



PLAMINPACK



PLAMINPACK



UNIVERSITÀ DI PISA



PRIMA Programme for supporting the Mediterranean area: research about sustainable practises



Wednesday, 17 December 2025



9:30-11:30 AM



**Department of Civil and Industrial Engineering, room F5,
Via Diotisalvi 5, 56122, Pisa, Italy
Welcome of Director Luca Romoli**

Teams Link:

<https://teams.microsoft.com/meet/37684342605932?p=hxn3qLWa0oGMxp08eM>



PLAMINPACK

Opening Session: Supporting Research Ideas Through Project Writing

9:30-9:40

Chiara Caccamo

Research Development Unit, Pisa University

The PRIMA Programme: Framework, Objectives and UNIPI's Contributions

9:40-10:05

Maria Beatrice Coltelli

DICI, Pisa University

PRIMA calls and the PLAMINPACK project

10:05-10:30

Antonella Castagna

DAFE, Pisa University

Peculiarities of the Mediterranean area: issues and opportunities

10:30-11:00

Ilaria Canesi, Noemi Cei

NTT (Next Technology Tecnotessile)

Sustainable practises in research projects

Final Session: PRIMA projects in Pisa University as case studies

11:00-11:10

Sergio Saia

DSV, Pisa University

ProSmallAgriMed and PRIMA SHARInG-MeD projects

11:10-11:20

Tommaso Giordani

DAFE, Pisa University

The Fig Tree as a Strategic Crop for the Mediterranean: Insights from the AGROFIG Project

11:20-11:30

Priscilla Farina

DAFE, Pisa University

UniPi's engagement in sustainable and safe fresh-food packaging: the FoWRSaP Project

11:30

Conclusions and Social Toast

The PLAMINPACK project is part of the PRIMA Programme supported by The European Union



PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA



Co-funded by
the European Union



Centro Interdipartimentale di Scienza
ed Ingegneria dei Materiali





Opening Session: Supporting Research Ideas Through Project Writing



UNIVERSITÀ
DI PISA

THE PRIMA PROGRAMME: FRAMEWORK, OBJECTIVES AND UNIPI'S CONTRIBUTIONS

Chiara Caccamo

Research Development Unit
Research and Knowledge Valorisation Division
University of Pisa

Pisa, 17.12.2025



PRIMA AT A GLANCE



WHAT IS PRIMA?

The PRIMA programme is a public-public institutionalized **Art.185 EU Partnership** between the EU and Participating States.



VISION

Inclusive, healthy and prosperous Mediterranean societies through innovative solutions in agro-food and water systems, contributing, by the end of the programme, to **sustainable use of natural resources, economic growth** and **stability**.



MISSION

To achieve, support and promote integration, alignment and joint implementation of national R&I programmes under a common research and innovation strategy to address the diverse challenges in **water scarcity, agriculture, food security**.

to
go



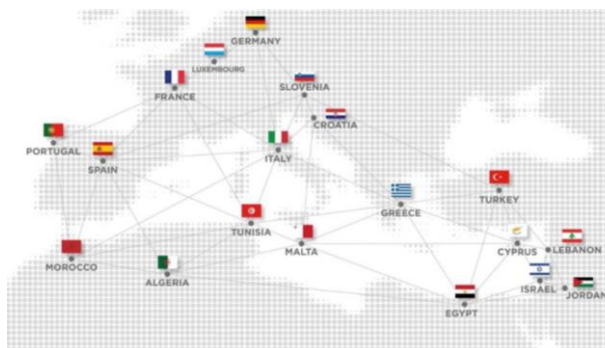
20 PARTICIPATING STATES

12 EU Member States:

Bulgaria, Croatia, Cyprus, France, Germany, Greece, Italy, Luxembourg, Malta, Portugal, Slovenia, Spain

8 Mediterranean Partner Countries:

Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia, Turkey



BUDGET

EUR 700 million

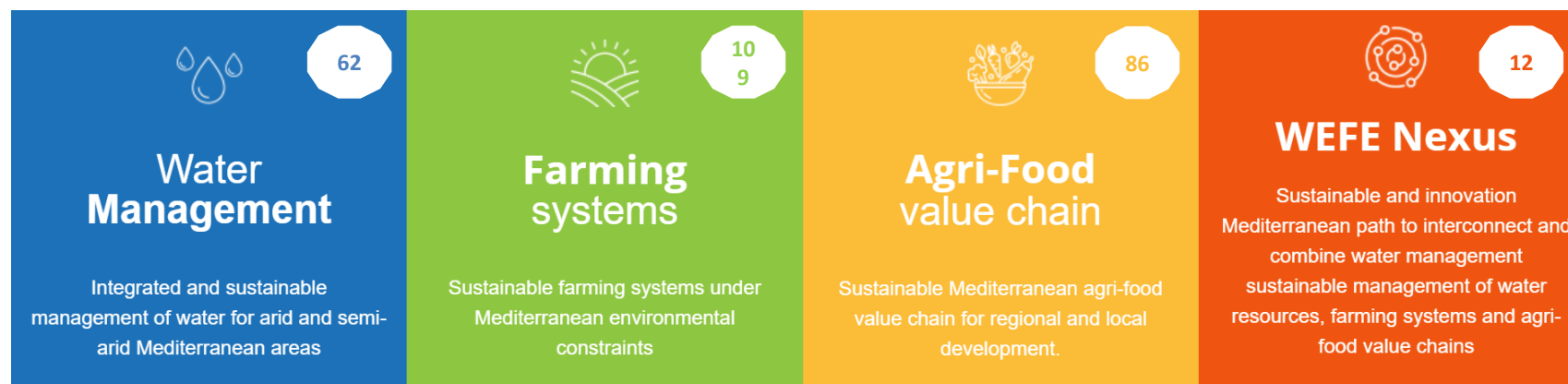


DURATION

2018-2028



THEMATIC AREAS & PRIORITIES



1. **WATER RESOURCES AVAILABILITY AND QUALITY WITHIN CATCHMENTS AND AQUIFERS**
2. **SUSTAINABLE INTEGRATED WATER MANAGEMENT**
3. **IRRIGATION TECHNOLOGIES AND PRACTICES**
4. **USE OF ALTERNATIVE RESOURCES**

1. **ADAPTATION OF AGRICULTURE TO CLIMATE CHANGE**
2. **DEVELOPING SUSTAINABLE AND PRODUCTIVE AGRO-ECOSYSTEMS**
3. **PREVENTING EMERGENCE OF ANIMAL AND PLANT DISEASES**
4. **DEVELOPING FARMING SYSTEMS ABLE TO GENERATE INCOME, TO CREATE EMPLOYMENT AND TO CONTRIBUTE TO A BALANCED TERRITORIAL DEVELOPMENT**

1. **VALORISING FOOD PRODUCTS FROM TRADITIONAL MEDITERRANEAN DIET**
2. **FOOD SAFETY IN LOCAL FOOD CHAIN**
3. **IMPLEMENTATION OF INNOVATION IN THE AGRO-FOOD CHAIN, PROMOTING HIGHER QUALITY, SUSTAINABILITY AND COMPETITIVENESS, WITH PARTICULAR REFERENCE TO SMALLHOLDERS**
4. **IMPLICATIONS OF DIETARY SHIFTS AND SUSTAINABLE DIETS FOR THE MED POPULATIONS AND FOOD INDUSTRY**

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go

FUNDING SCHEME

SECTION 1

Activities managed by PRIMA with EU funds

International procedure International funding

Actions funded by PRIMA-IS (EU contribution) following Transnational Calls organised by PRIMA-IS. Actions are evaluated, selected and funded in line with the Rules for Participation of Horizon 2020 and are centrally managed by the PRIMA IS. Grant agreements are to be signed with PRIMA-IS.

Supported activities:

- ✓ Research and Innovation action (RIA)
- ✓ Innovation Actions (IA)
- ✓ Coordination and Support Actions (CSA)

#

SECTION 2

Activities managed by PRIMA and funded by PRIMA PS

International + National procedures National funding

Activities are evaluated and selected following open calls for proposals centrally organised by the PRIMA-IS. Grant agreements will be signed between participants and by relevant national funding bodies following national rules.

Supported activities:

- ✓ Research and Innovation Activities (RIA)



Ministero dell'Università e Ricerca (MUR)



Funding Structure

Section 1

Submission



Only PRIMA

Rules for Participation



+ Derogations

Funding



PRIMA (H2020)

Eligibility Check



PRIMA IS

Scientific Evaluation



PRIMA IS

Monitoring



PRIMA IS

Grant Agreement



PRIMA IS

Type of Action



Section 2

Submission



PRIMA + NFA

Rules for Participation



National Funding Agency

Funding



National Funding Agency

Eligibility Check



NFA + PRIMA IS

Scientific Evaluation



PRIMA IS

Monitoring



PRIMA IS + NFA

Grant Agreement



National Funding Agency

Type of Action



2022

<https://prima-med.org/>

ELIGIBILITY CONDITIONS

Minimum consortium requirements:

At least 4 independent legal entities, established in at least **3** different **PRIMA Participating States (PS)**, of which:

- ✓ **At least 1** must be established in one of the following **EU/HEU associated countries**:

Bulgaria, Croatia, Cyprus, France, Germany, Greece, Italy, Luxembourg, Malta, Portugal, Slovenia, Spain

- ✓ **At least 2** must be established in one of the following **Mediterranean Partner Countries (MPC)**:

Algeria, Egypt, Jordan, Israel, Lebanon, Morocco, Tunisia, Turkey

Innovation actions (IAs) under Section 1:

Consortia must include **at least 1 SME** established in a PS

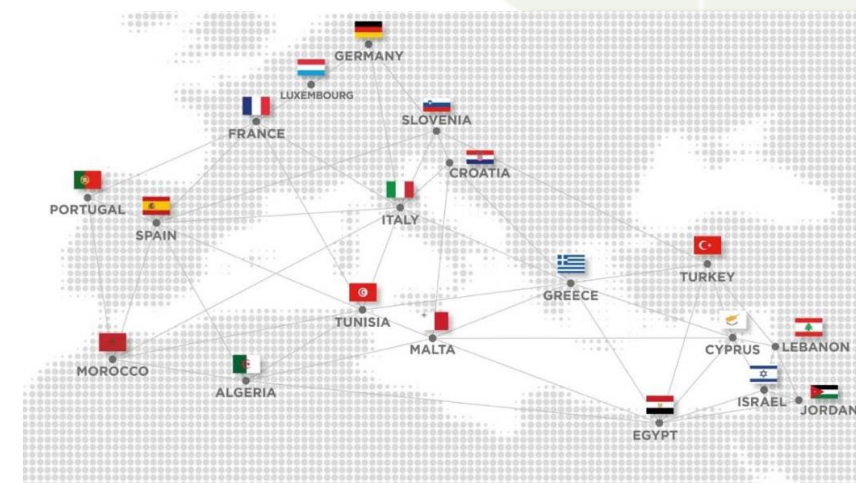
EXAMPLES (RIA)

Eligible Consortium:

- ✓ Italy – University (EU country)
- ✓ Morocco – SME (MPC)
- ✓ Tunisia – Research centre (MPC)
- ✓ France - Research centre (EU country)

Not eligible Consortium:

- ✓ Italy – University (EU country)
- ✓ Greece - Research centre (EU country)
- ✓ Spain – SME (EU country)
- ✓ Turkey – University (MPC)



UNIFI FUNDED PROJECTS



S2-2025 – COORD. [Grant Agreement Preparation]
SAGA - SALICORNIA GENOTYPING FOR SUSTAINABLE SOIL AND FARMING: FROM GENES TO AGROECOLOGY



TOTAL PROJECTS: 9

THEMATIC AREAS:

- ✓ FARMING SYSTEMS: 6
- ✓ AGRO-FOOD VALUE CHAIN: 3

SECTIONS:

- ✓ S1: 2
- ✓ S2: 7

UNIFI ROLE:

- ✓ COORDINATOR: 6
- ✓ BENEFICIARY: 3

UNIFI DEPARTMENTS:

- ✓ DISAAA 7
- ✓ DICI 1
- ✓ DVET 1

TOTAL FUNDING: €2.6M

SIMTAP
S2-2018

SELF-SUFFICIENT INTEGRATED MULTI-TROPHIC AQUAPONIC SYSTEMS FOR IMPROVING FOOD PRODUCTION SUSTAINABILITY AND BRACKISH WATER USE AND RECYCLING



Coord. Alberto Pardossi DISAAA

iGUESS-MED
S1-2019

INNOVATIVE GREENHOUSE SUPPORT SYSTEM IN THE MEDITERRANEAN REGION: EFFICIENT FERTIGATION AND PEST MANAGEMENT THROUGH IoT BASED CLIMATE CONTROL



