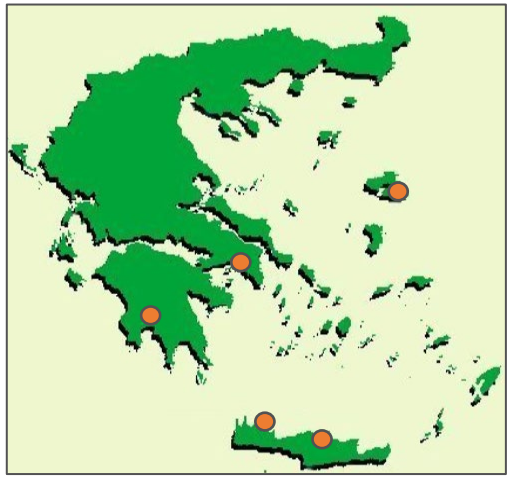
HELLENIC AGRICULTURAL ORGANIZATION
ELGO-DIMITRA
in Greece

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000427

- Over 700 employees
- Germplasm banks for all crops

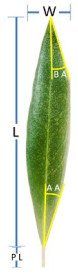
  - Agricultural Research
  - Farmers training
  - Certification in agriculture

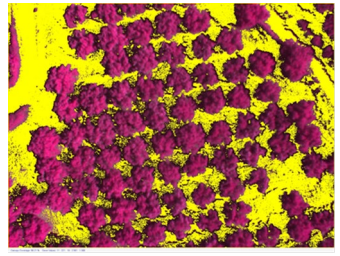
http://www.elgo.gr/



Institute for Olive Tree, Subtropical Crops and Viticulture

- National Germplasm Banks for olive, vines, citrus and subtropical plants
- Labs for all chains of olive growing (irrigation, fertilization, pest management, etc.)
- Collaboration with farmers

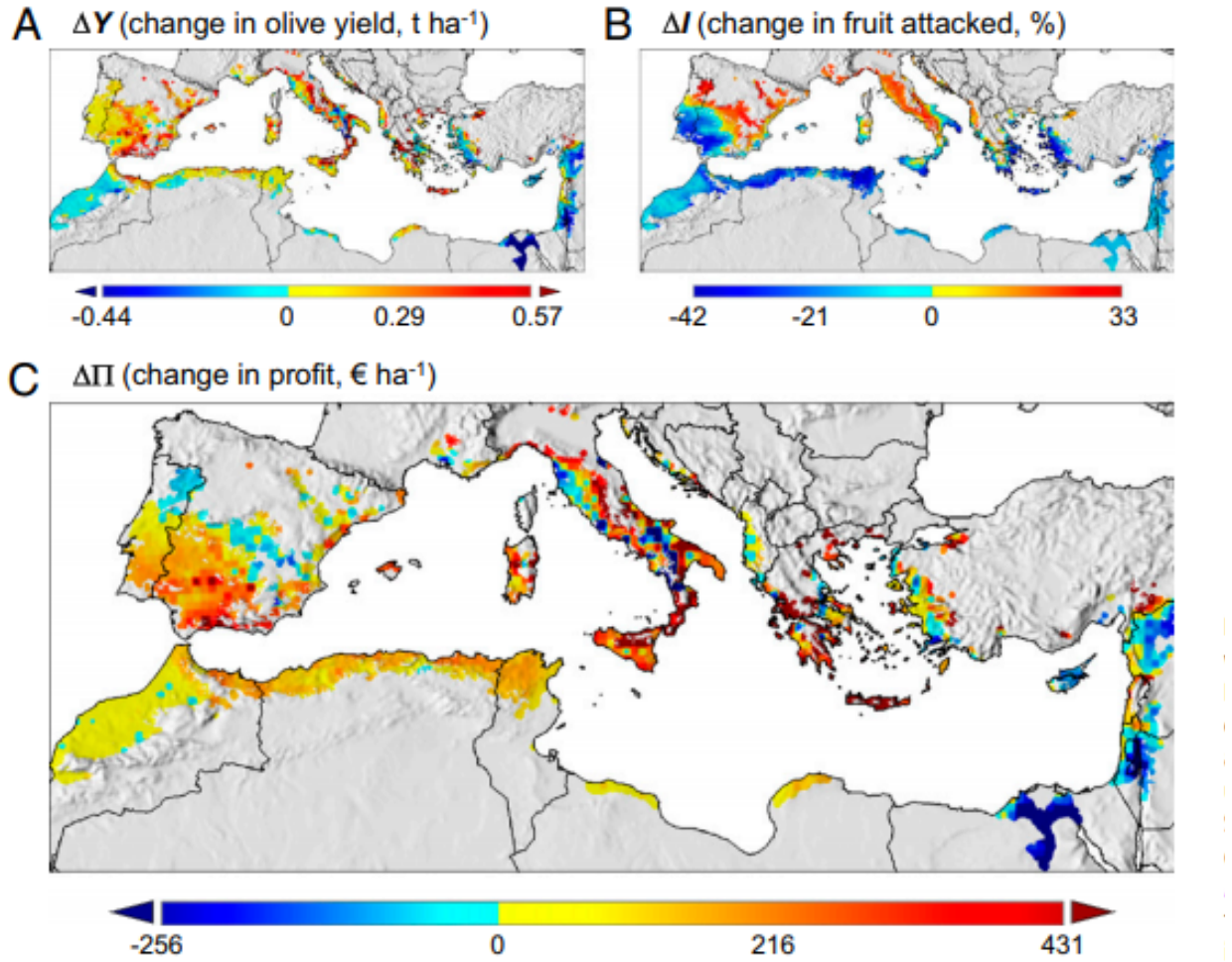




Climate change challenges

- **Water shortage**
- Flood
- **Extreme temperature**
- UV-B radiation
- **Soil degradation**
- Pests and diseases
- **Biodiversity decline**

Expected impact of climate change on olive growing



(A) Predicted changes in olive yield (t ha^{-1}); (B) change in infestation by olive fly (% olive fruit attacked by the fly); and (C) change in profit (E ha^{-1})

Ponti et al. 2014. www.pnas.org/cgi/doi/10.1073/pnas.1314437111

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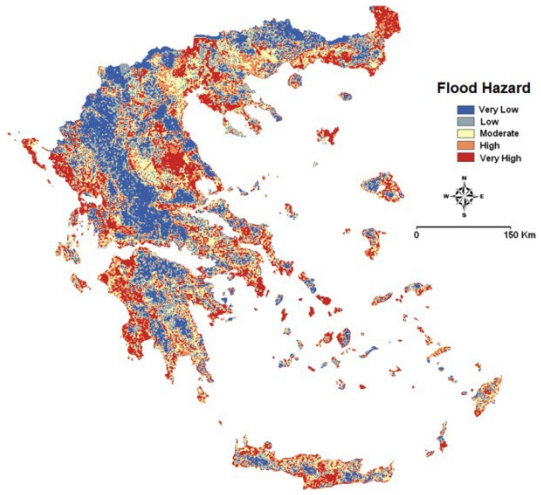
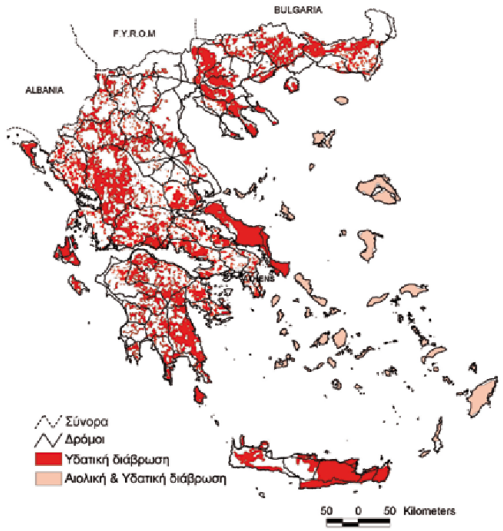
Risk maps in Greece

Drought

Soil erosion



Flood



Change of dry spell length affecting drought potential

- No impact on drought potential
- Very low increasing impact on drought potential
- Low increasing impact on drought potential
- Moderate increasing impact on drought potential

Origin of the data: © EuroGeographics Association for the administrative boundaries
ARIDE final report (2001)
The Prudence project model database
Source: ESPON Data Base

This map represents the connection between change of dry spell length (The Prudence project model database) and drought potential, based on precipitation deficit recordings 1904-1995.

Kourgialas, N.N., Karatzas, G.P. (2017) Science of the Total Environment, 601-602, pp. 441-452

GEN4 OLIVE
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000427

What can we do?

