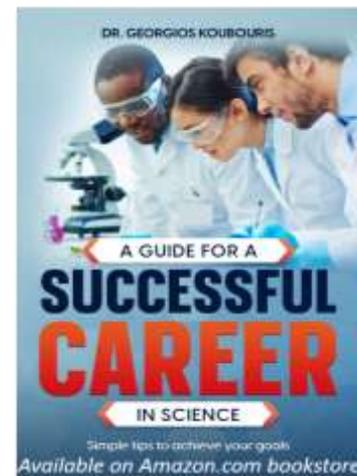




## TAIEX TSI Workshop

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



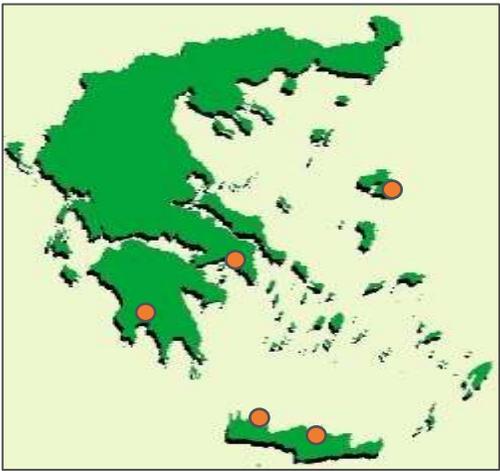


# HELLENIC AGRICULTURAL ORGANIZATION ELGO-DIMITRA in Greece



- Over 700 employees
- Germplasm banks for all crops
  - Agricultural Research
  - Farmers training
  - Certification in agriculture

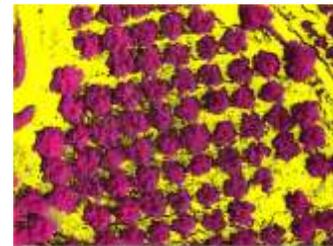
<http://www.elgo.gr/>



## 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**



# What can we do?

- Mitigate climate crisis



- Adapt olive grove management



- Select/breed resilient olive varieties



# Sustainable olive grove management

Consumers  
care about  
the environment



Atmos. Chem. Phys., 13, 8797–8811, 2013

[www.atmos-chem-phys.net/13/8797/2013/](http://www.atmos-chem-phys.net/13/8797/2013/)

doi:10.5194/acp-13-8797-2013

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**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<sub>2</sub> capture through photosynthesis



**Applied in over 100 olive groves in 15 years**



## 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

## Recycling pruning residue

Chipper shredder



Flail lawn mower



Decomposition rate  
faster                  slower

Nutrient recycling  
faster                  slower

Carbon storage  
short term          long term

# Compost amendment improves soil fertility



# Cover crops in olive groves



Single species  
Low carbon storage



High diversity  
Higher carbon storage  
Nitrogen fixation by legumes

## 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”

Addition of organic materials on the soil **improved water retention**



A close-up photograph of olive tree branches heavily laden with small, green olives. The leaves are dark green and elongated. The olives are clustered along the branches, some showing a slight yellowish-green hue. The background is a dense thicket of similar branches and leaves.

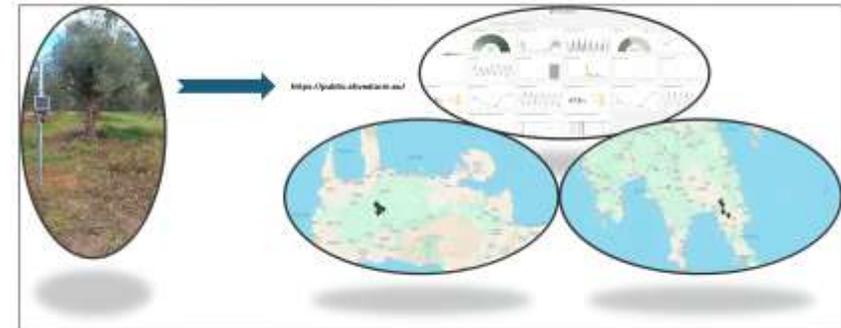
Olive oil yield is stabilized through pruning and soil enrichment