Ben. Luca Incrocci DISAAA

HaloFarMs
S2-2019

DEVELOPMENT AND OPTIMIZATION OF HALOPHYTE-BASED FARMING SYSTEMS IN SALT-AFFECTED MEDITERRANEAN SOILS



Ben. Annamaria Ranieri DISAAA

FIGGEN
S2-2019

VALORISING THE DIVERSITY OF THE FIG TREE, AN ANCIENT FRUIT CROP FOR SUSTAINABLE MEDITERRANEAN AGRICULTURE



Coord. Tommaso Giordani DISAAA

FEDKITO
S2-2019

FRESH FOOD SUSTAINABLE PACKAGING IN THE CIRCULAR ECONOMY



Coord. Barbara Conti DISAAA

SHARInG-MeD
S1-2022

SOIL HEALTH AND AGRICULTURE RESILIENCE THROUGH AN INTEGRATED GEOGRAPHICAL INFORMATION SYSTEMS OF MEDITERRANEAN DRYLANDS



Coord. Sergio Saia DVET

PLAMINPACK
S2-2023

PLANT-BASED ANTIMICROBIAL AND CIRCULAR PACKAGING FOR PLANT PRODUCTS



Coord. Maria Beatrice Coltelli DICI

FoWRSaP
S2-2023

AGRO FOOD WASTE RECOVERY: NEW PROCESSING TECHNOLOGIES FOR FOOD SAFETY AND PACKAGING



Ben. Barbara Conti DISAAA

AGROFIG
S2-2024

FOSTERING AGROFORESTRY BENEFITS THROUGH FIG TREE CULTIVATION IN THE MEDITERRANEAN

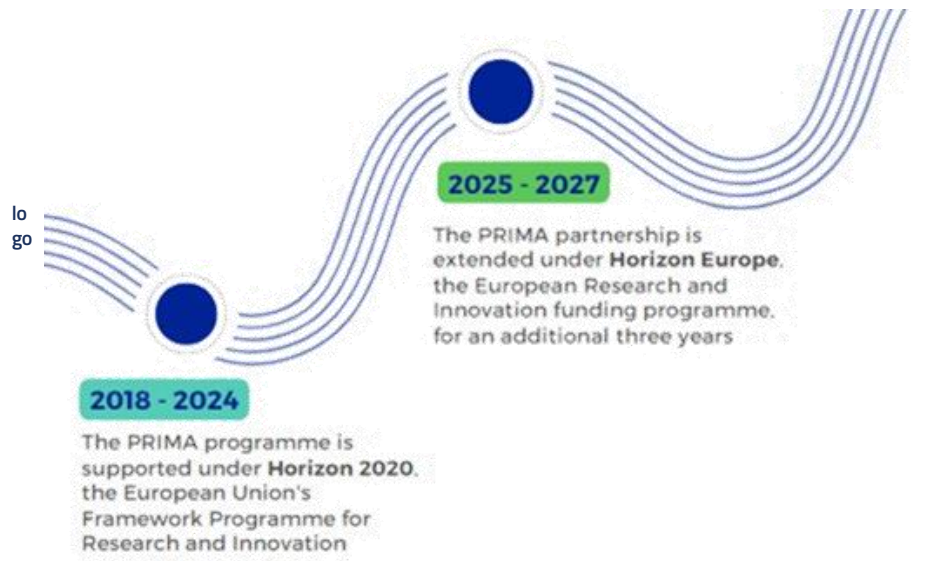


Coord. Tommaso Giordani DISAAA

NEXT CALL & FUTURE4PRIMA

CALL 2026

- ✓ Opening: **April 2026** (tbc)
- ✓ Deadline: **July 2026** (tbc)



PRIMA'S NEW HORIZON: FUTURE4PRIMA

FUTURE4PRIMA is a newly granted Coordination and Support Action (Horizon Europe), led by the PRIMA Programme. The project started in January 2024 and brings together 21 partners.

Objectives:

- ✓ To prepare for a possible extension of the PRIMA Programme beyond 2028.
- ✓ To explore opportunities for broadening PRIMA's thematic scope.
- ✓ To assess the potential expansion of the partnership to additional candidate countries or stakeholders.
- ✓ To support a prospective impact assessment by the European Commission.
- ✓ To foster policy uptake and accelerate the market adoption of innovations through a pilot proof-of-concept initiative.

RESEARCH DEVELOPMENT UNIT

WHAT WE DO

Coordinator

Marina Mazzoni

Project designers

Marco Bargagna

Chiara Caccamo

Martina Calamusa

Francesca Ceron

Francesca Zampagni



✓ Search and dissemination of **funding opportunities**

✓ **"One-to-one" support** for the drafting of European proposals (only if UNIPi is coordinator and according to annual cut-offs)

✓ **Administrative support** for the submission of national, European, and international proposals

✓ Organization of **information and training events**

✓ Organization and management of the **UNIPi's incentives for project development** (ERC@UNIPi, MSCA SoE@UNIPi, etc.)



PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA



The service is intended for
UNIPi's researchers and
professors only

OUR CONTACTS

Research Development Unit

Research and Knowledge Valorisation Division
University of Pisa



progettazione.ricerca@unipi.it



[Carta dei servizi](#)



THANK YOU!

ANY QUESTIONS?

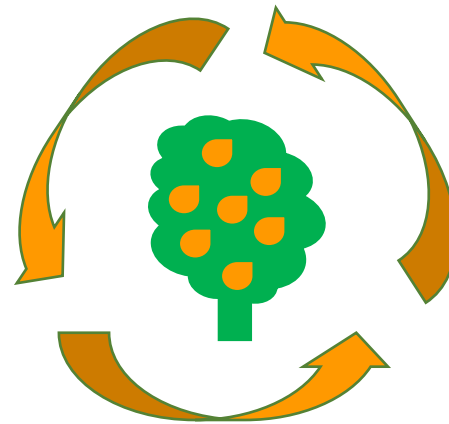


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PLAnt-based antiMicrobial aNd circular PACKaging for plant products

PRIMA calls and the PLAMINPACK project

Maria-Beatrice Coltelli

Department of Civil and Industrial Engineering, University of Pisa



PLAMINPACK



Multifunctional, Bio-EcoCOmpatible Materials (MBEM) lab

<https://it.linkedin.com/in/mbem-lab-unipi-b397a8261>



Prof. Andrea Lazzeri

Maria-Beatrice Coltelli

Laura Aliotta

Vito Gigante

Bianca Dal Pont

Francesca Cartoni

David Conti

Roberto D'Ambrosio (IPCF-CNR)

Viola Berrugi

....



Planet Bioplastics srl
Bio-based Industries Consortium





Renewability, compostability and recyclability of packaging are becoming more and more important because of the necessity of decreasing its burden on environment.

Renewability



Reduced greenhouse gases emissions

Compostability



Circularity and soil quality

Recyclability



Carbon storage as long as possible in products before their composting



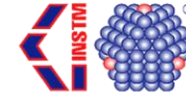
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Horizon 2020
European Union Funding
for Research & Innovation



Bio-based Industries
Consortium



biontop Project

Innovative materials based on PLA for sustainable packaging

Panariello L.^{1,2}, D'ambrosio R.^{1,2}, Cinelli P.^{1,2}, Coltelli M.B.^{1,2}, Lazzeri A.^{1,2}, Martinez B.M.³

¹Department of Civil and Industrial Engineering, University of Pisa, Pisa, Italy

²National Interuniversity Consortium of Materials Science and Technology (INSTM), Florence, Italy

³AIMPLAS Plastic Technology Centre, Valencia, Spain

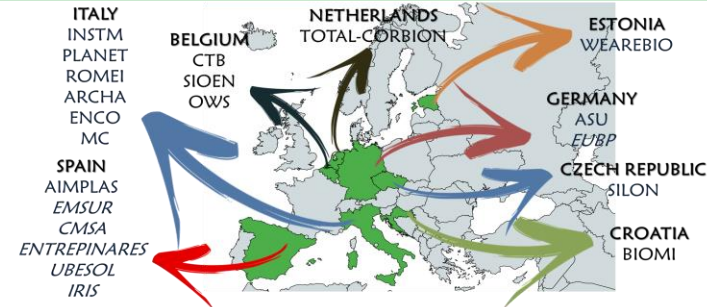
<https://biontop.eu/>



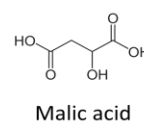
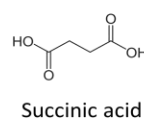
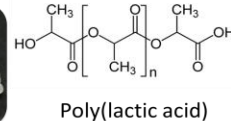
Introduction

Using sustainable sourced comonomers, additives and fillers to formulate novel PLA copolymers and compounds, BIONTOP project will deliver recyclable-by-design cost competitive packaging solutions that can be mechanically recycled or industrially/ domestically composted and are even suitable for anaerobic digestion.

Consortium



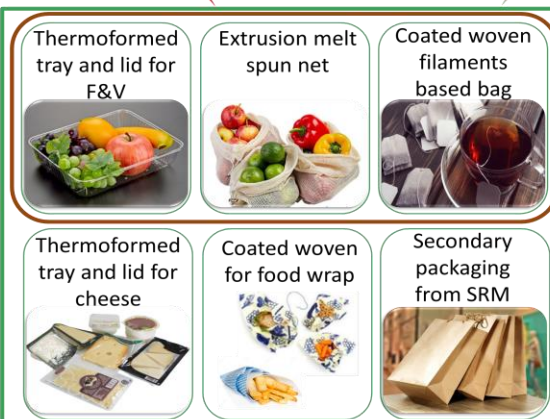
Ended in
May 2023



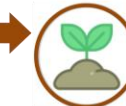
FILM AND FIBRE
EXTRUSION AND
OPTIONAL COATING



Natural additives and fibers



Home
Composting



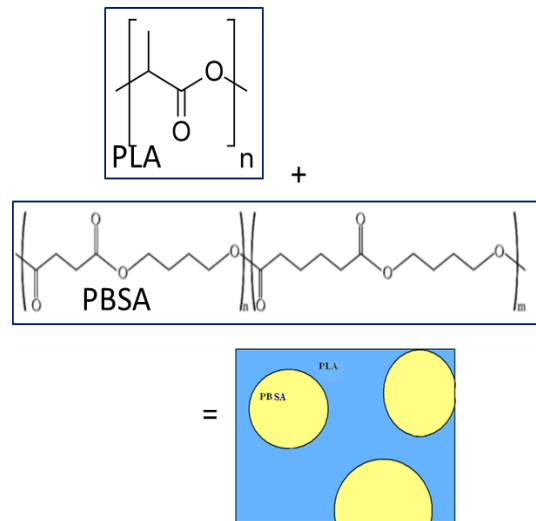
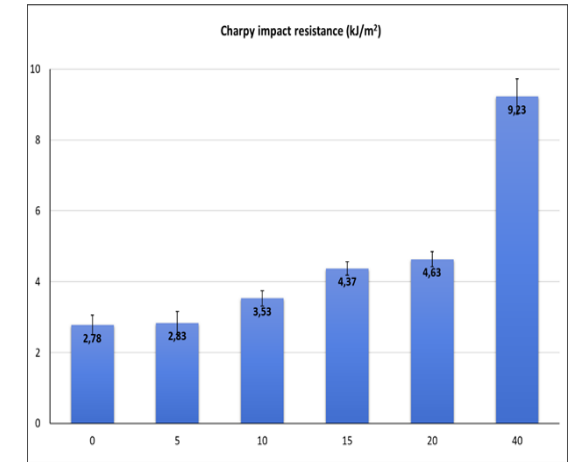
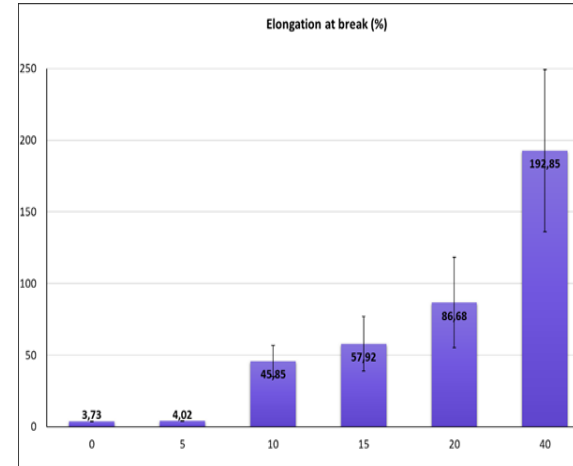
Material
Recycling





Films based on biopolyesters

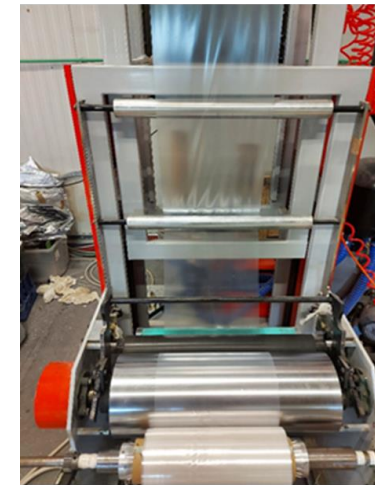
Knowledge of blends and mechanical properties of compounds



PLA (%wt)	PBSA (%wt)	MVR (cm³/10min)
pellets	-	2,2 ± 0,2
100	-	1,8 ± 0,3
95	5	2,1 ± 0,2
90	10	2,2 ± 0,3
85	15	2,1 ± 0,3
80	20	2,2 ± 0,3
60	40	2,6 ± 0,4