- Mitigate climate crisis


- Adapt olive grove management


- Select/breed resilient olive varieties


AGRI 3

Sustainable olive grove management

Consumers care about the environment

Atmos. Chem. Phys., 13, 8797–8811, 2013
www.atmos-chem-phys.net/13/8797/2013/
doi:10.5194/acp-13-8797-2013

Burning of olive tree branches: a major organic aerosol source in the Mediterranean

Project management practices

- C removed during olive production to be returned through byproducts spread on the soil either raw or composted
- Enrichment of indigenous weed flora by sowing a mix of selected seeds
- Minimum or no soil tillage
- Adaptation of tree pruning to maximize CO_2 capture through photosynthesis

Applied in over 100 olive groves in 15 years

SUSTAIN OLIVE

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

Project LIFE Oliveclima

- 5 years
- 4 olive growing areas
- 120 parcels
- Irrigated – rainfed
- Conventional or organic farms
- Different soil types & management

Awarded as the best project in Europe for climate action. E.C. 2019

AGRI 3

Recycling pruning residue

Chipper shredder

Flail lawn mower

Decomposition rate

faster slower

Nutrient recycling

faster slower

Carbon storage

short term long term

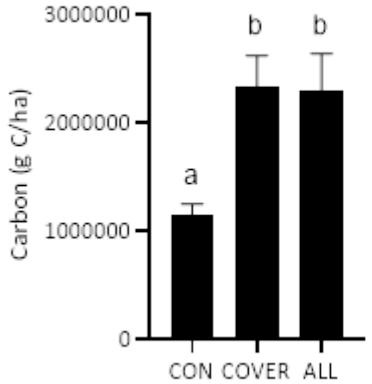
AGRI 3

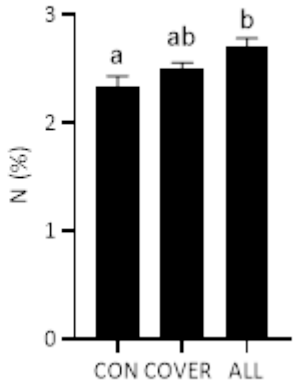
Compost amendment improves soil fertility

AGRI 3

Cover crops in olive groves

Single species
Low carbon storage

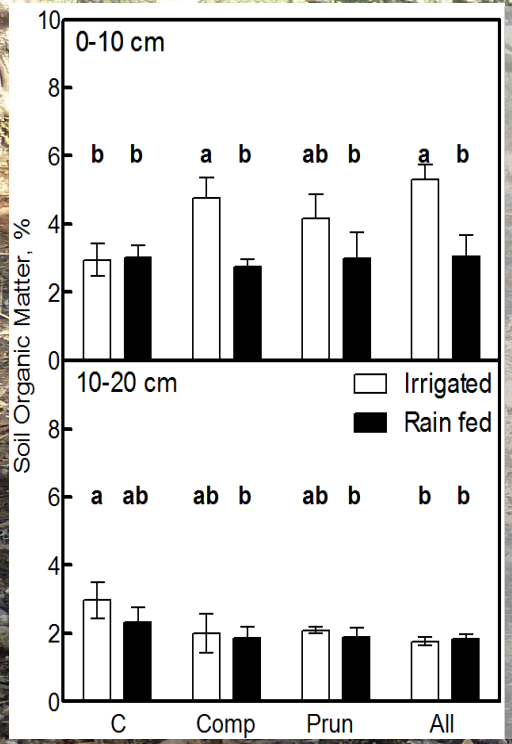




High diversity
Higher carbon storage
Nitrogen fixation by legumes

AGRI 3

Carbon return to the olive groves through organic material recycling



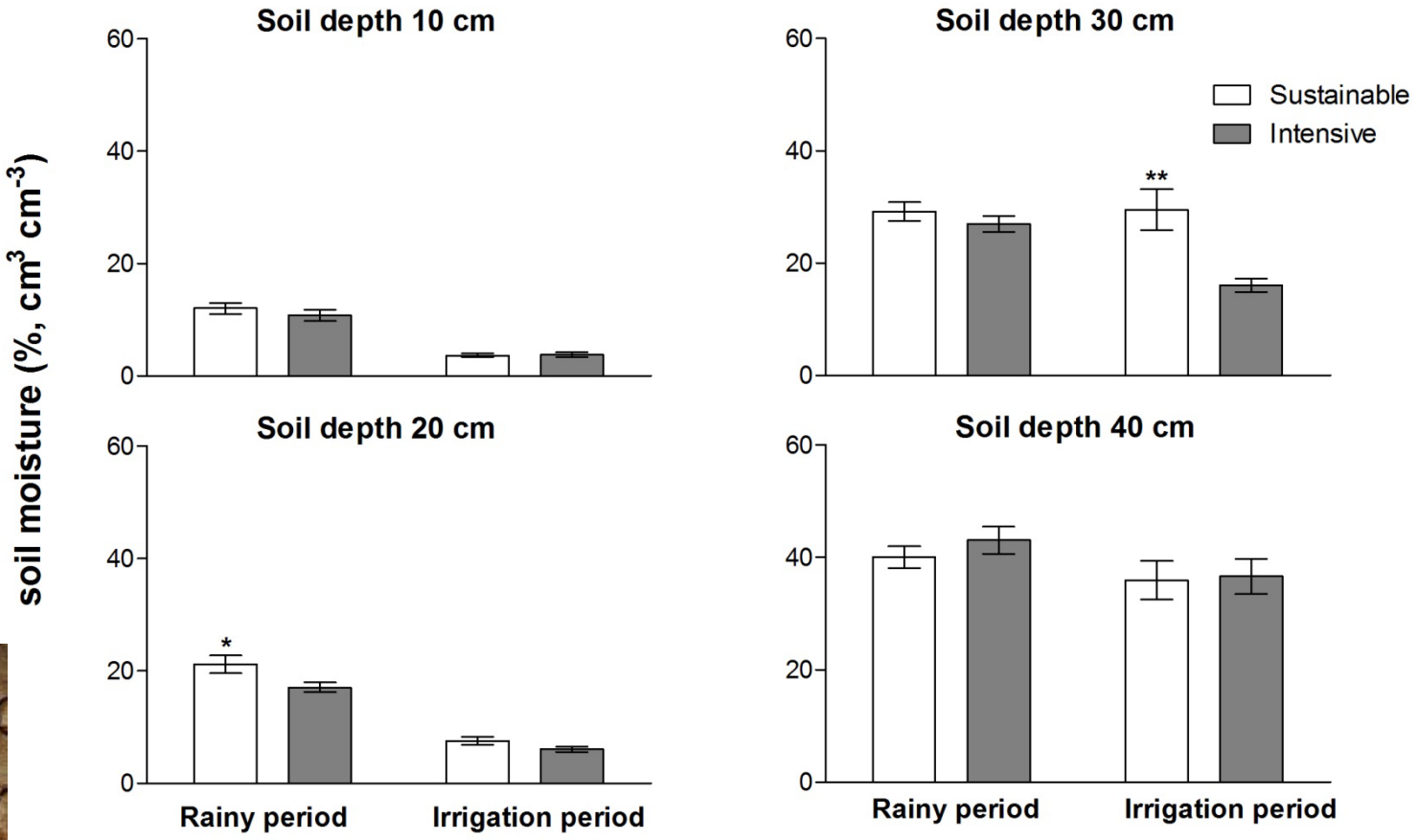
CI had significant impact on SOM content in the top layer of irrigated soil

Highest values were observed in “ALL” followed by “COMP” and “PRUN”

Irrigation increased SOM of the superficial layer in all CI treatments and this effect was statistically significant in “COMP” and “ALL”