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

### Good agricultural practices



### Farm sensors and meteorological stations

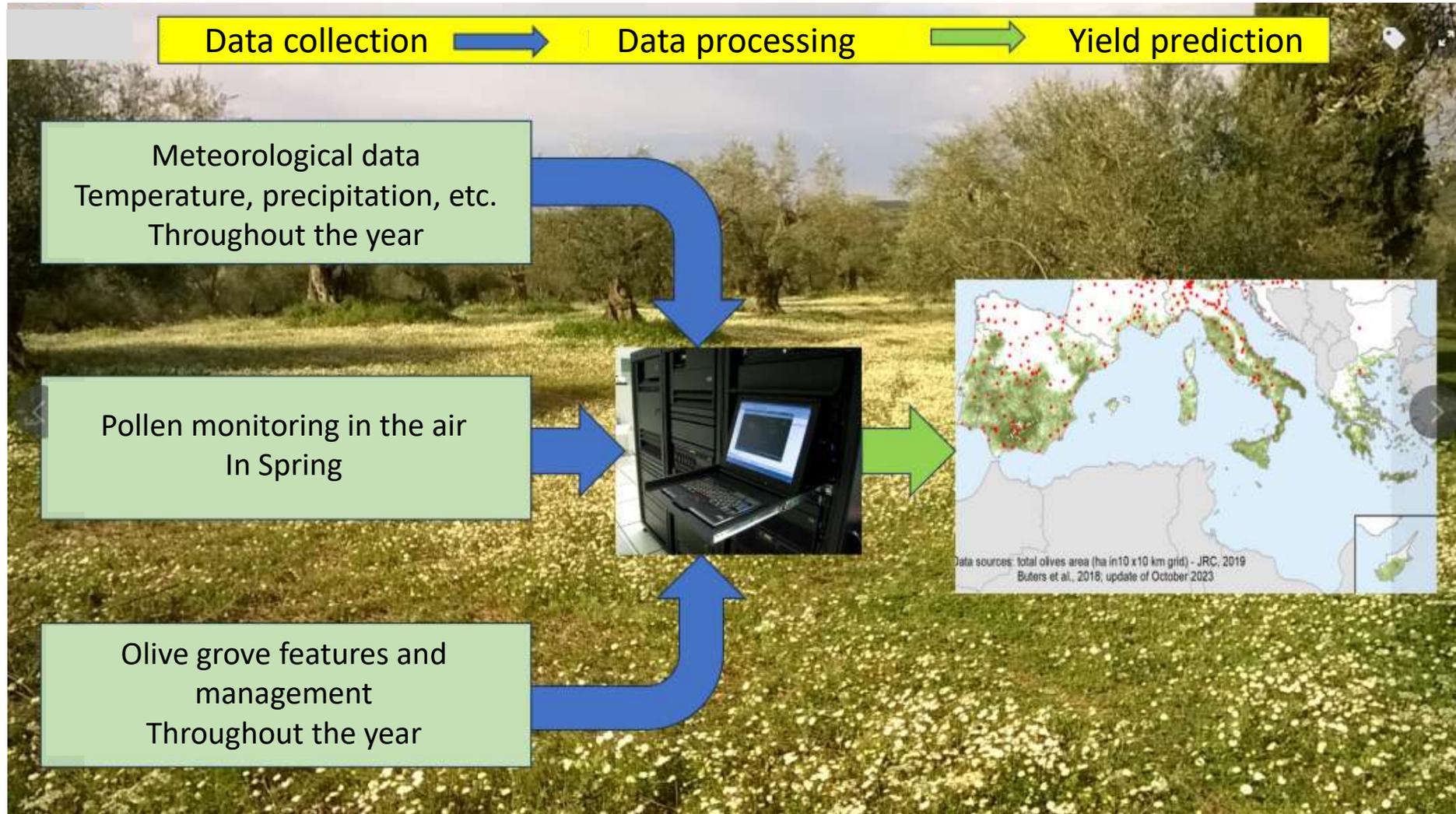


Early warning system



Risk scale			
None	Minor	Intermediate	High

The European Commission has been developing an olive production forecasting system