Home compostable films made by flat die extrusion and blown film extrusion

Films and sheets



Flat die extrusions

blown film extrusion



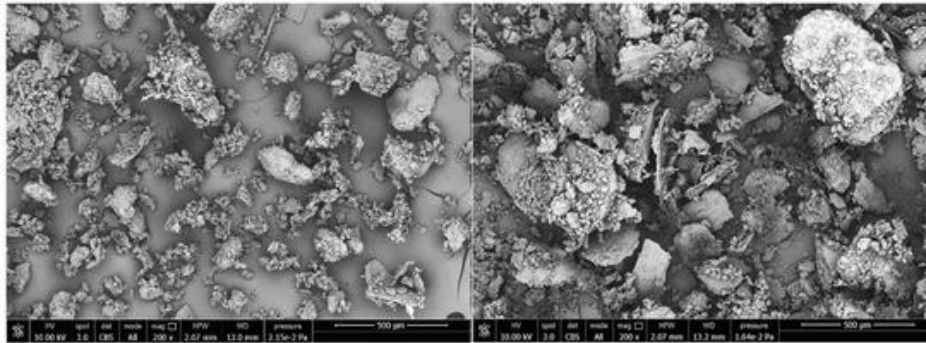
RESEARCH ARTICLE

Recyclability Studies on Poly(lactic acid)/Poly(butylene succinate-co-adipate) (PLA/PBSA) Biobased and Biodegradable Films

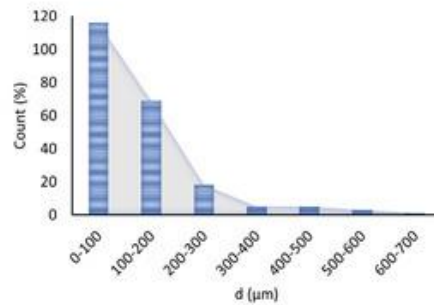
Maria-Beatrice Coltelli, Laura Aliotta, Gianluca Fasano, Filip Miketa, Filip Brkić, Rafael Alonso, Marco Romei, Patrizia Cinelli, Ilaria Canesi, Vito Gigante, and Andrea Lazzeri*

PLA/PBSA INDUSTRIAL FILMS RESULTED RECYCLABLE IN THE SAME PROCESS DESPITE SOME COLOR VARIATIONS

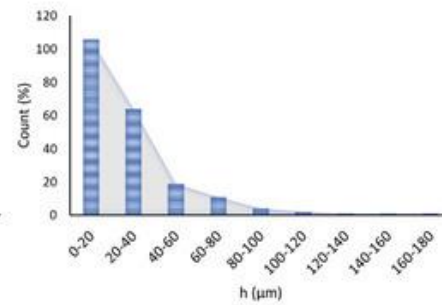




(a)



(b)



(c)



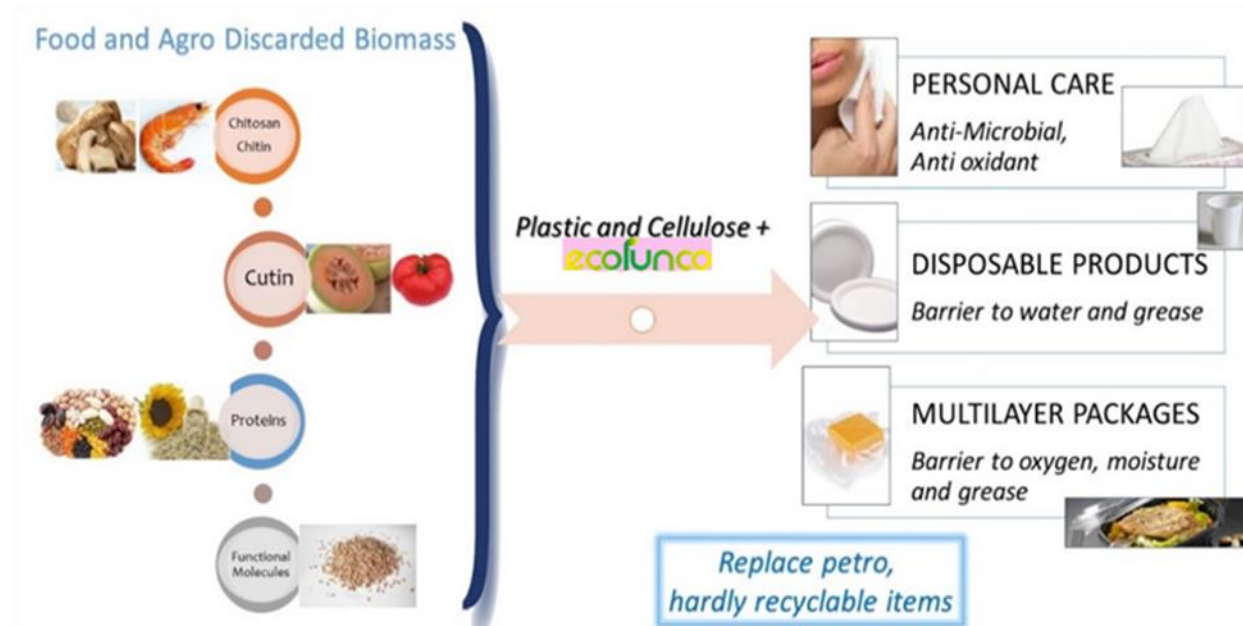
Composites with bran

- Bran addition caused a decrement in the mechanical properties in parallel with the EWF reduction due to the high irregularity of filler geometry and presence of agglomerates, especially where the content of filler is high.
- If used without any pre-treatment, bran particles act as a stress intensification factors, reducing the cross section of the material and leading to a decrease in the tensile properties and fracture resistance.

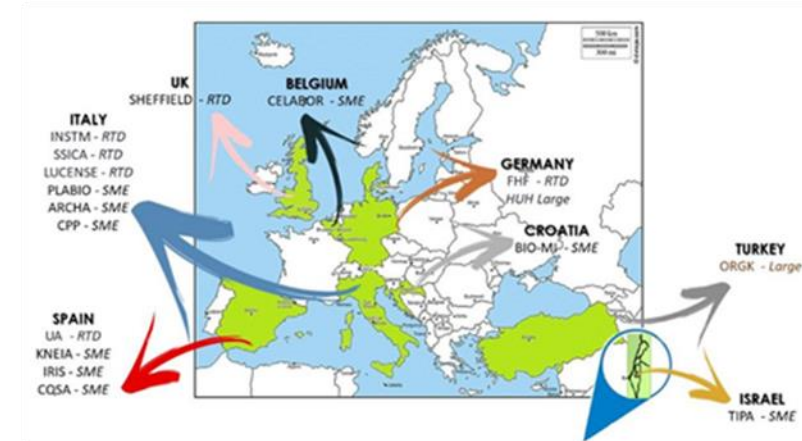


ECOFUNCO project: *Eco sustainable multifunctional biobased coatings with enhanced performance and end of life options*

- Highly performing, economically and environmentally sustainable bio-based coating for plastic and cellulosic substrates
- **17 Partners**, 39 months, started 1st May 2019
- **8 Countries** (Italy, Spain, UK, Belgium, Germany, Croatia, Turkey, Israel)
- **Partners** 6 RTO, 9 SME, 2 Large Enterprises
- **5.5 Million euro** (4.6 Million Euro BBIJU contribution)



- Patent about hot-melt coating

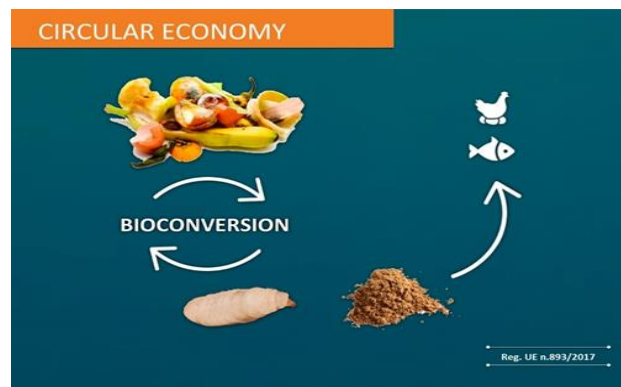


Ended in July 2022



PLAMINPACK

Chitosan from insects rearing: a promising anti-microbial material



The specific conditions processing, production, storage, transport and use of insect flour for use in aquaculture (fish farming) has been regulated by the European Regulation 2017/893 that allows the use of proteins derived only from seven insect species, including the dipteran *Hermetia illucens*, for fish feed



Prof. Patrizia Falabella, UNIBAS

R. Salvia, P. Falabella BIOCONVERTER INSECTS: A GOOD EXAMPLE OF CIRCULAR ECONOMY, THE STUDY CASE OF HERMETIA ILLUCENS

In: An Introduction to circular economy, Ed. P. Morganti, M-B. Coltelli, NOVA, 2021



PRIMA project coordinated by UNIPI
Prof.ssa Barbara Conti and
Prof. Antonella Castagna

FrEsh food sustainable pacKaging In The circular ecOnomy

Use of chitosan as liquid, spray or smart active packaging aromatized with essential oils (EOs), together with biosensor technologies to protect fresh food from insect and fungi attack.



What program and what call?

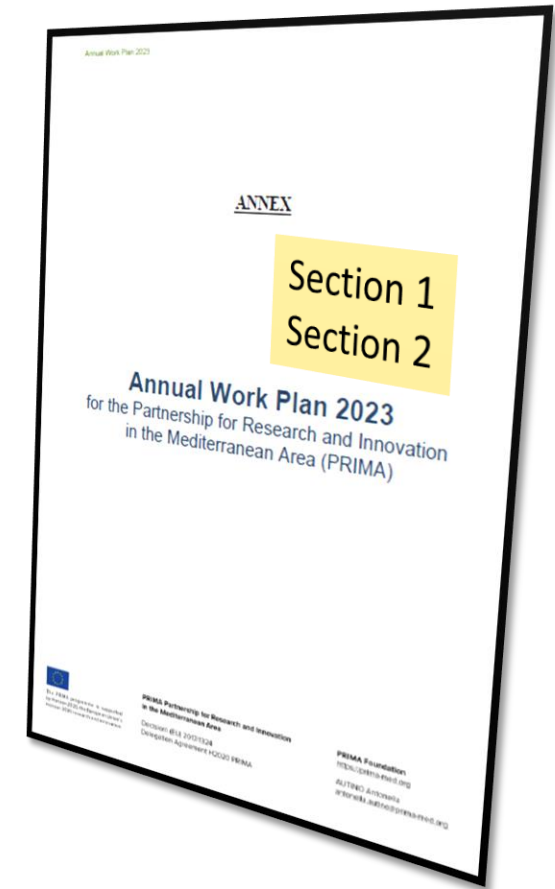
PRIMA program 2023: Thematic Area 3 - Agro-food value chain

Topic 2.3.1 (RIA) 4 – Assessing novel antimicrobial food packaging and coating materials to reduce food waste to improve safety in the Mediterranean food supply chain.



Challenge

About 30% of the food globally produced for human consumption is estimated yearly, lost or wasted along the supply chains annually (FAO, 2021), with severe economic, social and environmental impacts.





Packaging is essential to **prevent food deterioration** and preserve or prolong food quality and shelf-life while assuring safety. Biodegradable packaging materials are gaining significant importance in the face of ever-growing environmental concerns about plastic pollution. They are a **sustainable, environmentally friendly, and cost-effective alternative to conventional plastic packaging materials.**

Objective

Novel, cost-competitive and versatile **biodegradable food packaging with coatings** that have adequate functionalities to control the packaging atmosphere and prevent food spoilage while causing no environmental damage.





Expected



Impacts:

Introduce new **environmentally-friendly techniques** to reduce food waste.



Reduce the need for **chemical treatments** by using agricultural by-products while preserving food's nutritive and organoleptic properties.

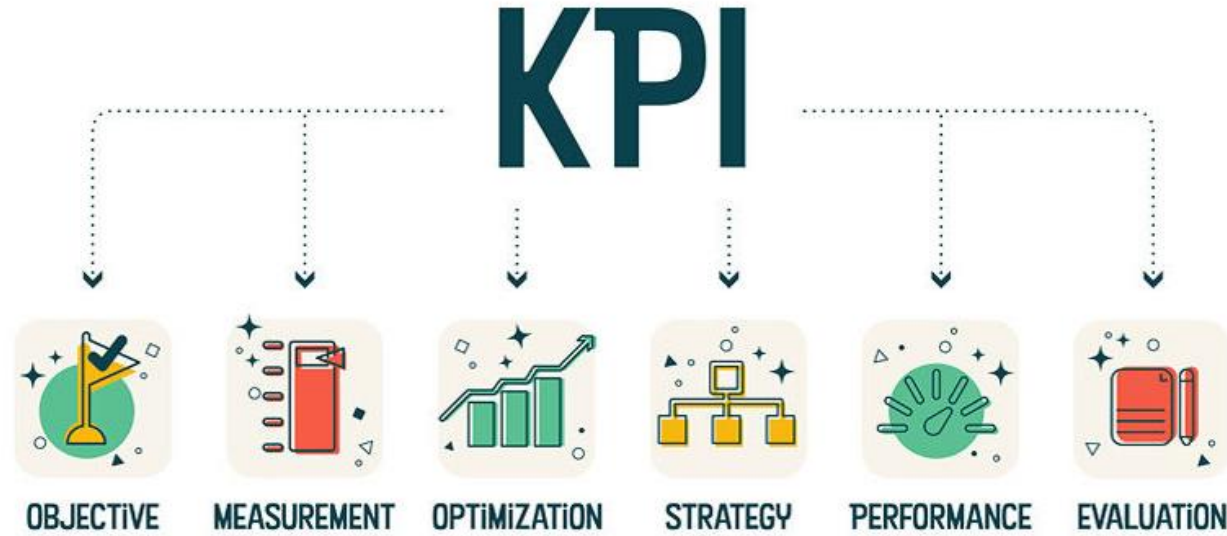


Demonstrate **the efficacy of bio-based materials for packaging** to improve food safety and reduce food waste that meets market requirements.