AGRI 3 + 6

Addition of organic materials on the soil improved water retention



AGRI 3

Olive oil yield is stabilized through pruning and soil enrichment

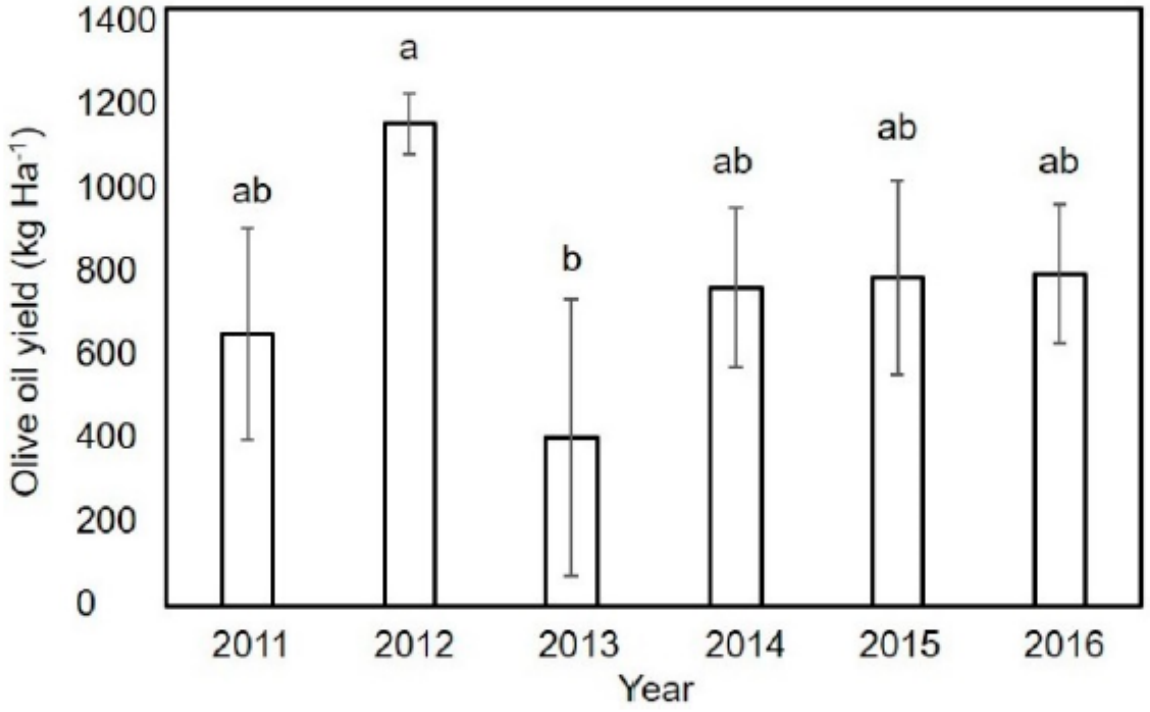


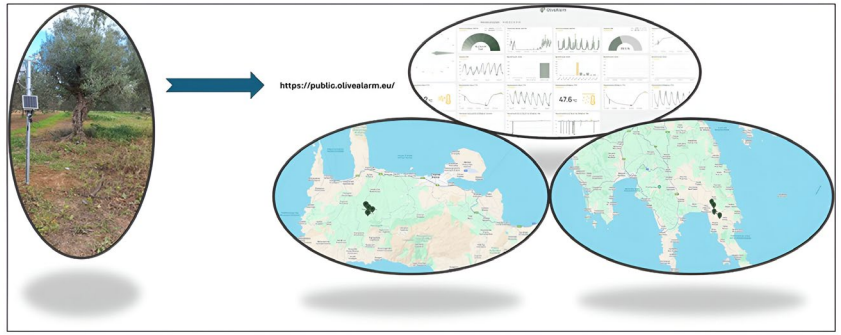
Figure 3. Evolution of olive oil production (Kg Ha^{-1}) per year during 2011–2016 in the three study areas in Greece (Nileas, Peza, and Mirabello). Bars present means of 60 replicates with standard errors. The means of the three study areas were analysed. Bars with different letters have statistically significant difference (LSD test, 0.05).