The screenshot displays the web interface for the irrigation-crete.gr system. At the top, the browser address bar shows the URL 'irrigation-crete.gr'. Below the browser, a navigation bar contains the DE.F.I.C.I.T. logo and several menu items: 'Σχετικά', 'Υπόμνημα', 'Πρακτικές', 'Μετεωρολογικά', and 'Βοήθεια'. A search bar on the right allows for location input: 'Περιοχή ή {lat,lng}'. The main content area is split into two panels. The left panel, titled 'Μετεωρολογικοί Σταθμοί', features a search box 'Εύρεση σταθμού' and a list of seven meteorological stations, each with a location name and the 'Εθνικό Αστεροσκοπείο Αθηνών' affiliation. The right panel shows a satellite map of Crete with numerous blue cloud icons representing irrigation advice points. A white tooltip box over the map reads: 'Αρδευτικές ανάγκες - Κάντε κλικ πάνω στον χάρτη για πληροφορίες άρδευσης σχετικά με το επιλεγμένο αγροτεμάχιο'. The bottom of the page includes a copyright notice '© Copyright DEFICIT' and a user count '19375'.

irrigation-crete.gr

Σχετικά Υπόμνημα Πρακτικές Μετεωρολογικά Βοήθεια

Περιοχή ή {lat,lng}

Μετεωρολογικοί Σταθμοί

Εύρεση σταθμού

- Αγιοι Πάντες Χανίων  
Εθνικό Αστεροσκοπείο Αθηνών
- Αγιος Ανδρέας Ρεθύμνου  
Εθνικό Αστεροσκοπείο Αθηνών
- Αγιος Νικόλαος  
Εθνικό Αστεροσκοπείο Αθηνών
- Αγιος Στέφανος  
Περιφέρεια Κρήτης
- Άδελε Ρεθύμνου  
Εθνικό Αστεροσκοπείο Αθηνών
- Έλος Χανίων  
Εθνικό Αστεροσκοπείο Αθηνών
- Αλικιανός Χανίων  
Εθνικό Αστεροσκοπείο Αθηνών

Αρδευτικές ανάγκες

Κάντε κλικ πάνω στον χάρτη για πληροφορίες άρδευσης σχετικά με το επιλεγμένο αγροτεμάχιο

© Copyright DEFICIT

19375

## 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



## Recycling of olive mill wastewater

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



# Commercial exploitation

The screenshot shows a PDF document from Morris County Municipal Utilities Authority (MUA) titled "WOOD MULCH COMPOST FOR SALE/DELIVERY". The document includes the MUA logo, a cartoon illustration of a person using a wheelbarrow to transport mulch, and a text box explaining the benefits of wood mulch. A yellow arrow points to a table of delivery options.

**MORRIS COUNTY**  
**mua**  
**MUNICIPAL UTILITIES AUTHORITY**

**WOOD MULCH  
COMPOST  
FOR SALE/DELIVERY**

Using wood mulch can reduce weeds, save water, moderate soil temperatures, and make an attractive groundcover throughout the home landscape.

The Morris County Municipal Utilities Authority offers home deliveries of **SCREENED COMPOST** and **DOUBLE-GROUND WOOD MULCH** from mid-April through the end of September to **Morris County residents only**.

To order, call 973-285-8389 or 973-285-8383. Please be patient when placing your order (April

DELIVERY OPTIONS	
<b>SCREENED COMPOST</b>	
5 Cubic Yards = \$135.00	
10 Cubic Yards = \$200.00	
<b>WOOD MULCH</b>	
5 Cubic Yards = \$130.00	
10 Cubic Yards = \$190.00	