Job creation and job retention activities with equal gender opportunities.





KPIs are used to measure the outcomes of the project.

For this, you may refer to the [Strategic Research and Innovation Agenda](#). For example:

- Number of **newly designed food products with enhanced shelf-life**, quality and health-related beneficial properties
- Number of **developed Innovative bio-based materials for packaging** to improve food safety and reduce food waste meeting market requirements
- Number of **jobs created/retained** with equal gender opportunities



Contributions to EU Policies, Mission, and Partnerships

The proposal should indicate linkages to relevant EU policies and objectives in the context of the European Green Deal and relevant [EU Missions and Partnerships](#)



Contributions to Sustainable Development Goals

The proposals should indicate their contribution to relevant SDGs and methodology to contribute to reporting SDG indicators.



Supporting Information for the Section 2 Call for Proposals

Type of action	Research & Innovation Activities (RIA* ⁶)
The total indicative amount allocated to this call	EUR 36 132 500
Funding level	Depending on National Regulations
Budget and duration of grants	PRIMA considers that proposals requesting a contribution of at least EUR 1.5 million and with a duration of 36 months would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submitting and selecting proposals requesting other amounts or duration, following national regulations.
TRL	Proposals should clearly state the starting and end TRLs of the key technology or technologies targeted in the project.
Standard eligibility conditions for participation	Please refer to section 5.1.1 of the PRIMA Annual Work Plan 2023 (AWP2023) for the list of countries eligible for funding.
Specific additional requirements for the 2023 Calls	<i>Due to the specific challenge of these topics, and in line with our principles of allowing maximum participation from Southern Mediterranean Countries to foster both North-South and South-South cooperation, the following additional eligibility criteria apply:</i> <i>"In addition to the minimum number of participants (3 legal entities) set out in the standard eligibility conditions (mentioned above), consortia must include at least one additional independent legal entity established in any of the MPC.</i> <i>So the eligibility rules can be read as follows:</i> <i>At least four legal entities established in three different countries considered as PRIMA Participating States, out of which:</i> <i>-at least one must be established in an EU Member State or a third country associated with Horizon 2020 and not being an MPC</i> <i>-at least two must be established in third country/countries bordering the Mediterranean Sea (MPC): Algeria, Jordan, Israel, Tunisia, Morocco, Lebanon, Egypt, Turkey."</i> <i>Examples:</i> Germany-Greece-Morocco-Turkey is eligible Germany-Greece-Morocco entity 1-Morocco entity 2 is eligible Germany entity 1-Germany entity 2-Greece-Morocco IS NOT ELIGIBLE, lack of the 4th partner from a MPC France-Algeria-Egypt is NOT ELIGIBLE, lack a 4th partner that can be from a MPC OR from a EU PRIMA PS

Submission and evaluation procedure	The call will be organised according to a two-stage submission process. For the first step, a first-stage proposal (maximum ten pages) must be submitted within the first-stage submission deadline. Successful applicants in the first step will be invited to the second step to submit a full proposal (maximum 50 pages). A timeline for submitting and evaluating applications can be found in Table 9 of the AWP2023.
Grant agreement	Each national funding body will fund the beneficiaries established in its own country; thus, the national funding rules apply. Each national funding body will sign a grant agreement (or any official documents acting as a contract) with their national beneficiaries taking part in the selected project (section 5.2.11 of the AWP2023). The coordinator of the project has to decide with his/her partners of a common starting date and send this information to all the funding bodies involved in funding this project in order to ensure that the national <u>grant agreements</u> are <u>synchronized</u> in time to cover all the period of the project.
Consortium agreement	A consortium agreement mentioning the distribution of the tasks among partners (as listed in the proposal) must be concluded. Some national funding bodies may require this document before signing the grant agreements, so it is necessary to refer to the national regulations and draft the <u>consortium agreement</u> accordingly (section 5.2.11 of AWP2023)



Structure of a project:

- Excellence
 - Objectives, concept, methodology
 - Ambition and innovation potential
- Impact
 - Expected results and outcomes
 - Communication, dissemination & exploitation
 - Contribution to EU policies
- Implementation
 - Work plan (WPs, tasks, deliverables)
 - Consortium structure & roles
 - Budget and risk management





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....Imagining a sustainable packaging for products of a biocircular farm....



PLAnt-based antiMicrobial aNd circular PACKaging for plant products

PLAMINPACK

Long shelf life
packaging integrating
the agro-food waste of
the respective plants



Mediterranean
perishable foods

Extractions:
Anti-oxidant

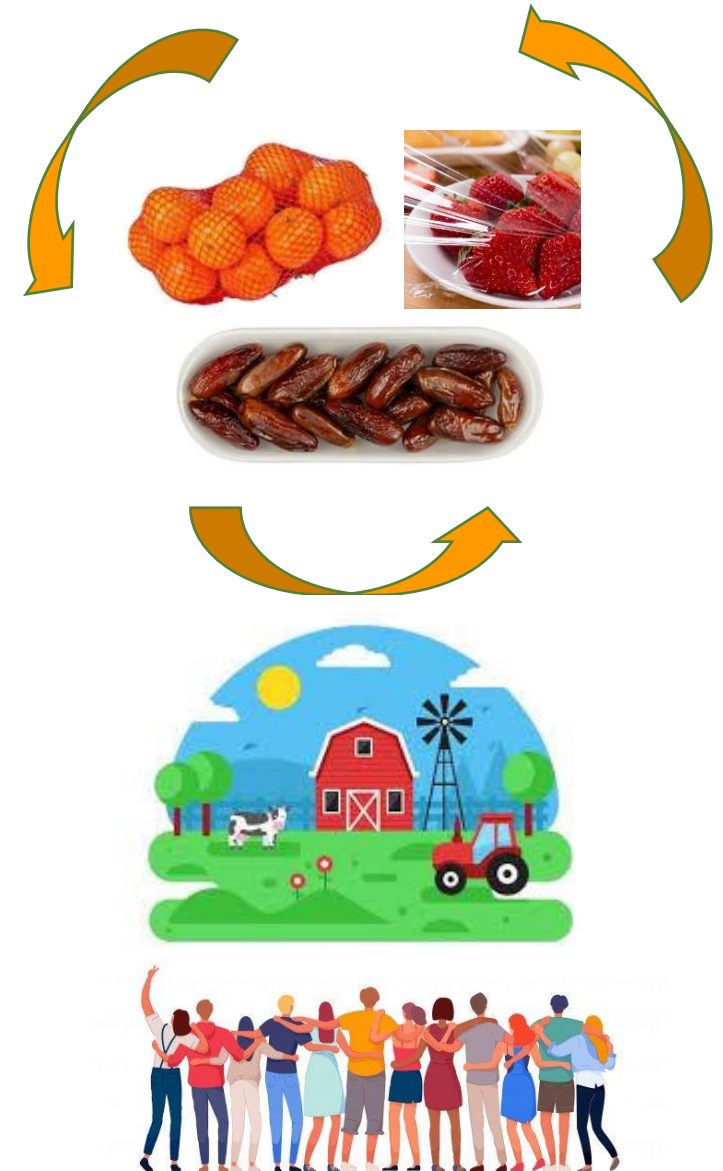
Bioconversion:
Anti-microbial



AMIN in Arabic means safe: the best protection for its fruits lies in the plant



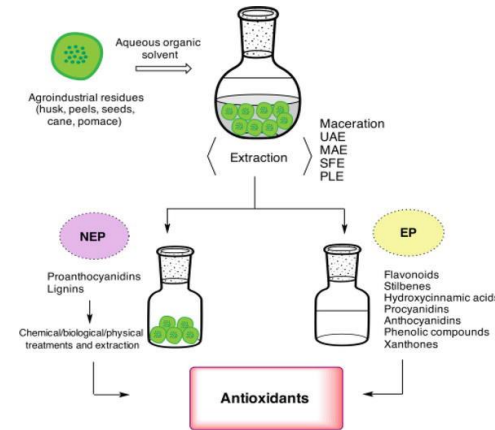
- **Develop easy to up-scale biobased packaging materials** and methodologies (to produce nets, films, trays, coatings) based on home-compostable and **anti-microbial plant sources** for reducing the loss of food, especially the most perishable one, thus **replacing the fossil packaging** versions currently present in supermarkets and shops.
- This **new packaging concept** will be fully inserted in the circular management of a farm, including specific digital tools, so that all the biomass waste is reused and contribute to generate again food, packaging, feed or amendments.
- New packaging materials will be tested for their stability under environmental conditions exposure as well as **potential recyclability** and **environmental impacts** after waste materials disposal.
- Thus, this new packaging will contribute to the **growth of local businesses** and **job creation** so that all actors along the value chains can gain from biomass valorisation, **protecting biodiversity** and the environment while **securing food products** and food systems.





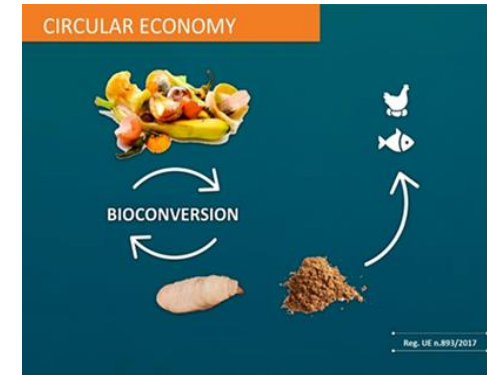
Extract plants waste

SO1: Extract with green and easily up-scalable methodologies **molecules** from Plant Waste Residuals (PWR) related to **tangerine, dates and strawberries** to obtain valuable AntiOxidants/Anti-Microbials (AOM) and a Solid Residue (SR). **KPIs:** anti-microbial AOM with an antioxidant activity comparable with fossil extracts



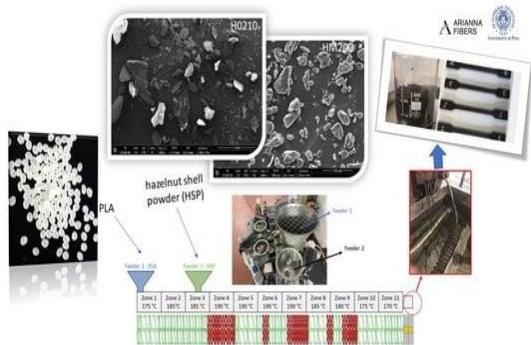
Bioconvert plants waste

SO2: Bioconvert PWR of tangerine, strawberries and dates, including fruit by-products, recovered after the harvesting to obtain *Hermetia illucens* proteins, chitosan and coatings for packaging. *UNIBAS, ASU*. **KPIs:** rearing of suitable species with PWR; production of chitosan to be used in packaging; production of proteins to be used in packaging coating.



Compostable formulation extrusion

SO3: Biopolymer melt extrusion, to insert the AOM, HIC, proteins and powder from SR with biobased biopolyesters to develop granules for obtaining **anti-microbial nets, films and trays prototypes**. *UNIFI, NTT, ASU*. **KPIs:** anti-microbial properties of about 30 samples tested in laboratory; 10 kg of granules for net, tray and film; 30 prototypes of nets, trays and films





Validate the effectiveness

SO4: Validate anti-microbial properties, oxygen barrier properties and shelf-life enhancement reached with new packaging. *UCA, ASU*. **KPIs:** anti-microbial properties of the packaging; enhanced shelf life (> 40%) for tangerine (in net) and strawberry and date (in trays plus film) and with respect to fossil-based benchmark; good correlation between extracts composition, materials composition and effectiveness on shelf-life extension.



Potentiate with coupled techniques

SO5: Integrate plasma technology and HIC coatings treatments into the packaging chain. *ASU, UNIPi, UCA*. **KPIs:** enhancement of shelf life of at least 30% thanks to the plasma and/or coating application.