AGRI 3 + 8

OLIVEALARM – Digital tools for the adaptation of olive growing to climate change

Good agricultural practices

Farm sensors and meteorological stations



Early warning system

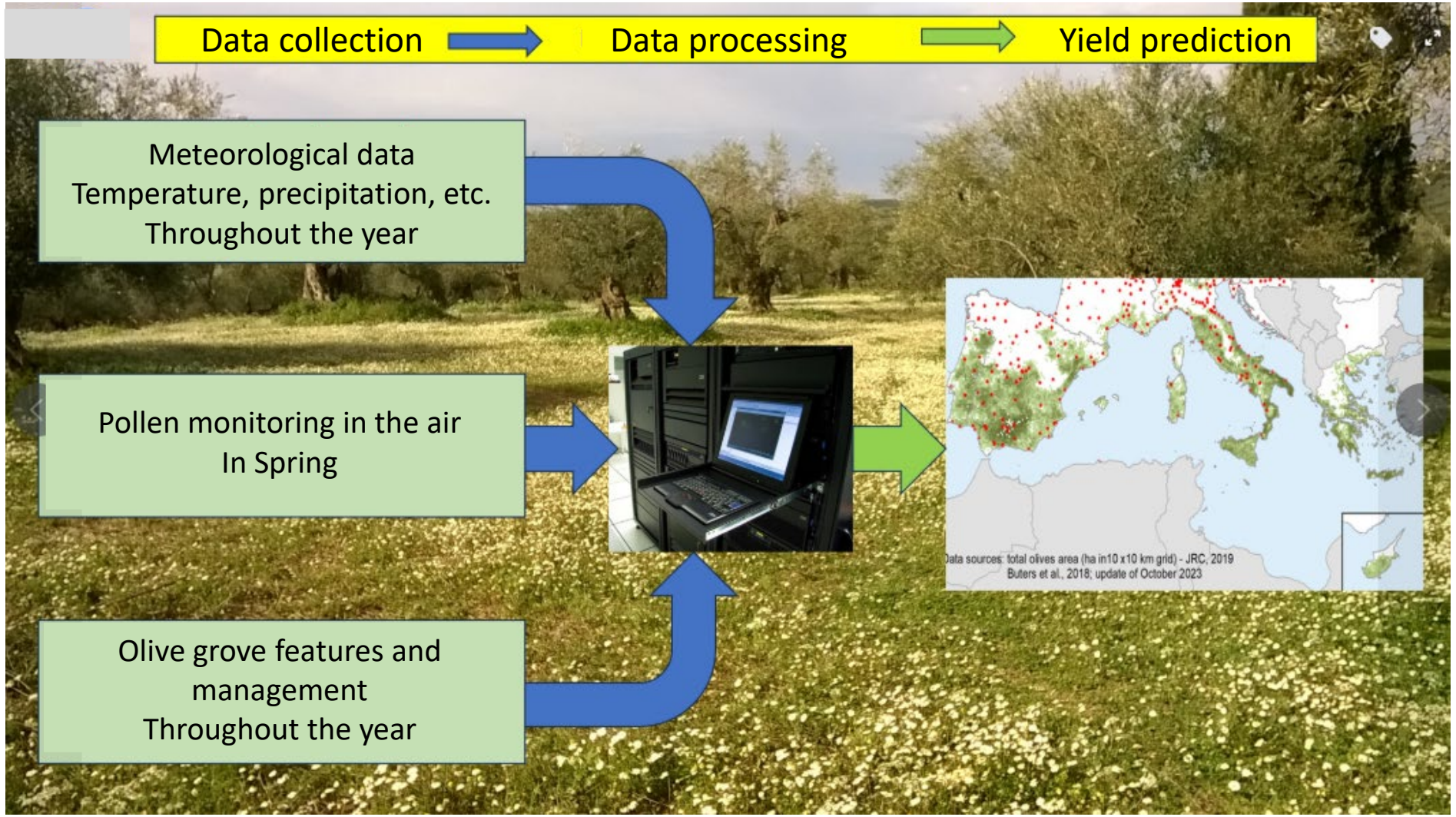
OliveAlarm

Risk scale			
None	Minor	Intermediate	High

AGRI 3 + 8

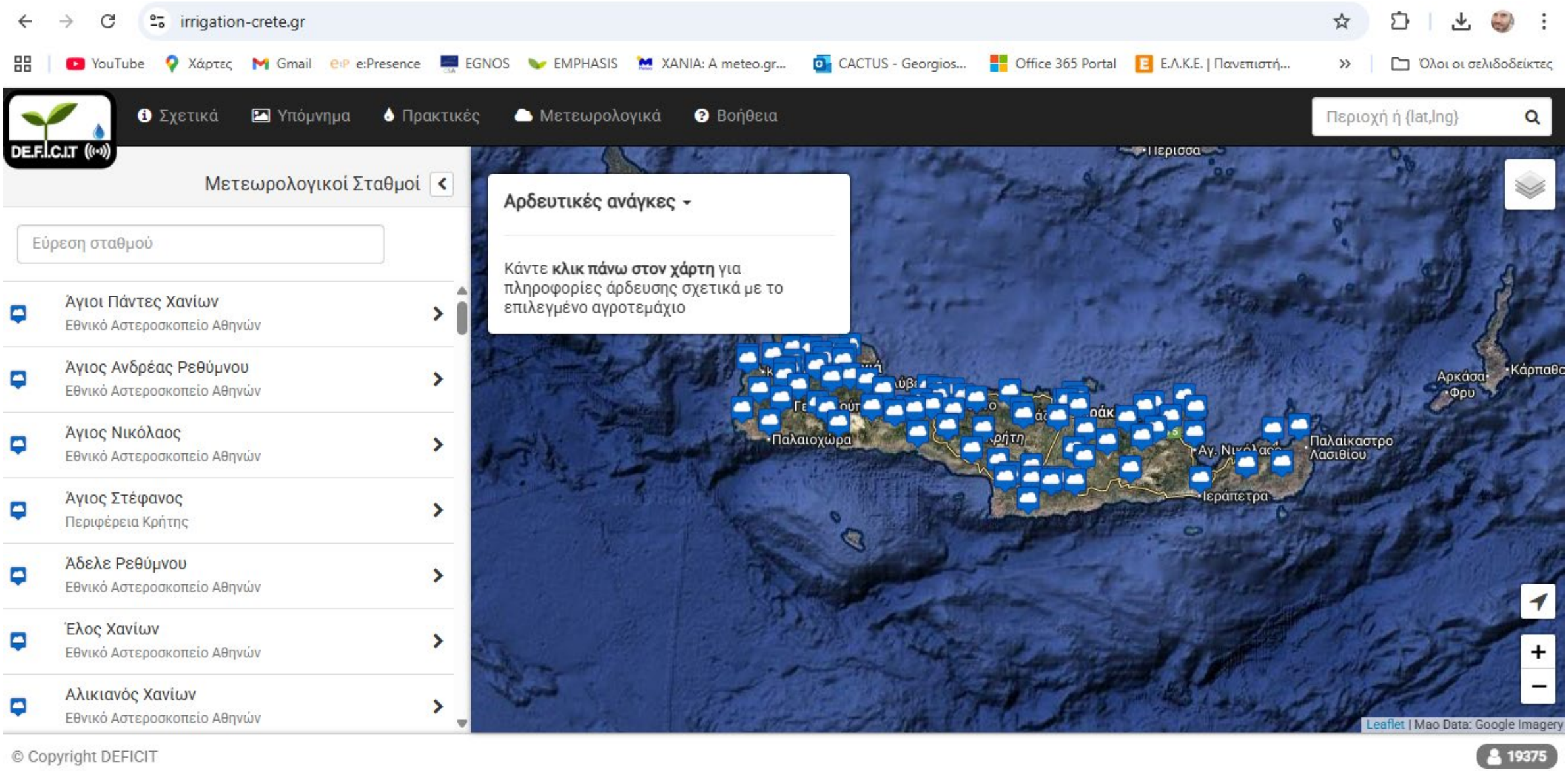
The European Commission has been developing n olive production forecasting system

ΕΛΓΟ-ΔΗΜΗΤΡΑ
ΕΛΛΗΝΙΚΟΣ ΓΕΩΡΓΙΚΟΣ ΟΡΓΑΝΙΣΜΟΣ - ΔΗΜΗΤΡΑ



AGRI 6

Farm scale Irrigation advice system in the Region of Crete



AGRI 3 + 5 + 7 + 9

Demonstration olive groves in the region of Crete

- 12 representative olive groves
- Demonstration of sustainable management
- Measurement in trees, soil, and biodiversity
- Certification of
  - Carbon footprint → Carbon credits → additional income
  - Biodiversity → Olivares Vivos Seal → added product value
- Training of farmers and information events for the general audience

AGRI 3 + 4

Recycling of olive mill wastewater

Based on research results, the National Legislation changed and allows for this practice

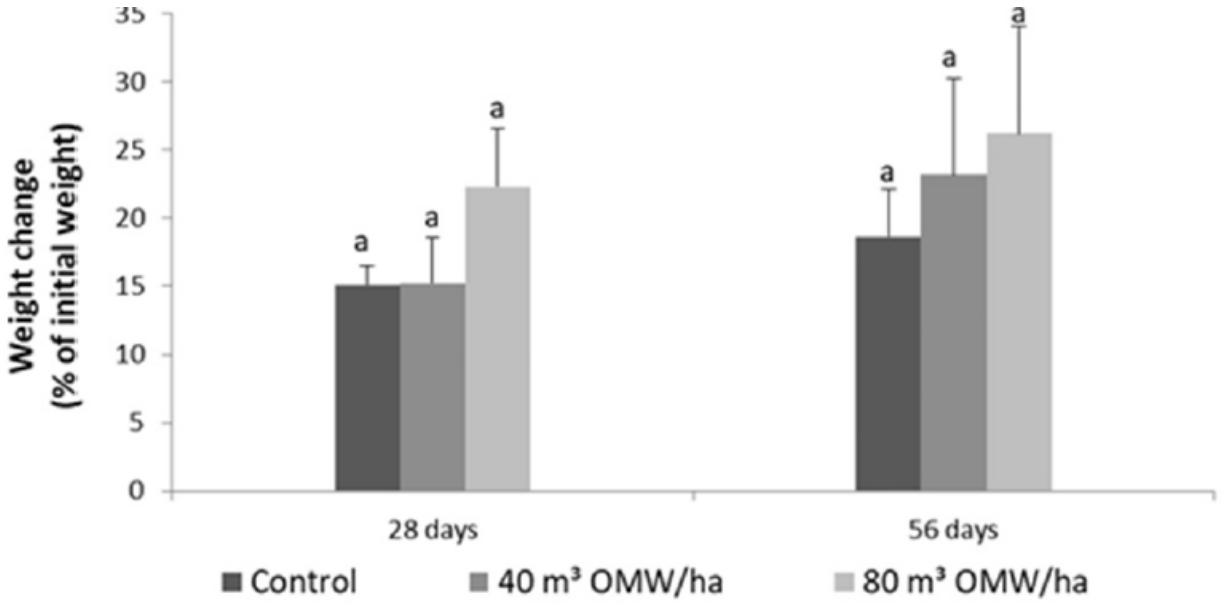


Fig. 1. Body weight change (% ± SE) of earthworms after the application of OMW onto the culturing substrate at doses of 40 m^3 ha^{-1} and 80 m^3 ha^{-1}, after 28 and 56 days. In the control deionized water was added to the substrate. Columns followed by the same letter are not significantly different ($P < 0.05$, Tukey HSD test).

AGRI 3

Commercial exploitation

The current state of global biodiversity

- We are losing many more animals and plants than in the past. This loss of species is estimated to be 1,000 to 10,000 times greater than what happens naturally. And it shows no sign of slowing down.

- WWF's Living Planet Report shows that wildlife populations have declined by an average of 69% since 1970. This is particularly the case in the tropical regions, which are also home to some of the world's most biodiverse landscapes.

- Animal species are disappearing before they have even been discovered. And some experts believe we are in the midst of a sixth mass extinction.

- The delicate balance of nature is lost. This is of real concern because we depend on many important ecosystem services, including clean water, fresh air and sustainable food production.

https://www.greenpeace.org.uk/challenges/wildlife-and-biodiversity/what-is-biodiversity/

Biodiversity plays key role in agroecosystem resilience

Wrong weed management resulted in single species dominance

Multispecies soil cover

Olive varieties

- more than 4000 accessions
- Over 90 % in the Mediterranean basin
- cultivated in many regions of the world with Mediterranean climates, such as South Africa, Chile, Peru, Pakistan, Australia, Oregon, and California, and in areas with temperate climates such as New Zealand.

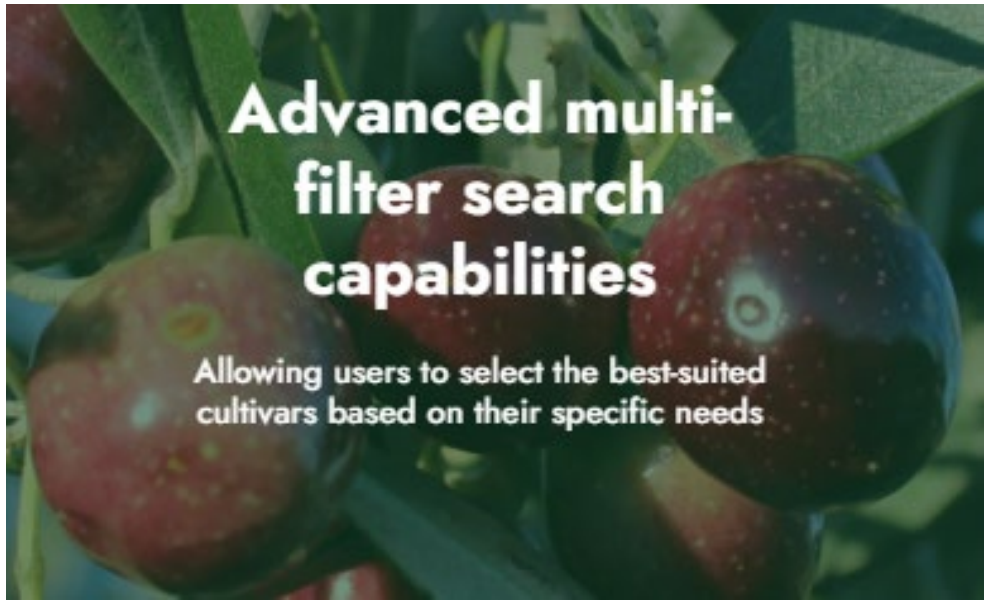
The International Olive Council (IOC) Network