# 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.

# Biodiversity plays key role in agroecosystem resilience

Wrong weed management resulted in  
single species dominance



Multispecies soil cover



# Olive varieties



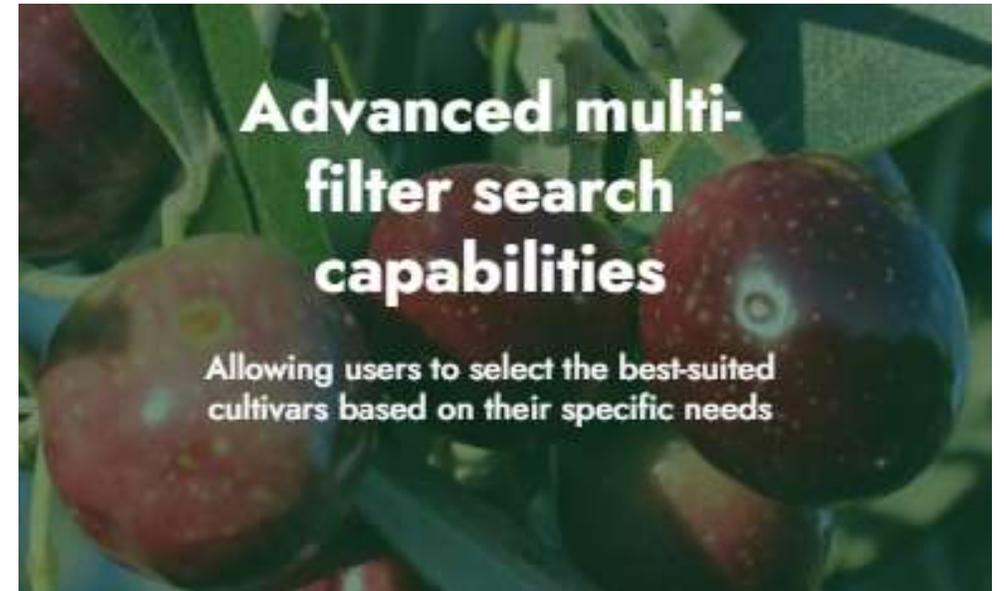
- more than 4000 accessions
- Over 90 % in the Mediterranean basin
- cultivated in many regions of the world with Mediterranean climates, such as South Africa, Chile, Peru, Pakistan, Australia, Oregon, and California, and in areas with temperate climates such as New Zealand.

# 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 in 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.



# 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://worldlivecatalogue.internationaloliveoil.org/en>



# Olivares Vivos

**BIODIVERSITY FROM THE  
FIELD TO THE AGRARIAN INCOME**





# Why olive groves?

A STRATEGIC CROP TO STOP

# THE LOSS OF BIODIVERSITY



## Olive groves



## Mediterranean biodiversity hotspot



In the most important Biodiversity Hotspot in Europe.

An extraordinary refuge of biodiversity.