Potentiate with ICT tools

SO6: Combination of ICT technologies for avoiding food loss, optimizing extraction effects and modelling the ripening process of fruits. *SFAX, UHOH* **KPIs:** a database to connect extracts amount and quality with plants waste produced; **machine learning procedures with digital twinning for analysing the relevant data of the ripening process:** (i) AI-enhanced digital twin of the packaging and the ripening process; (ii) simulation of the ripening process using the digital twin; (iii) the ripening process of the product as well as the interactions with the packaging on this process modelled using AI-enhanced digital twins, to enables the simulation of the ripening process using the digital twin.





Assess environmental aspects: degradation/weathering

SO7: Validate the degradation/weathering of packaging in environmental conditions as well as **potential environmental impacts**. **UOI.** **KPIs:** degradation/ageing/durability of prepared-polymers (thermal degradation, oxidation, photo-oxidation, and environmental weathering); characterization of degradation products (formation of microplastics); environment impacts and toxicity of degraded polymers and degradation products.



Assess environmental aspects: Life Cycle, circularity and end of life

SO8: Study of **Life Cycle Assessment** of the PLAMINPACK chain and its end of life considering circularity aspects (**reutilization, recyclability and compostability**). **ASU.** **KPIs:** 1 LCA study; recyclability studies by reprocessing; home-compostability tests.



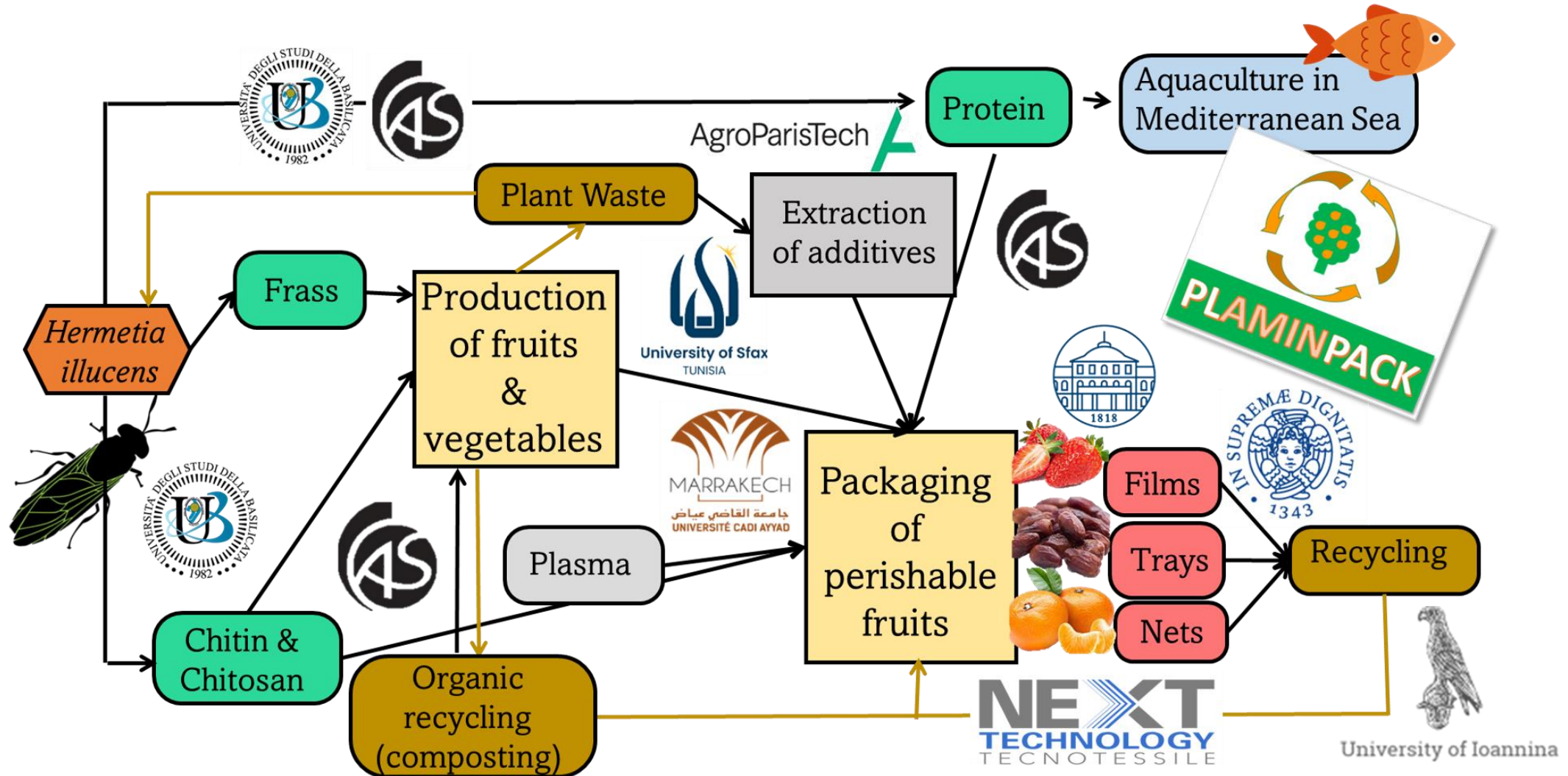
Biocircular economy in the Mediterranean area

SO9: Promote **circular bioeconomy-based skills** and professionalities linked to biobased materials in the Mediterranean area. **UOI.** **KPIs:** Dissemination program linked to promotion of skills and stakeholder's involvement.





Circularity of PLAMINPACK





PLAMINPACK

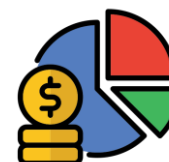
Starting date: July 1st 2024

Ending Date: June 30th 2027



The Consortium

Participant No	PI name	Organisation	Country
1 Coordinator	Maria-Beatrice Coltelli	Università di Pisa (UNIPi)	Italy
2 Partner	Amine Guendouz	Université Cadi Ayyad (UCA)	Morocco
3 Partner	Daniele Spinelli	Next Technology Tecnotessile (NTT)	Italy
4 Partner	Patrizia Falabella	Università degli Studi della Basilicata (UNIBAS)	Italy
5 Partner	Florent Allais	AgroParisTech (APT)	France
6 Partner	Hajer Ben Hlima	Sfax University (SFAX)	Tunisia
7 Partner	Ioannis Konstantinou	University of Ioannina (UOI)	Greece
8 Partner	Markus Schmid	Albstadt-Sigmaringen University (ASU)	Germany
9 Partner	Christian Krupitzer	Universität Hohenheim (UHOH)	Germany

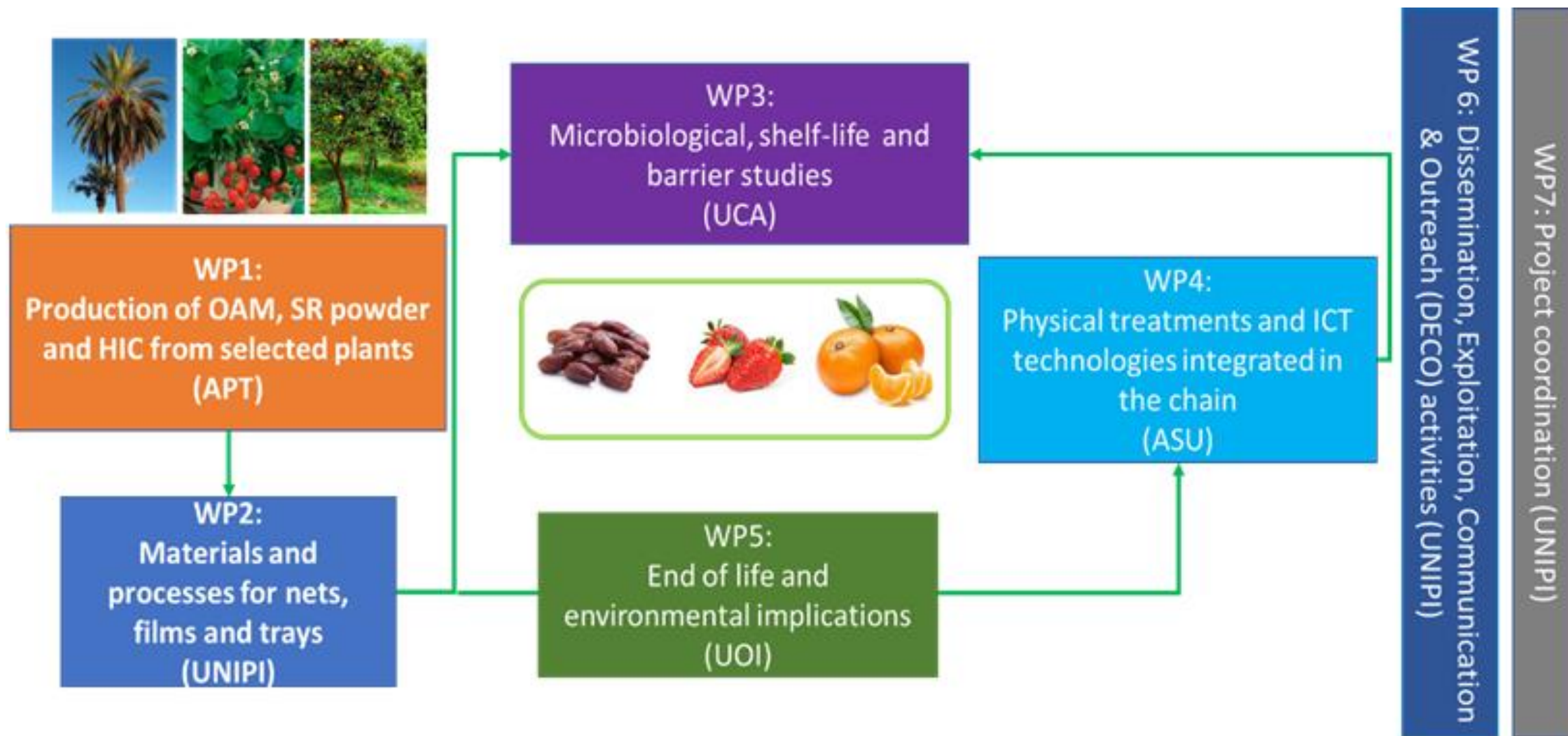


Budget (funded by national funding bodies of Participant States):

- contribution requested to PRIMA is 1919816 € for a total of partners (for a cost of 2265086 €)



Implementation scheme

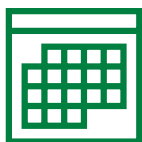




Usually, every **objective** becomes a **WORK PACKAGE (WP)**, thematic building blocks divided in...



TASKS: detailed actions inside each WP.
They can be divided in **Subtasks**



DELIVERABLES: concrete outputs, similar to technical reports, for every task of a work package. They serve to update the trials done and results of the project up to that moment



MILESTONES: key checkpoints to monitor progress



REPORTING: periodic technical & financial reports to PRIMA



PLAMINPACK

Project schedule:

July 1° 2024

June 30° 2027



WPs list and tasks

		Y1												Y2												Y3											
WP	Description	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36
WP1	Production of AOM, SR and HIC from selected plants (APT)	M1																								M6-8											
1.1	Selection of PWR and fruits samples (UCA)			✓																																	
1.2	Extraction of AOM and production of SR powder (APT)																								✓												
1.3	Production of HIC from PWR (UNIBAS)																																			✓	
1.4	Production of HI larval flour (UNIBAS)																																				✓
WP2	Materials and Processes for nets, films and trays (UNIPi)													M2												M4											
2.1	Materials and processes for nets (NTT)																																				
2.2	Materials and processes for films (UNIPi)																																				
2.3	Materials and processes for trays (UNIPi)																																				
2.4	Biopolymer based coatings (ASU)																																				
2.5	Prototypes of anti-microbial nets, films and trays (UNIPi)																																				✓
WP3	Microbiological, shelf-life and barrier studies (UCA)																																				
3.1	Anti-microbial tests onto packaging (UCA)																																			✓	
3.2	Gas barrier tests onto packaging (ASU)																																				✓
3.3	Shelf life studies onto strawberries, dates and tangerines (UCA)																																				✓
WP4	Physical treatments and ICT technologies integrated in the chain (ASU)																									M9											
4.1	Plasma treatments and their combination with coating (ASU)																																				M11,12
4.2	Correlation between data coming from extractions and the different PWR (SFAX)																																				✓
4.3	Digital twinning of the ripening and the package (UHOH)																																				✓
WP5	End of life and environmental implications (UOI)													M3												M10											
5.1	Degradation/ageing/durability of prepared materials (UOI)																																				✓
5.2	Organic and mechanical recyclability of packaging (ASU)																																				✓
5.3	Life Cycle assessment of the novel packaging (ASU)																																				✓
5.4	Potential toxicity assessment (UOI)																																				✓
WP6	Dissemination, Exploitation, Communication & Outreach (DECO) activities (UNIPi)													M5																							
6.1	Training/information activities related to the different project knowledge (UOI)																																				
6.2	Exploitation of project results in market®ulation contest (UNIPi)																																				✓
6.3	Dissemination of project results (ASU)																																				
6.4	Communication and outreach activities, including WEFE NEXUS (UNIPi)																																				
WP7	Project coordination (UNIPi)																																				
7.1	Technical and financial coordination and management of risks (UNIPi)	TM		✓			TM							TM												TM											TM
7.2	Data management (UNIPi)						✓																														
		Laboratory phase				Prototyping				Life Cycle Assessment & Environment				Other activities & Management																							