- The IOC is the world's only international intergovernmental organization in the field of olive oil and table olives.
- It was set up it Madrid, Spain, in 1959, under the auspices of the United Nations.
- Since 1994, the IOC has promoted a network that currently includes National Germplasm Banks in 22 countries focusing on the exploration and conservation and cataloguing of local cultivars.
- The network conserves more than 1100 accessions, which were collected and have been partially characterized.

www.international.oliveoil.org

Rallo, L. *et al.* (2018). Strategies for Olive (*Olea europaea* L.) Breeding: Cultivated Genetic Resources and Crossbreeding. In: Al-Khayri, J., Jain, S., Johnson, D. (eds) Advances in Plant Breeding Strategies: Fruits. Springer, Cham. https://doi.org/10.1007/978-3-319-91944-7_14

Genetic resources for adaptation to climate change



https://www.uco.es/ucolivo/gen4olive/

Filter Olive Cultivars

Country of Origin

Any Country

Usability

Any Usability

Agronomic Traits (1 - Low, 5 - High)

Oil Yield and Quality (1 - Low, 5 - High)

Phenological Process (1 - Early, 5 - Late)

Susceptibility to Pests and Diseases (1 - Low susceptibility, 5 - High susceptibility)

Climate Adaptability (1 – Low sensitivity, 5 – High sensitivity)

Table Olive Aptitude Information (1 - Low, 5 - High)

World Catalogue of Olive Varieties

https://worldolivecatalogue.internationaloliveoil.org/en

Olivares Vivos

BIODIVERSITY FROM THE FIELD TO THE AGRARIAN INCOME

Why olive groves?

A STRATEGIG CROP TO STOP

THE LOSS OF BIODIVERSITY

In the most important Biodiversity Hotspot in Europe.

An extraordinary refuge of biodiversity.

With great potential to get it back

Olive groves

Mediterranenean biodiversity hotspot

The environmental crisis

Main environmental problems

The environ-mental price

La agricultura convierte el Guadalquivir en el río más turbio de Europa

El estudio que desde hace cinco años realiza la Universidad de Huelva alerta sobre las prácticas agrícolas que provocan erosión y la ocupación por cultivos de zonas de inundación del río

Erosion

Loss of biodiversity

The economic crisis

IN TRADITIONAL OLIVE GROVE

Prices Below Production cost

Traditional olive groves on steep slopes

Traditional olive groves

Intensive olive groves

Production costs and market Price (Jaén, Spain)

Olives For life

OLIVARES VIVOS

LOOKING FOR A SOLUTION
FOR BOTH CRISES

THE STRATEGICAL APROACH

To address both crises together

To recover the biodiversity of the olive groves and to turn it into profitability.

In agriculture, there is no sustainability without profitability.

THE STRATEGICAL APROACH

Going beyond

Farming field

To encompass the whole

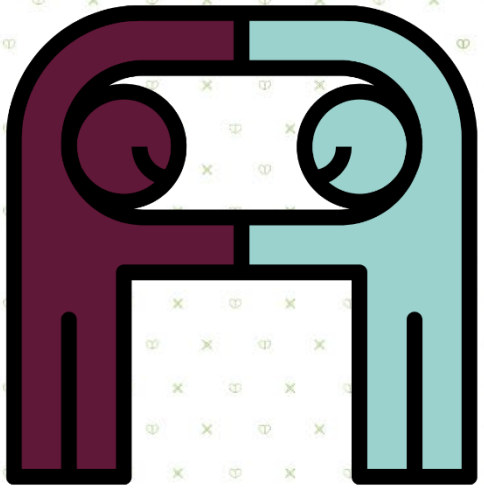
Agri-food field

Farm to Fork approach

THE STRATEGICAL APROACH

Farm to Fork approach

A strategy To connect Producers with consumers



1

HOW?

Designing and certifying scientifically an olive growing model compatible with the conservation of biodiversity.

An olive growing model

Farm to Fork approach

2 **Positioning, through a certification seal, this production model as a profitable added value in the oil market.**

THE STRATEGICAL APROACH

Yet ANOTHER seal?

The first agri-food product with a scientifically proven contribution to biodiversity

It is not just another seal; it is the only one whose specific objective is the recovery of flora and fauna.

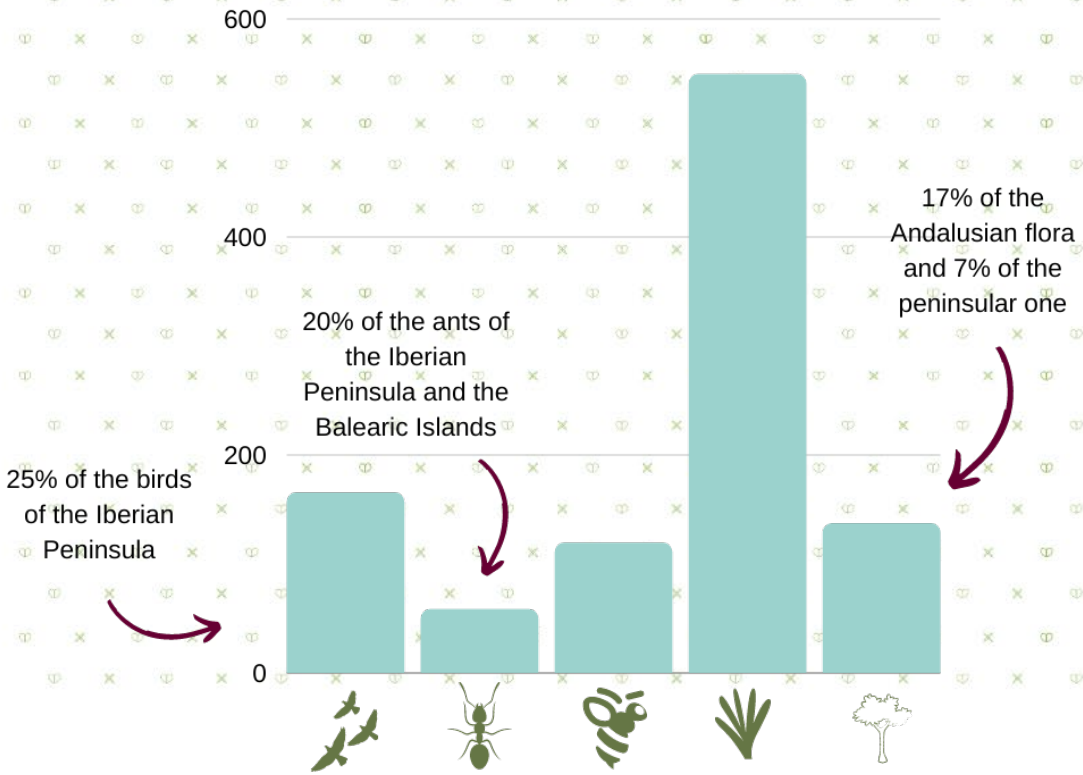
Olivares vivos demonstration project

Biodiversity monitoring

Indicators:

- ✓ Birds
- ✓ Ants
- ✓ Pollinators
- ✓ Herbaceous plants
- ✓ Woody plants

preoperational biodiversity



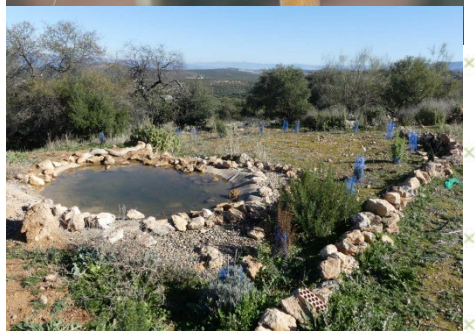
More than 7,500 censuses carried out and more than 250,000 contacts registered and analyzed

	Species	Genera	Families/ Subfamilies
Birds	165	119	52
Ants	58	18	3
Pollinators	119	40	32
Solitary bees	17	5	1
Herbaceous	549	271	59
Woody plants	137	105	49

THE olivares vivos model

Agri-environmental scheme

Restoration of non-productive areas of the farms



Sustainable management of herbaceous cover

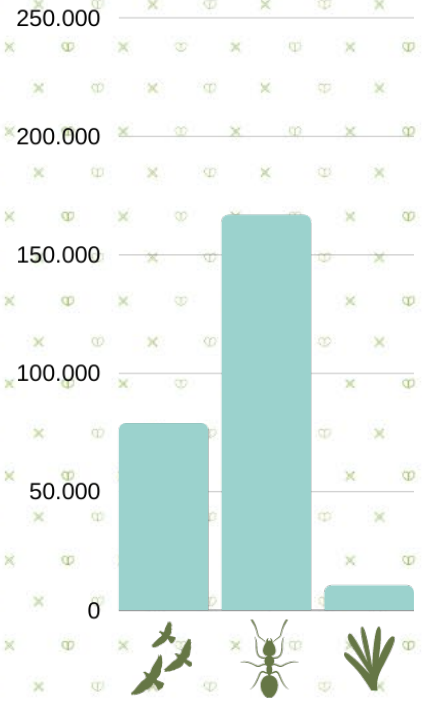
Structures to help fauna

Post-operational monitoring

In 40 olive groves: 20 control and 20 demonstration ones.