With great potential to get it back



# The environmental crisis

## Main environmental problems

# The environmental 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

## Production costs and market Price (Jaén, Spain)

IN TRADITIONAL OLIVE GROVE

Prices  
Below  
Production  
cost



Traditional olive groves on steep slopes

Traditional olive groves

Intensive olive groves





Olives For life

# OLIVARES VIVOS

LOOKING FOR A SOLUTION  
FOR BOTH CRISES





## THE STRATEGICAL APPROACH

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 APPROACH

Going beyond  
Farming field

To encompass the whole  
Agri-food  
field



Farm to Fork approach



# THE STRATEGICAL APPROACH



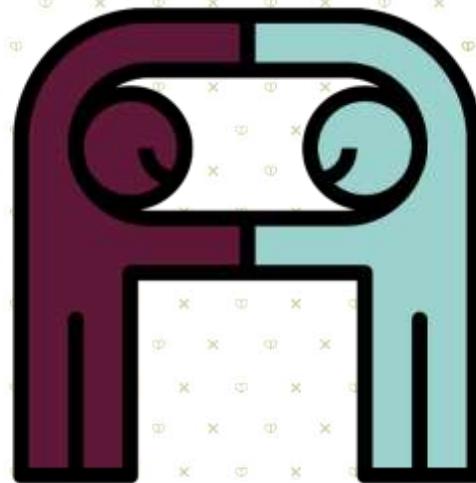
Farm to Fork approach

# A strategy

# To

# connect

Producers with  
consumers



# 1

# HOW?

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



Farm to Fork

Farm to Fork approach

# An olive growing model

2

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





# THE STRATEGICAL APPROACH

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:**

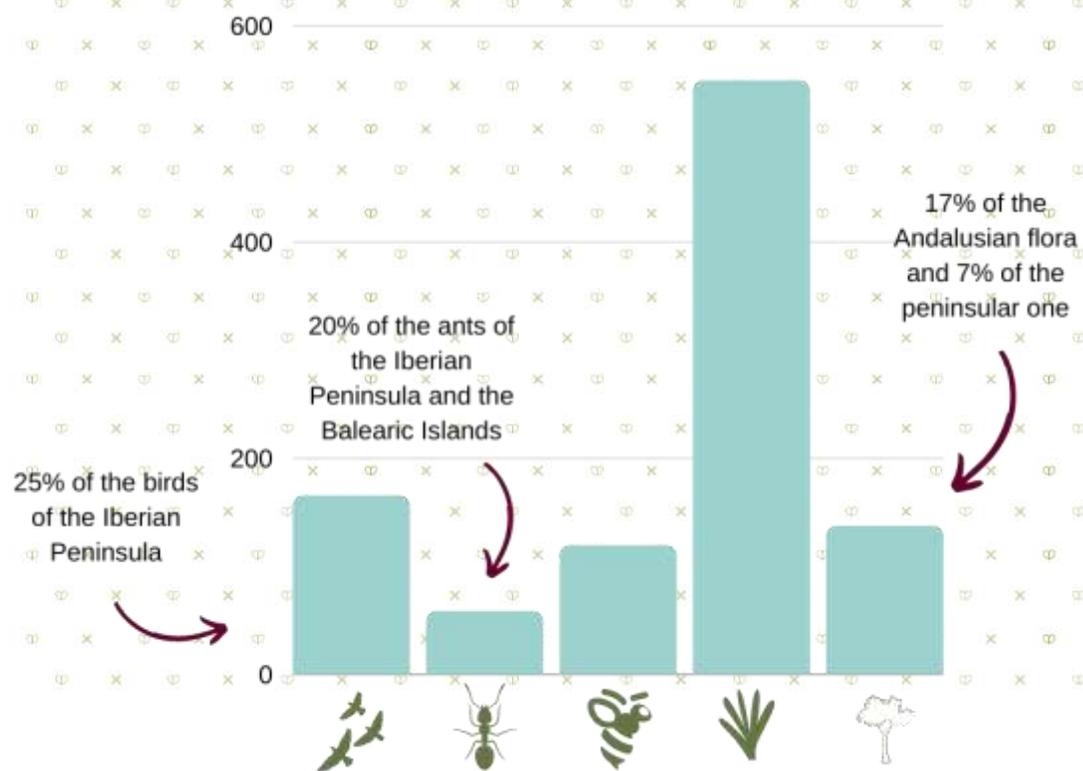
- ✓ Birds
- ✓ Ants
- ✓ Pollinators
- ✓ Herbaceous plants
- ✓ Woody plants





# 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



Sustainable  
management  
of herbaceous  
cover

Restoration of  
non-productive  
areas of the  
farms



Structures to  
help fauna



# Post- operational monitoring



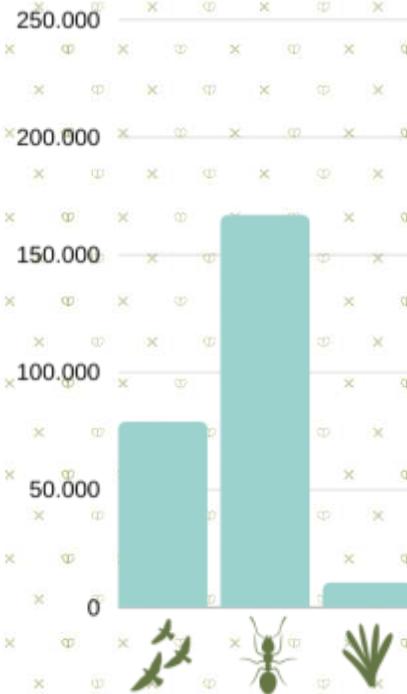
**In 40 olive groves: 20 control  
and 20 demonstration ones.**