M milestone, ✓ deliverable v periodic reporting

M milestone, ✓ deliverable v periodic reporting
TM technical meeting

Each WP has its start and its own end

Colors distinguish among laboratory phase, management activities, life cycle assessment and prototyping, for example

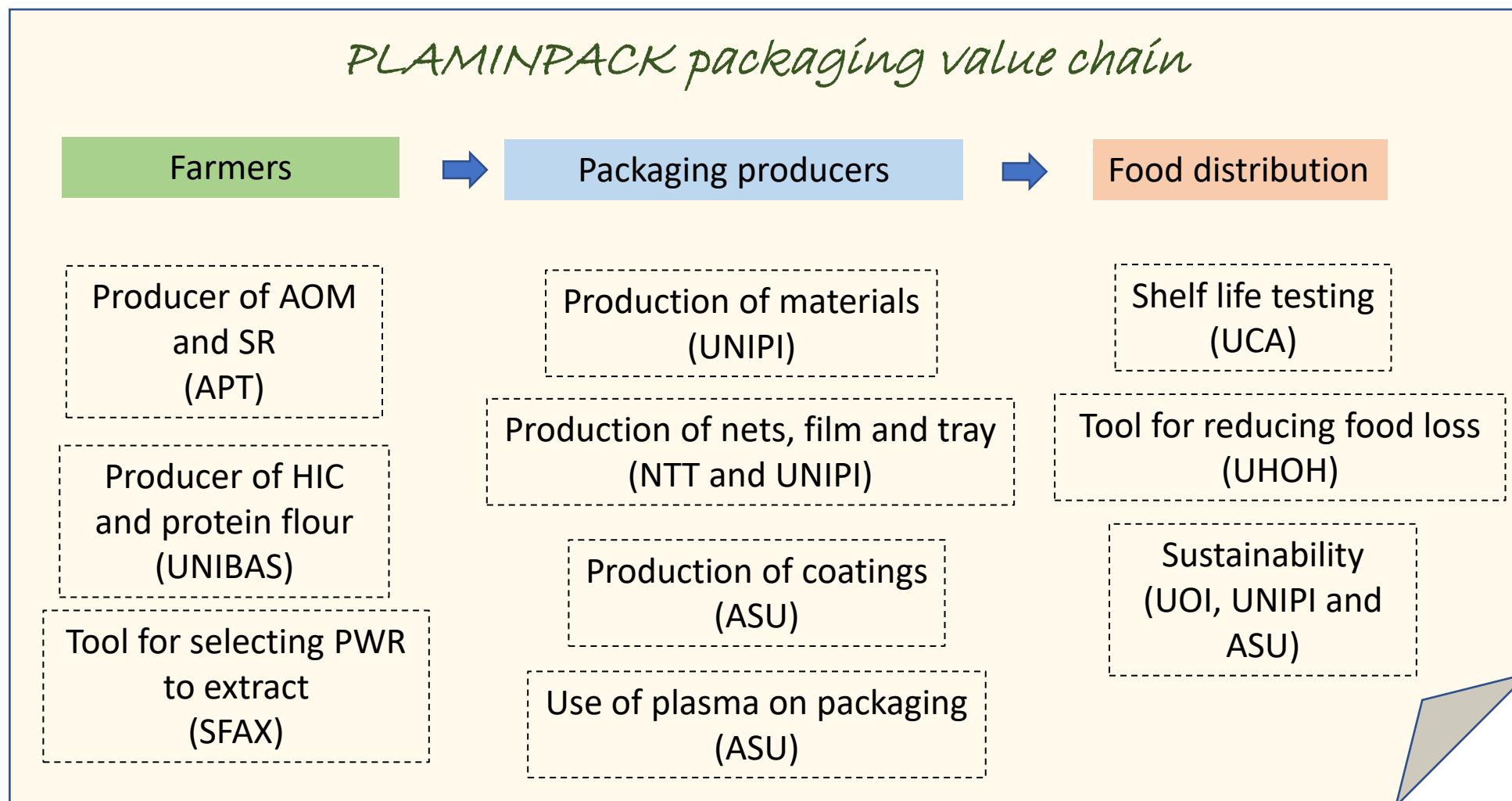


By summarizing, PLAMINPACK implementation will result in the following innovative results:

- ✓ **New materials:** bionanocomposite for film including biopolyesters, HIC and AOM; bionanocomposite for net including biopolyesters, HIC and AOM; composite for tray including biopolyesters, SR, HIC and AOM; HI protein-based coating for MAP.
- ✓ **New products:** film, tray and net.
- ✓ **New technologies:** optimized extraction methodology for the 3 plants wastes; production of HIC from the three plants wastes; production of insect flour from HI rich in protein (Mediterranean aquaculture); plasma coupled with HIC coating.
- ✓ **New tools:** (1) tool for selecting the best biorefinery methods for producing AOM considering the PWRs; (2) tool for predicting the ripening of fruits considering the packaging formulation/structure.
- ✓ **New circular packaging model:** the PLAMINPACK circularity, where plants are valorised integrally considering biotechnology interconnected processes (biorefinery, bioconversion, recycling, composting).



PLAMINPACK packaging value chain





materials

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Transforming Agricultural Waste from Mediterranean Fruits into Renewable Materials and Products with a Circular and Digital Approach

by Antonella Castagna¹ , Aouatif Aboudia² , Amine Guendouz³ , Carmen Scieuzo⁴ , Patrizia Falabella⁴ , Julia Matthes⁵ , Markus Schmid⁵ , David Drissner⁵ , Florent Allais⁶ , Morad Chadni⁶ , Christian Cravotto⁶ , Julia Senge⁷ , Christian Krupitzer⁷ , Ilaria Canesi⁸ , Daniele Spinelli⁸ , Fadoua Drira⁹ , Hajer Ben Hlima⁹ , Slim Abdelkafi⁹ , Ioannis Konstantinou¹⁰ , Triantafyllos Albanis¹⁰ , + Show full author list

¹ Department of Agriculture, Food and Environment, University of Pisa, 56126 Pisa, Italy

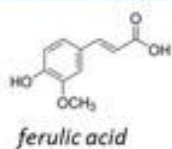
² Bioresources and Food Safety Laboratory, Faculty of Science and Technology of Marrakech, Cadi Ayyad University, P.O. Box 549, Marrakech 40000, Morocco

³ Agrobiotechnology and Bioengineering Center, CNRST-Labeled Research Unit (Agro Biotech-URL-CNRST-05 Center), Faculty of Science and Technology, Cadi Ayyad University, P.O. Box 549, Marrakech 40000, Morocco

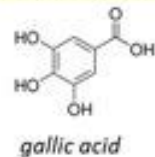
⁴ Department of Basic and Applied Sciences, University of Basilicata, 85100 Potenza, Italy

Polyphenols

Hydroxycinnamic acids



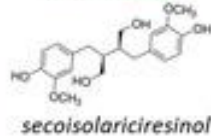
Hydroxybenzoic acids



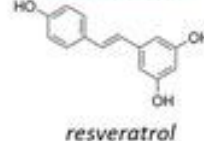
Flavonoids

Flavonols
Flavones
Isoflavones
Flavanones
Anthocyanidins
Flavanols

Lignans



Stilbenes



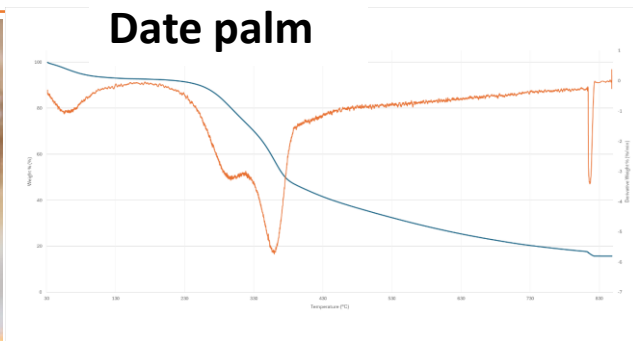


PLAMINPACK

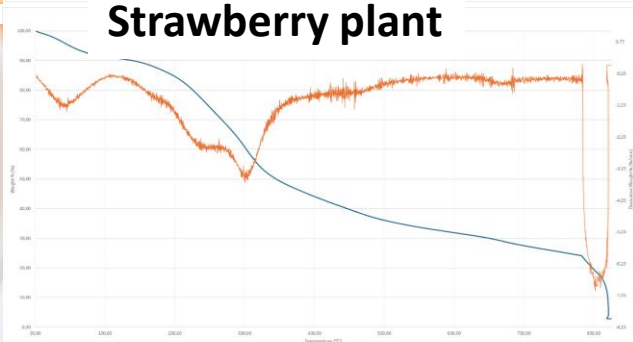
Raw powders from strawberry, date and tangerine plants



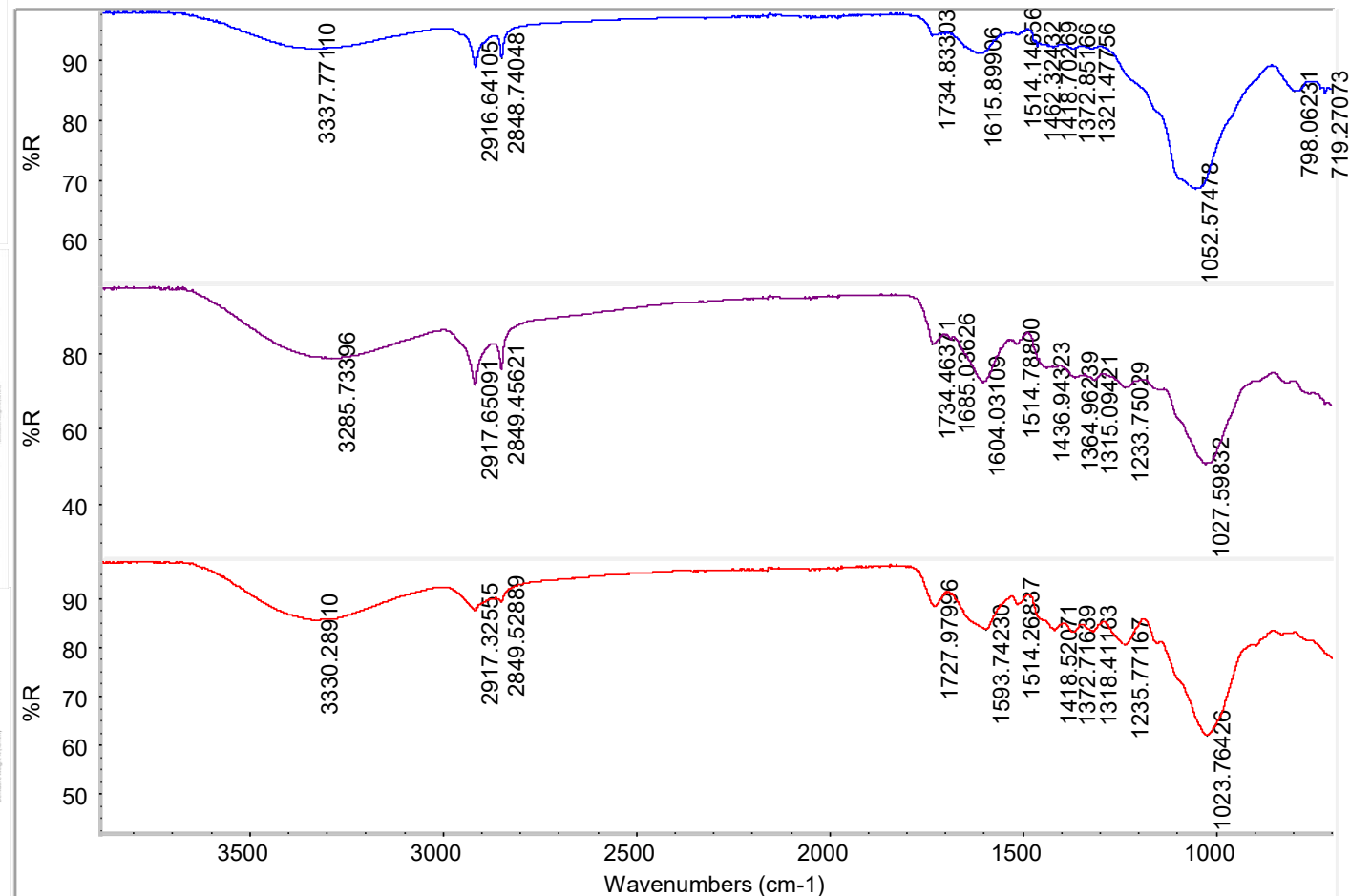
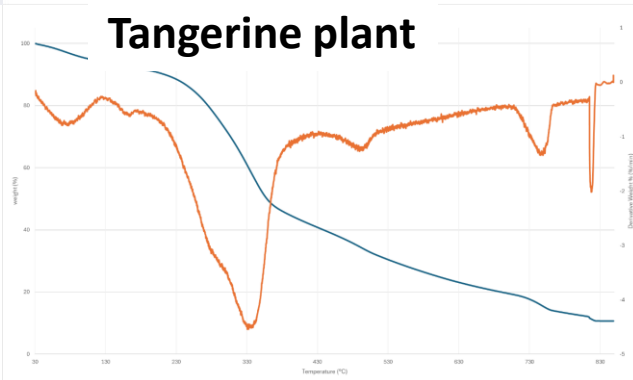
Date palm



Strawberry plant



Tangerine plant



Date plant waste showed the highest thermal stability but a very irregular and coarse fibrous structure. Infrared ATR spectra suggested diversification in aromatic/phenolic content of powders.