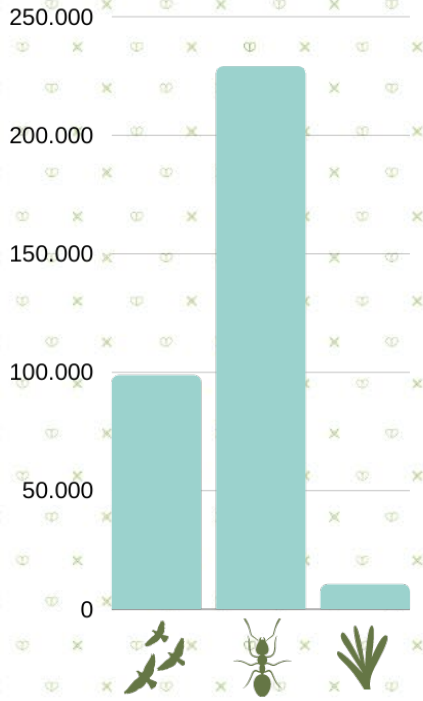
Pre-operational

Sampling effort:
7,624 census.
255,842 records.



Post-operational

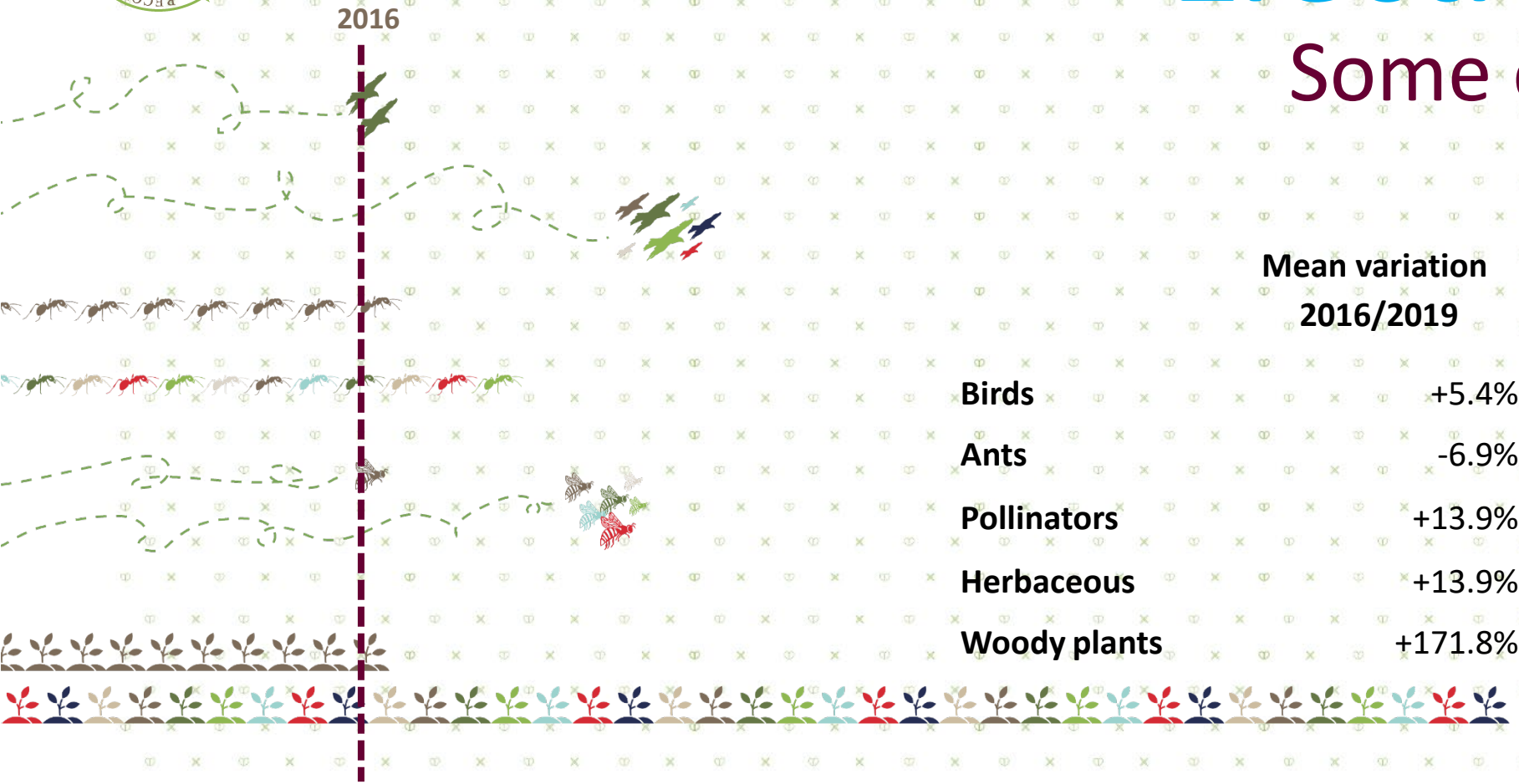
Sampling effort:
7,624 census.
339,288 records.



Good practices that work

Efectiveness

Some of the results: richness

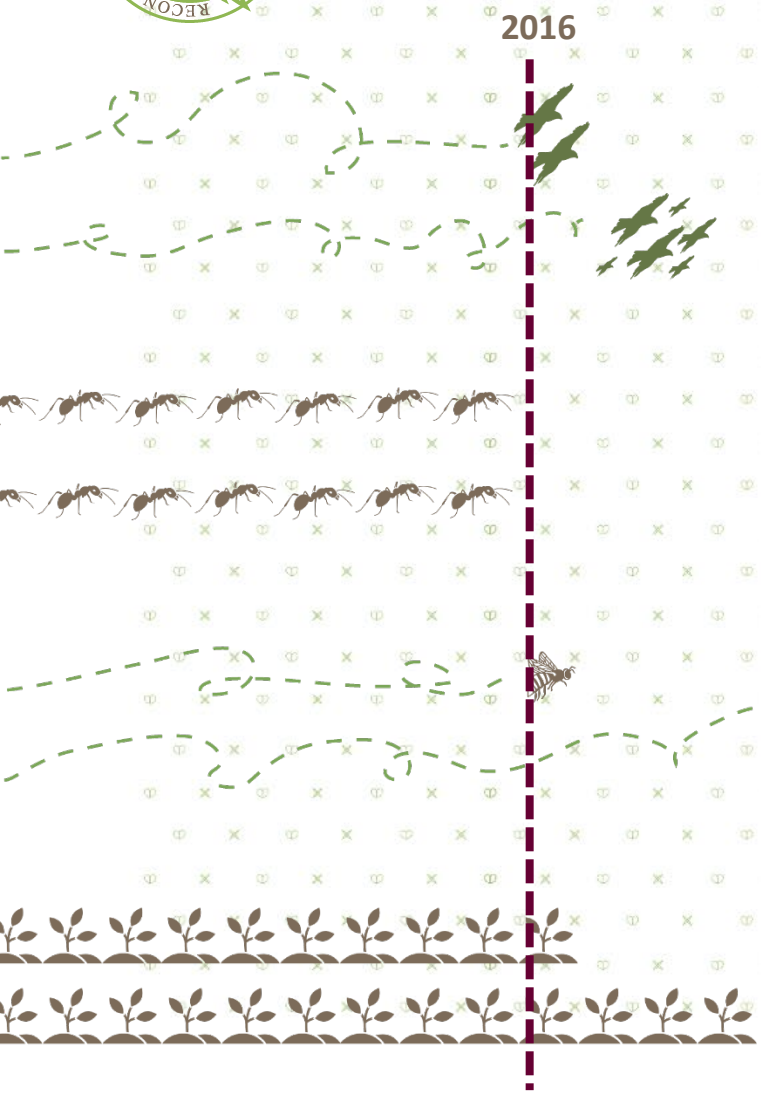


	Mean variation 2016/2019	Variation in intensive olive groves 2016/2019
Birds	+5.4%	+9.6%
Ants	-6.9%	+3.1%
Pollinators	+13.9%	+7.5%
Herbaceous	+13.9%	+30.1%
Woody plants	+171.8%	+259%