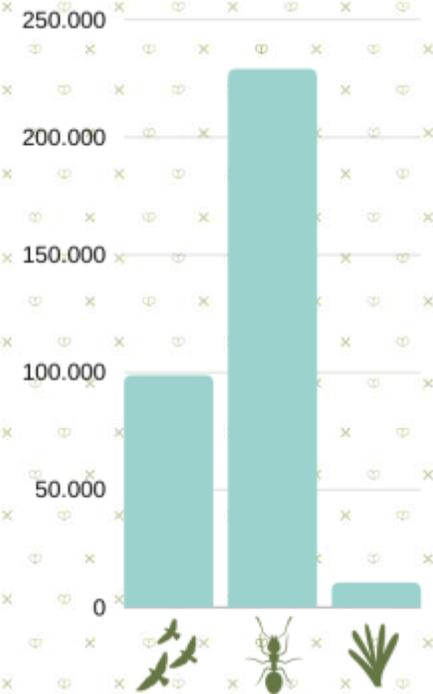
# Pre-operational

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



# Post-operational

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

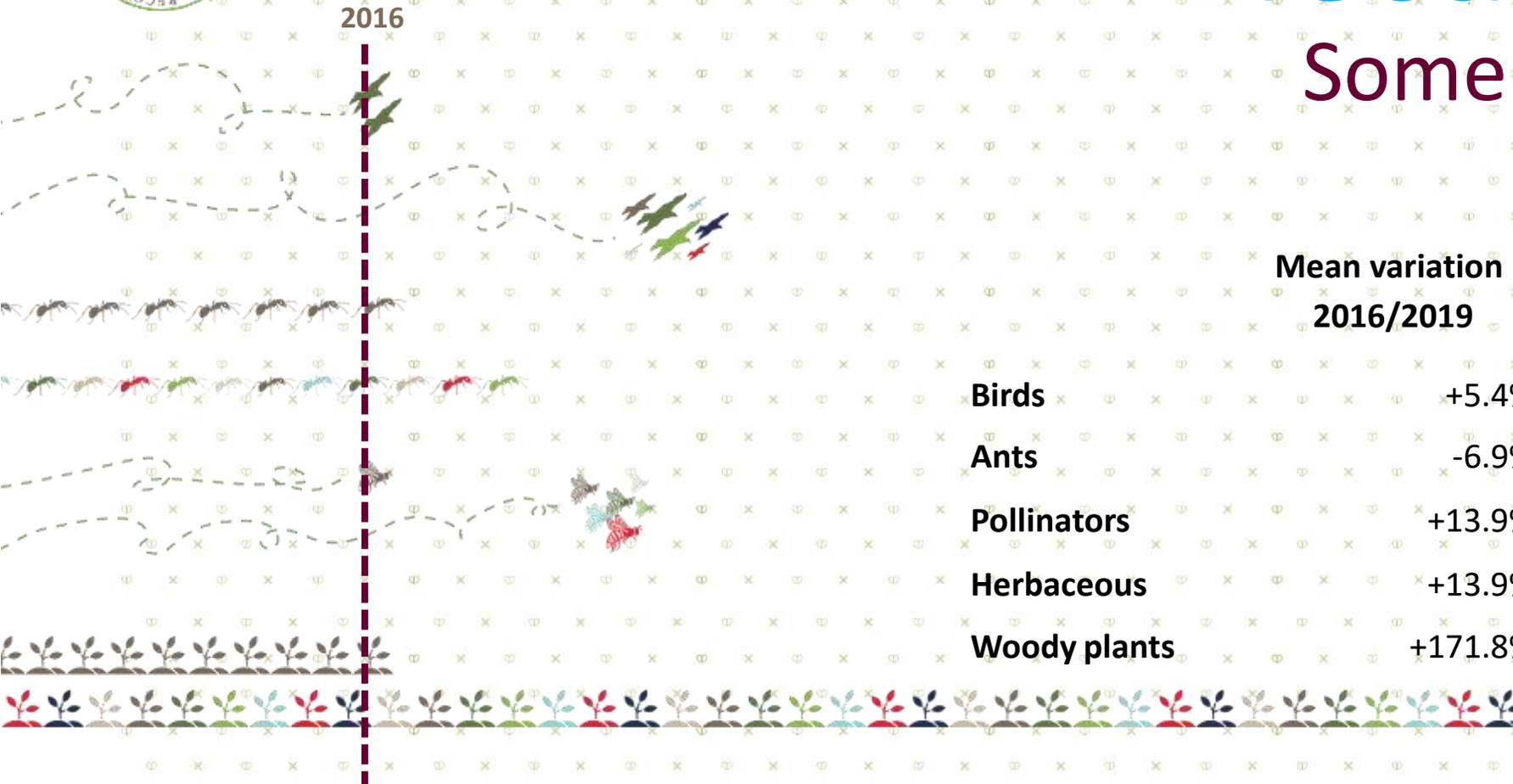




# Good practices that work

# Efectiveness

## Some of the results: richness



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



# Good practices that work

# Efectiveness

## Some of the results: abundance





# 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



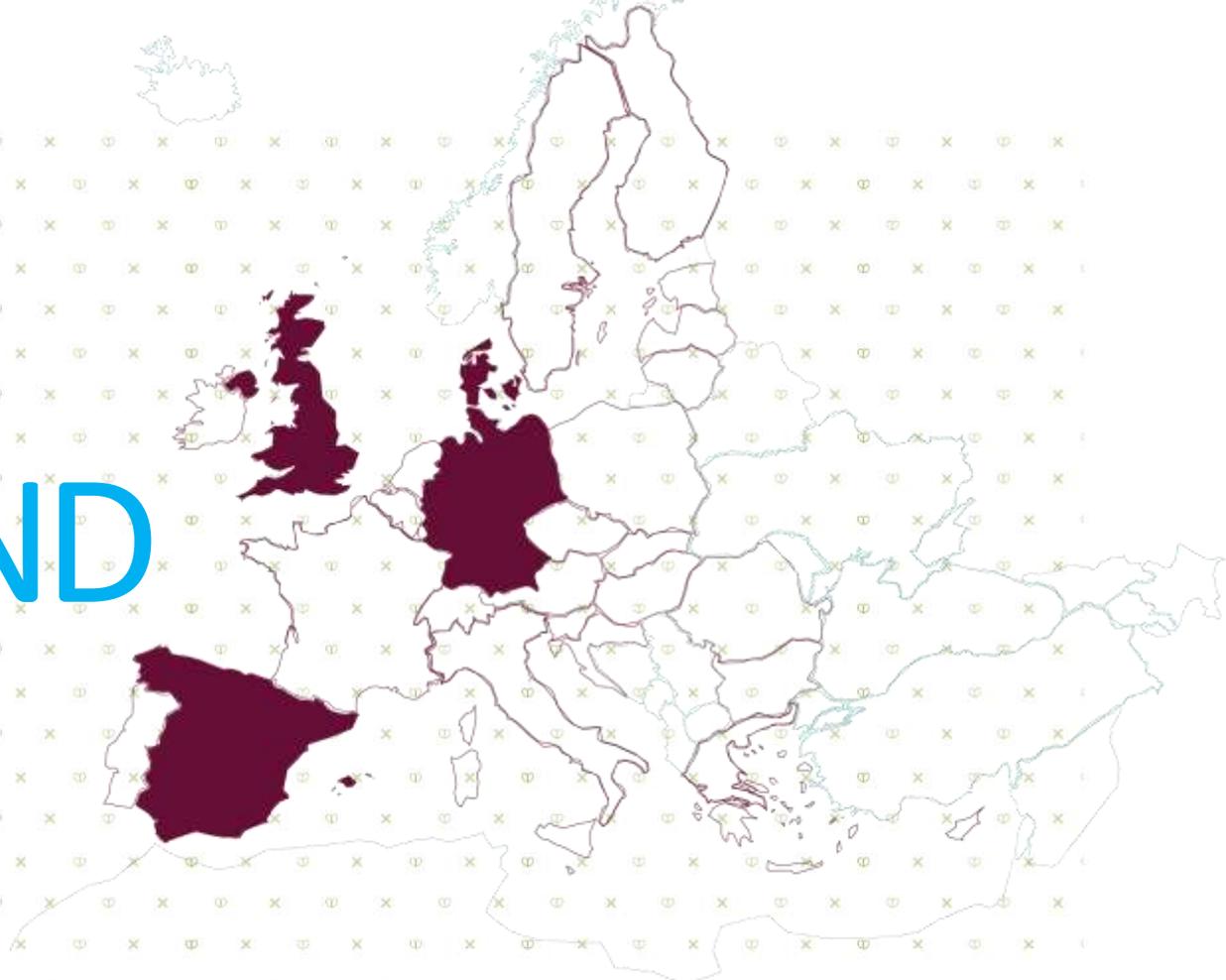


ASSISTANCE FOR THE

# 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



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

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

<sup>a</sup> Dept. Biología Animal, Biología Vegetal y Ecología, Universidad de Jaén, E-23071 Jaén, Spain  
<sup>b</sup> Estación Experimental de Zonas Áridas, EGEA-CSIC, Ctra. de Sacramento s/n, La Cañada de San Urbano, E-04120 Almería, Spain  
<sup>c</sup> 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  
<sup>d</sup> 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:

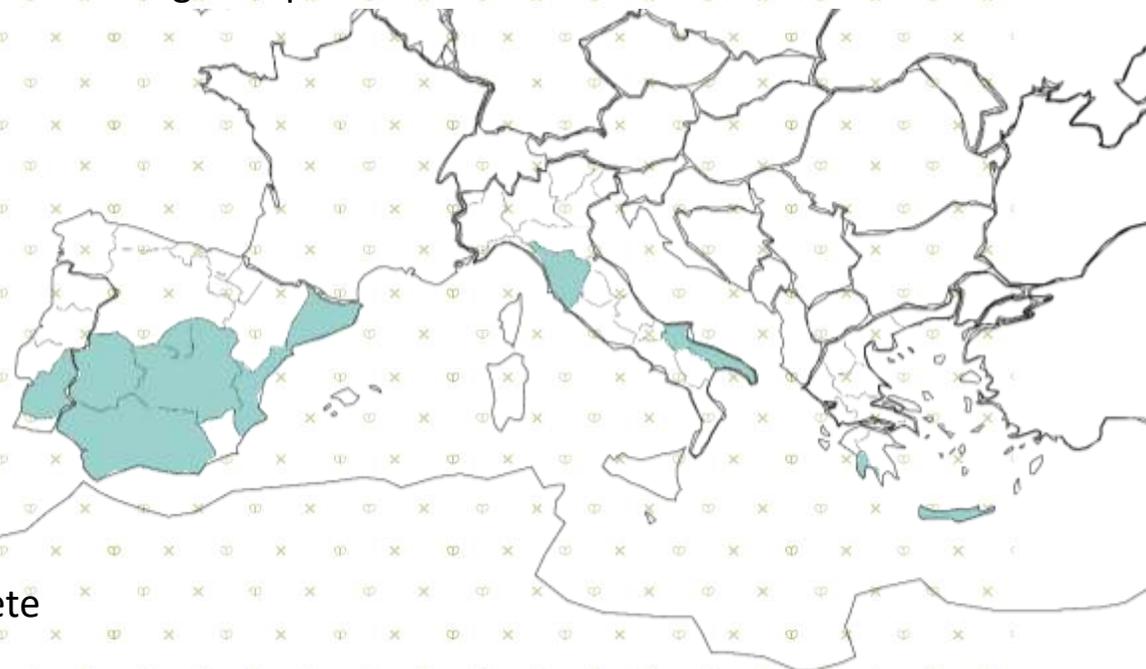
- Alentejo

### Italy:

- Toscana and Lazio

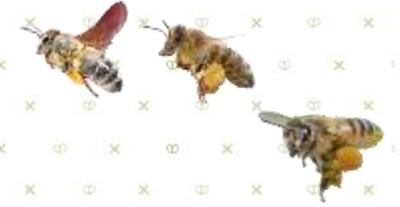
### Greece:

- Peloponnesse 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
- Nature 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=en>

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](#)

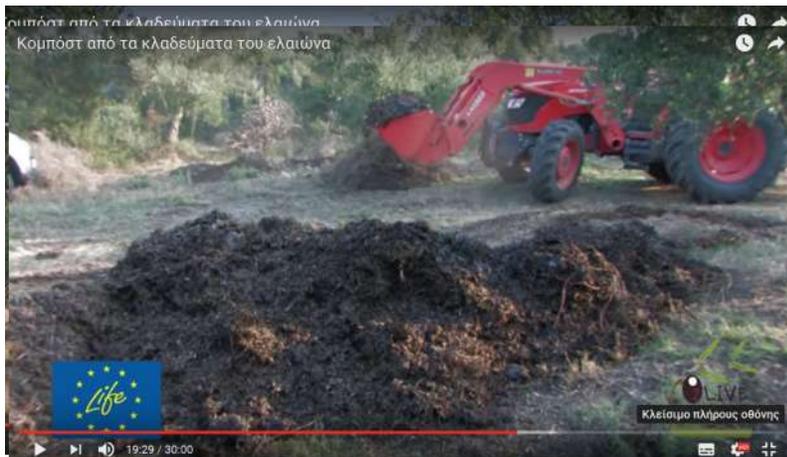
**Olive Roads** is the promotion of the cooperation of the country's human resources and infrastructures, in order to highlight the qualitative characteristics of Greek varieties and olive oil and adapt to Climate change and emerging diseases that threaten olive production. <https://dromoielias.gr/>

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



Dr. Georgios Koubouris

Researcher, Head - Olive Cultivation Lab

ELGO DIMITRA Institute of Olive Tree, Subtropical Crops & Viticulture  
Chania – Greece Tel: 0030 28210 83434 Skype: Georgios.Koubouris



True Healthy  
Olive Cultivars



INTERNATIONAL  
OLIVE  
COUNCIL



- Certified Nursery
- Olive Alarm
- Early Harvest



Olivares Vivos



DR. GEORGIOS KOUBOURIS



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Thank you!