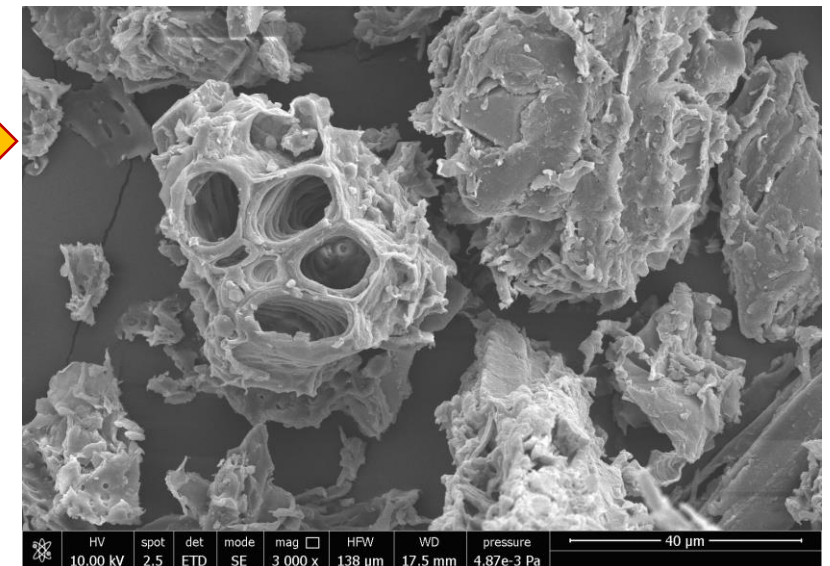
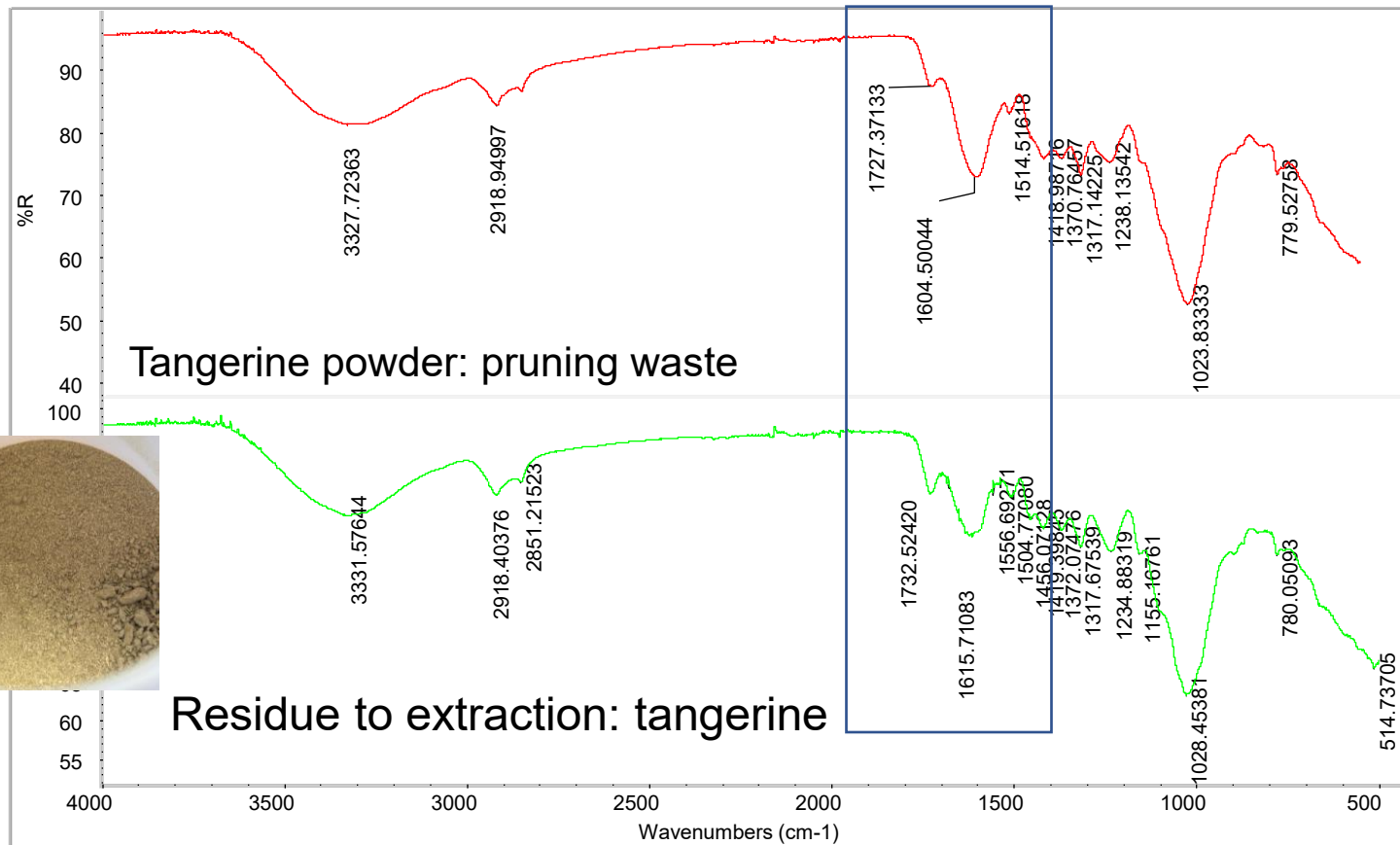


WP1: Production of OAM, SR powder and HIC from selected plants

Fillers deriving from tangerine tree (Morocco)

Decreased and shifted peaks related to polyphenols

Spectrochimica Acta P. A: Mol. Biomol. Spectr.,153,2016,
94-101, <https://doi.org/10.1016/j.saa.2015.08.020>

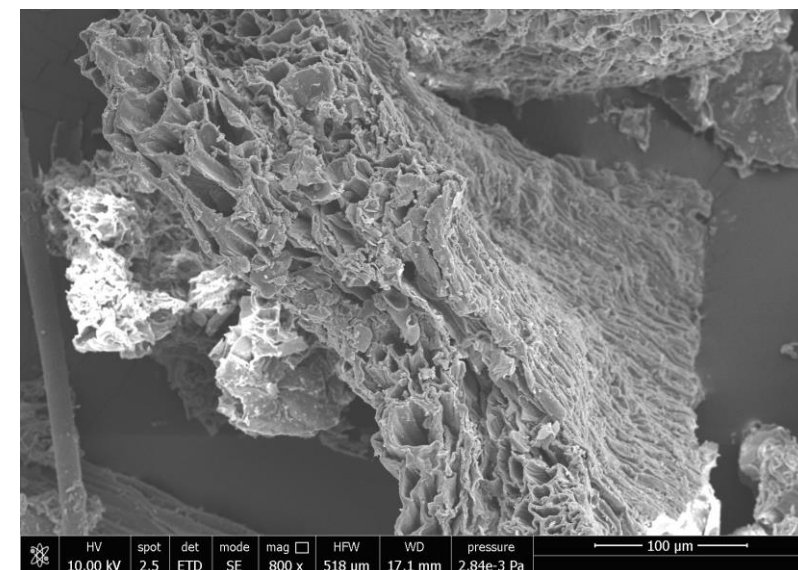
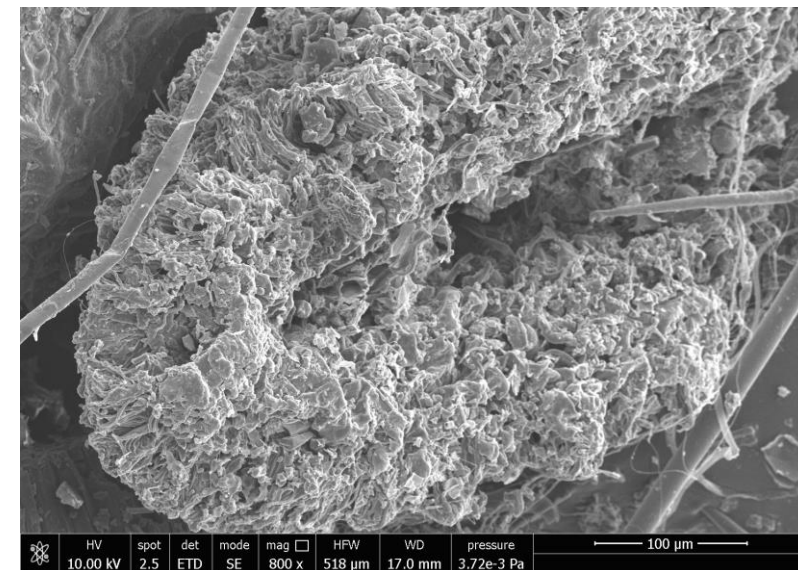
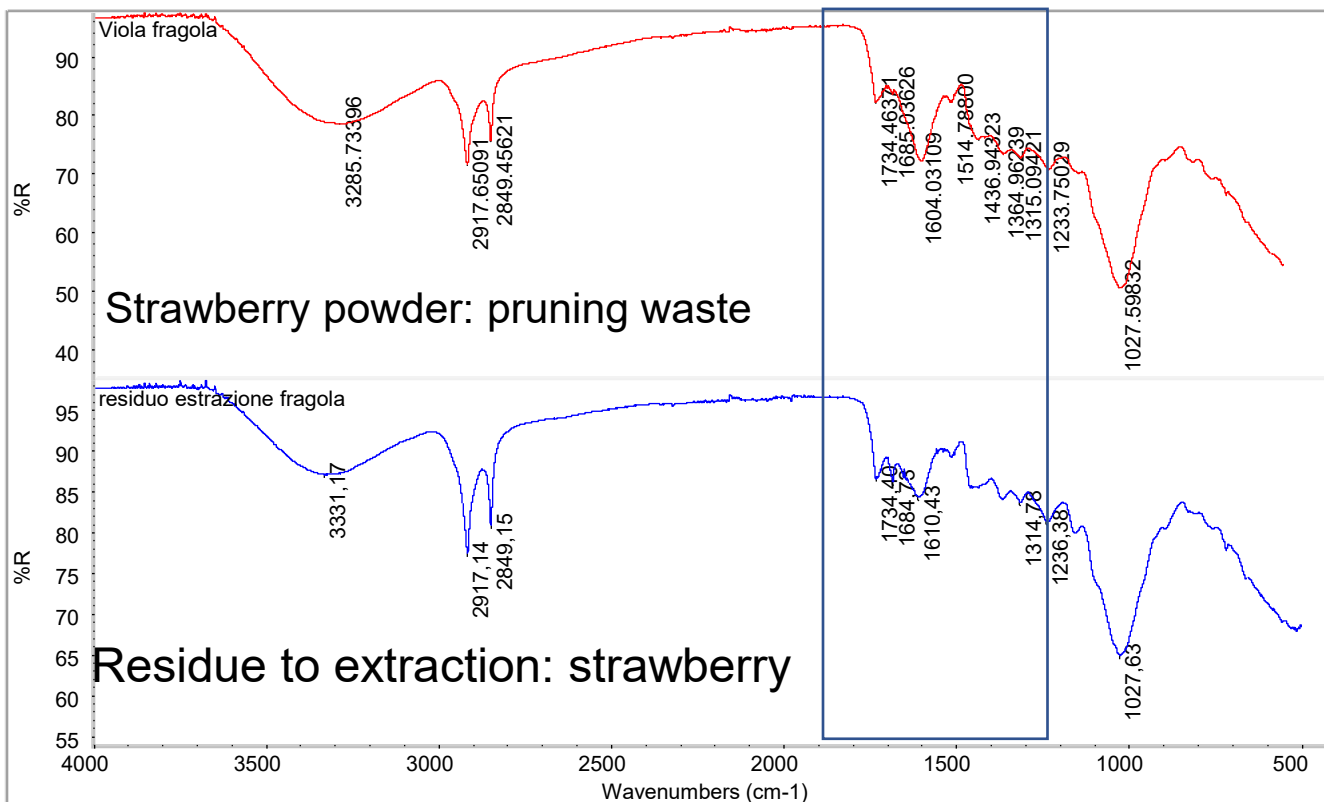


After the extraction the removal of polyphenols and the formation of surfacial cavities was revealed



Fillers deriving from strawberry plant (Italy)

After the extraction, the removal of polyphenols and the formation of surfacial cavities was revealed