Good practices that work

Efectiveness

Some of the results: abundance



	Mean variation 2016/2019	Variation in intensive olive groves 2016/2019
Birds	+9.8%	+15.1%
Ants	+4.1%	0%
Pollinators	+47.2%	+259.8%
Herbaceous	+13.4%	+26.7%
Woody plants	+20%	+20%

How can biodiversity increase profitability

1 Ecosystem services

Less use of pesticides and fertilizers

2 Payment for environmental services

Better prepared for new eco-schemes

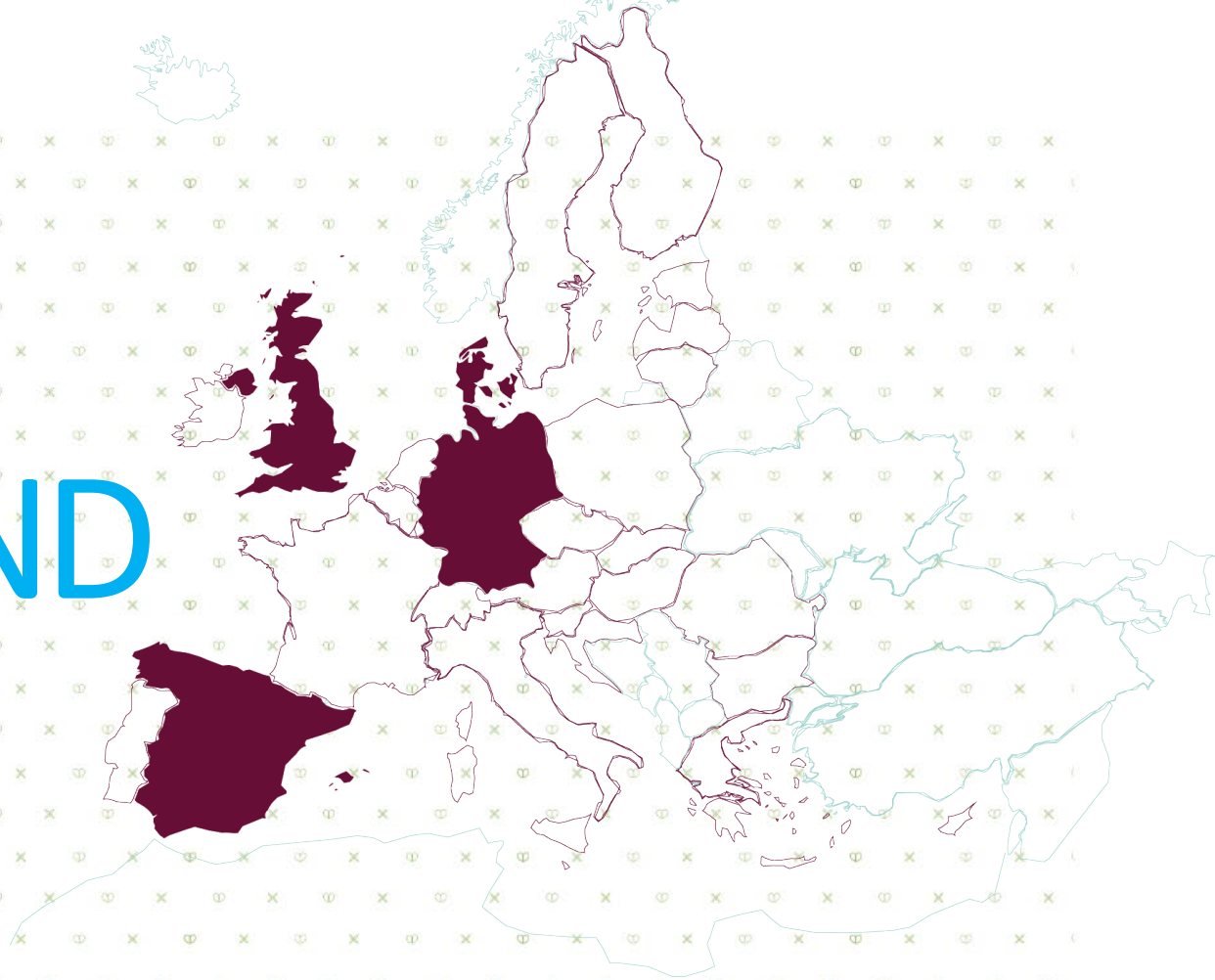
3 Market added value

Consumer demand for sustainability

ASSISTANCE FOR THE

PRODUCTION AND marketing

OF OLIVARES VIVOS OLIVE OILS

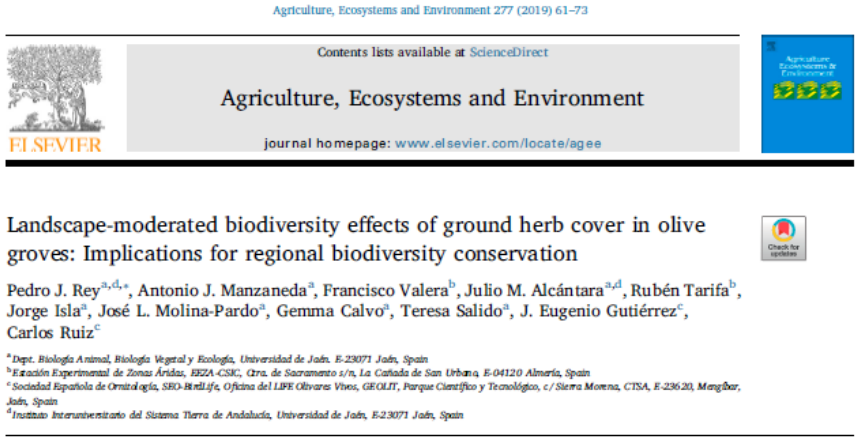


Background

1 Market studies in Spain, Denmark, Germany and the United Kingdom. 800 surveys in each country.

2 Report on the key aspects of the potential consumer behavior of Olivares Vivos oil

Good practices that work



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journal homepage: www.elsevier.com/locate/agee

Landscape-moderated biodiversity effects of ground herb cover in olive groves: Implications for regional biodiversity conservation

Pedro J. Rey[a,d,*], Antonio J. Manzaneda[a], Francisco Valera[b], Julio M. Alcántara[a,d], Rubén Tarifa[b], Jorge Isla[a], José L. Molina-Pardo[a], Gemma Calvo[a], Teresa Salido[a], J. Eugenio Gutiérrez[c], Carlos Ruiz[c]

[a] Dept. Biología Animal, Biología Vegetal y Ecología, Universidad de Jaén, E-23071 Jaén, Spain
[b] Estación Experimental de Zonas Áridas, EEZA-CSIC, Ctra. de Sacramento s/n, La Cañada de San Urbano, E-04120 Almería, Spain
[c] Sociedad Española de Ornitología, SEO-BirdLife, Oficina del LIFE Olivares Vivos, GEOLIT, Parque Científico y Tecnológico, c/ Sierra Morena, CTSA, E-23620, Mengíbar, Jaén, Spain
[d] Instituto Interuniversitario del Sistema Tierra de Andalucía, Universidad de Jaén, E-23071 Jaén, Spain

Biodiversity recovery potential

modelling

+35%

+15% with herbaceous cover management

+20% with landscape diversification measures

Good practices that work

Monitoring of the Productivity

Farms were surveyed before and during the project implementation

NO AFFECTION TO THE PRODUCTIVITY WAS DETECTED

The certification

Certification scheme

Divided in two different standards:

1 Farms producing the olives.

2 Chain of custody for the different actors involved in the production and bottling of the olive oil

Good practices that work

Feasibility and replicability

Scheme:

1. **Simple.**
2. **Understood by the farmer.**
3. **Understood by the consumers.**

The strategy is to replicate the Olivares vivos + model

4 countries covering the main olive growing areas

Spain:

- Extremadura, Castilla la Mancha, Levante
- Specific farms for climate change adaptation.

Portugal:

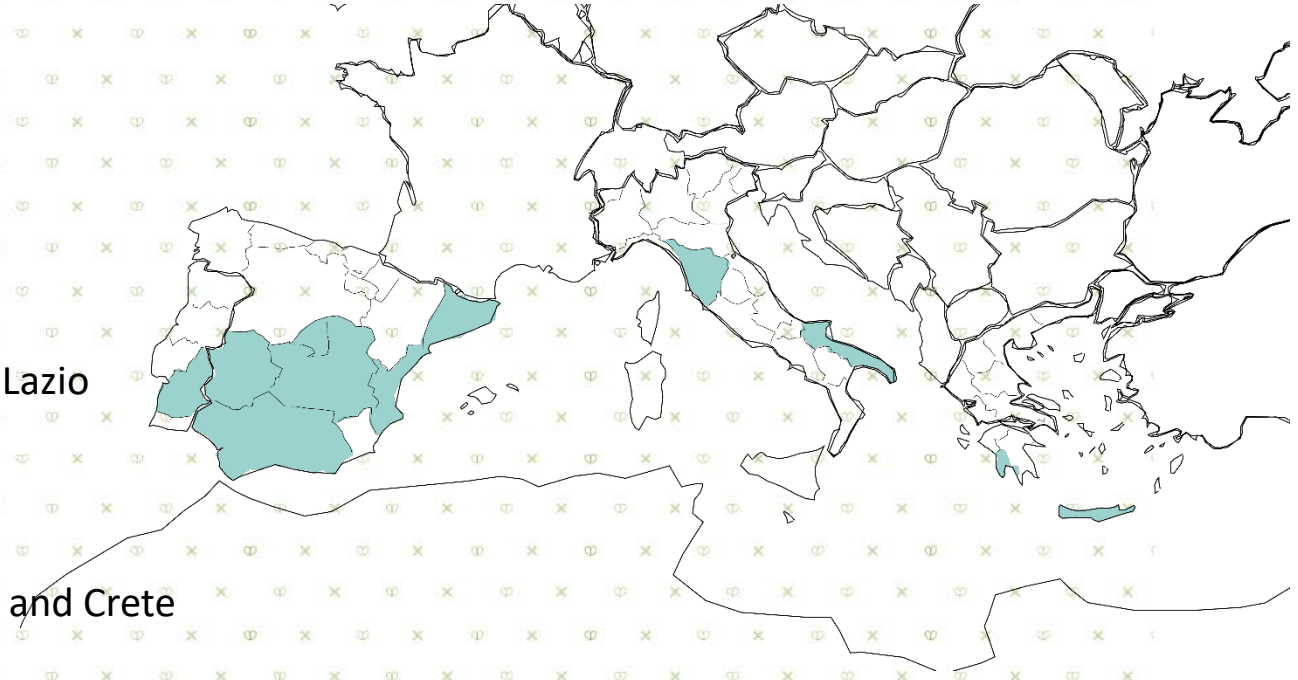
- Alentejo

Italy:

- Toscana and Lazio

Greece:

- Peloponesse and Crete



Eu environmental strategies

Biodiversity strategy for 2030

- Increase in flora and fauna
- Improvement of Green Infrastructure
- Reduces the use of pesticides
- + Landscape elements

EU pollinators initiative

- Specific increase in pollinators
- Improvement of their habitats
- Reduces the use of pesticides
- Better connectivity

Strategy on Adaptation to Climate Change

- Increase in carbon sequestration
- Natured based solution

Irrigation based on sensors

Increased soil organic matter

Nutrition based on leaf and soil analysis

Resilient olive trees

Reduced soil tillage

Yearly light pruning

Early harvest

Pest and disease management

Recent projects in Greece by ELGO-DIMITRA

The **PRIMA FREECLIMB** project is built to match topic 1.2.1 of the PRIMA (Sect. 2) framework in developing smart and sustainable farming systems in Mediterranean countries, to preserve natural resources (water and land use) by increasing production efficiency. https://sites.unimi.it/primafreeclimb/

GEN4OLIVE is an EU-funded Innovation Action that aims at increasing olive GenRes mobilisation and encouraging pre-breeding activities to adapt to Climate change and emerging diseases that threaten olive production. https://gen4olive.eu/

The main goal of **PRIMA SUSTAINOLIVE** is to improve the sustainability of the olive oil sector, through the implementation and promotion of a set of innovative sustainable management solutions, based on agroecological concepts, as well as in the exchange of knowledge and participation of multiple associates and end users. https://sustainolive.eu/?lang=el

The **LIFE oLIVECLIMA** project is an effort to guide the agricultural sector in order to face these challenges by converting olive cultivation to a climate change management tool. https://oliveclima.eu/

The **LIFE AgroClimaWater** project's main objective is to promote water efficiency and support the shift towards climate resilient agriculture in Mediterranean countries through the development of water management adaptation strategies in Farmers' Organizations. http://www.lifeagroclimawater.eu/

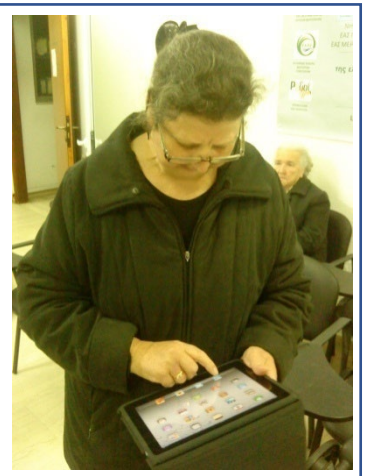
'Olivares Vivos', the profitable olive growing model that recovers biodiversity and can be replicated in other woody crops. Home - Olivares Vivos

Olive Roads is the promotion of the cooperation of the country's human resources and infrastructures, in order to highlight the qualitative characteristics of Greek varieties and olive oil and adapt to Climate change and emerging diseases that threaten olive production. https://dromoielias.gr/

The aim of this EU-funded project **OLIVEMIRACLE** is to provide accurate tools to test the effectiveness of adaptation/mitigation management strategies to support long-term investment decision making on olive-tree cultivation across the Mediterranean under current and future climate. http://olivemiracle.eu

Videos in YouTube by LIFE OLIVECLIMA

1. Pruning olive tree
2. Fertilization of olive groves
3. Weed management during winter
4. Composting olive residues
5. Holistic olive grove management



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True Healthy Olive Cultivars

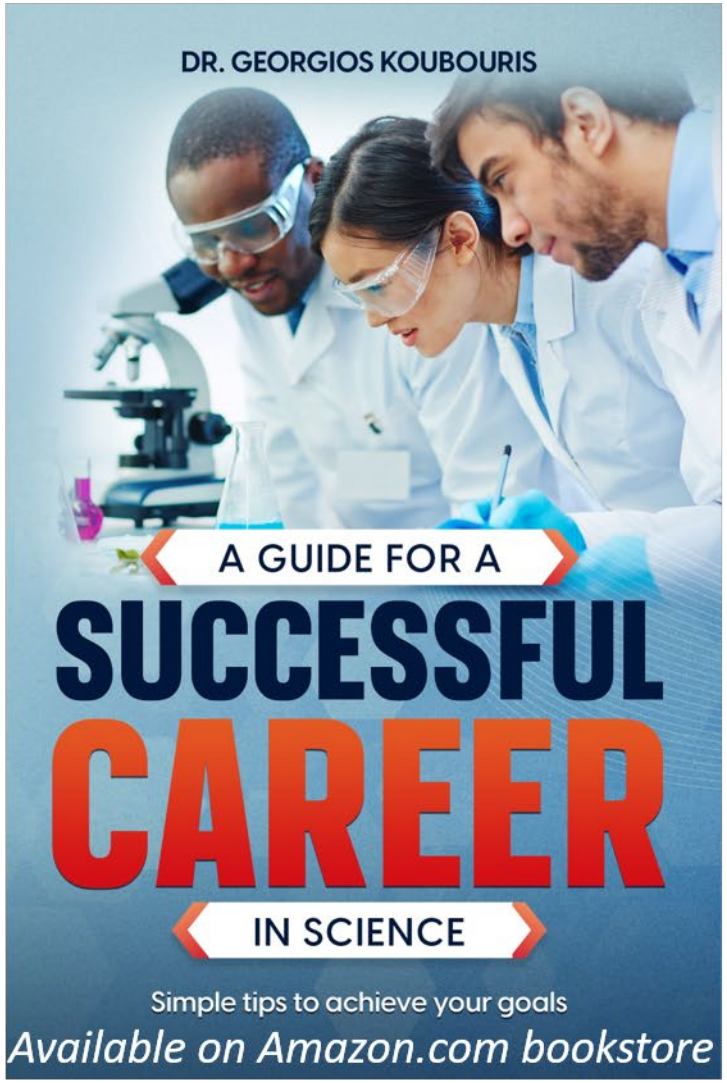
Breedolea

- Certified Nursery
- Olive Alarm
- Early Harvest

CertOlive

Multivar

Freeclimb



Thank you!