Article

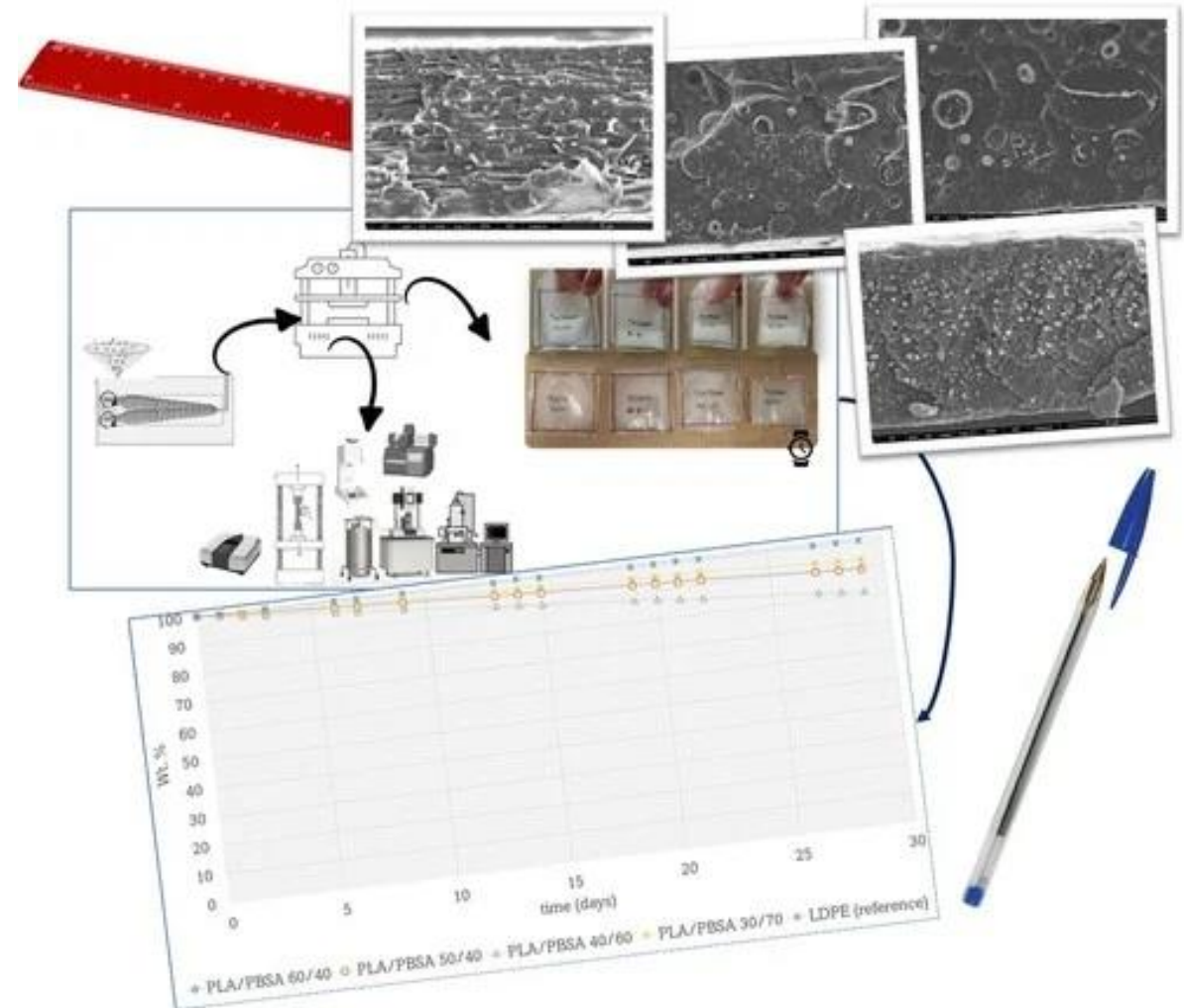
Assessing PLA/PBSA Films for Sustainable Packaging for Moist and Perishable Foods

Maria-Beatrice Coltelli , Francesca Cartoni, Luca Panariello , Laura Aliotta , Vito Gigante and Andrea Lazzeri

Department of Civil and Industrial Engineering, University of Pisa, 56122 Pisa, Italy;
francesca.cartoni@unipi.it (F.C.); luca.panariello@ing.unipi.it (L.P.); laura.aliotta@unipi.it (L.A.);
andrea.lazzeri@unipi.it (A.L.)

* Correspondence: maria.beatrice.coltelli@unipi.it (M.-B.C.); vito.gigante@unipi.it (V.G.)

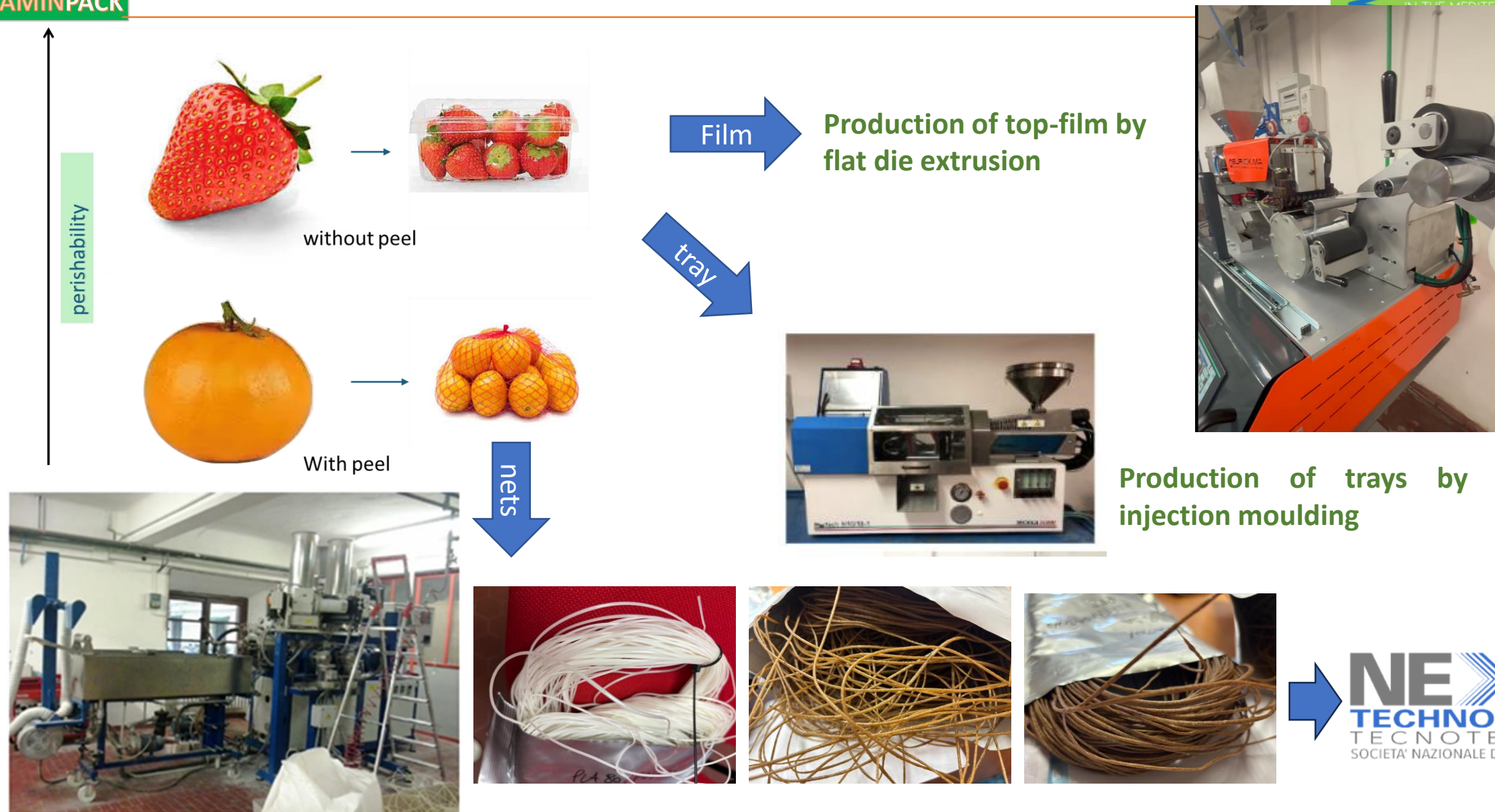
Regarding films, the results identify the 50–60 wt% PLA window as the most promising starting point for targeted compatibilization, surface treatments, or multilayer architectures intended to close the gap with polyolefin barrier performance while retaining biodegradability





PLAMINPACK

WP2: Materials and Processess for nets, films and trays





PLAMINPACK

<https://www.plaminpack.com/>



About Us



News



Master's Degree with top marks for Viola Berrugi!

Today, Viola Berrugi, a Master's student in Materials and Nanotechnology, defended her Master's thesis entitled "Biopolymer-vegetable residue composites for the production of biodegradable food packaging," developed within the PLAMINPACK project.

[MORE INFO](#)



A new paper has been published !!!

"Assessing PLA/PBSA Films for Sustainable Packaging for Moist and Perishable Foods" is a new paper published on Polymers in the framework of PLAMINPACK project

[MORE INFO](#)



PLAMINPACK at IOCPS2025

Today a presentation entitled "Protecting perishable food by using renewable and biodegradable polyester films" was held in the International Online Conference on Polymer Science.



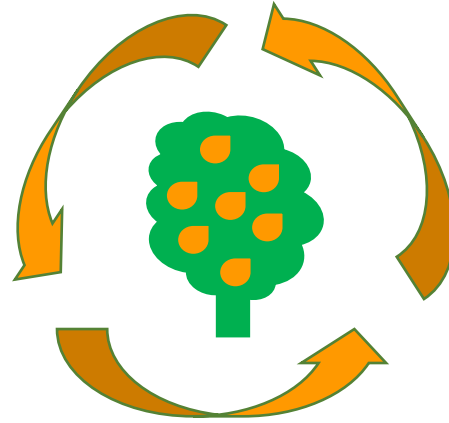
Register to PLAMINPACK results and updates

Stay tuned with PLAMINPACK for being inspired regarding a fully biocircular approach!!!

Interested in the PLAMINPACK project? Join our community by registering on our website and be the first to discover our breakthrough

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Surname * :
Company *

Please, register on our website!!!



PLAMINPACK

PLAnt-based antiMlcrobial aNd circular PACKaging for plant products

Thank you for your attention!



PLAMINPACK



Peculiarities of the Mediterranean area: issues and opportunities



Antonella Castagna
DAFE, University of Pisa

Why the Mediterranean area matters?



It is a living lab for sustainability challenges

exceptional biodiversity

long history of human activity

strong climatic variability

intense socio-economic pressures

It is a strategic area for research and innovation



The Mediterranean area has an exceptional biodiversity

About 25,000 plant species, with percentages of endemism that can reach 50–60%.

More than half of the Mediterranean flora does not exist anywhere else in the world





The Mediterranean area has an exceptional biodiversity

About 534 species of birds, nearly 300 species of terrestrial reptiles, about 110 species of amphibians and nearly 300 species of mammals

Over a third of the species are endemic





The Mediterranean area has an exceptional biodiversity

The invertebrates represent the least visible but ecologically fundamental component of Mediterranean biodiversity.

The estimated insect species alone are about 150.000





About 20% of the Mediterranean species are threatened with extinction

Biodiversity is a key element for the resilience of agricultural systems, providing fundamental ecosystem services such as soil fertility, pollination, and the stability of production systems



International Union for the Conservation of Nature





The Mediterranean area is a global hotspots of climate change

More frequent and intense heatwaves, prolonged droughts, sudden and extreme rainfall events

Heavy effects on agriculture, water availability and soil stability





Climatic fluctuations affect agricultural productivity

Increased pest pressure (insect, bacteria, fungi), water shortages and altered ripening dynamics





The Mediterranean soils are vulnerable

Low organic matter, great spatial variability, prone to erosion, increasingly vulnerable to degradation and salinization

Soil restoration and conservation are not just agricultural practices — they are climate-adaptation strategies



The Mediterranean soils are at risk of desertification

Spain, Italy, Portugal, Greece, Cyprus: moderate to high risk of desertification (EEA)

Italy: about 6% strong or moderate erosion, about 9% vulnerable to desertification (ISPRA)



This risk increased by about 40% in agricultural Mediterranean areas in the last century

Without intervention, soil erosion and desertification can become irreversible





Secondary salinization is a threat for the Mediterranean soils

Globally more than 10% of cultivated areas and about 25% of irrigated lands in the Mediterranean area are affected by salinity (FAO)

In Italy this problem affects all regions, with a total area of about 3 million ha

The salinized areas could reach 24–32% of the Earth's surface in the coming decades





Anthropogenic and natural causes

Bad agricultural management, excessive fertilization, use of brackish water. Imbalance between evaporation and precipitation

Climate change (heat waves, long-term absence of rainfall) intensifies the process



Seawater intrusion contributes to salinization

Groundwater level falls below the sea level due to high temperatures and increasing water withdrawal

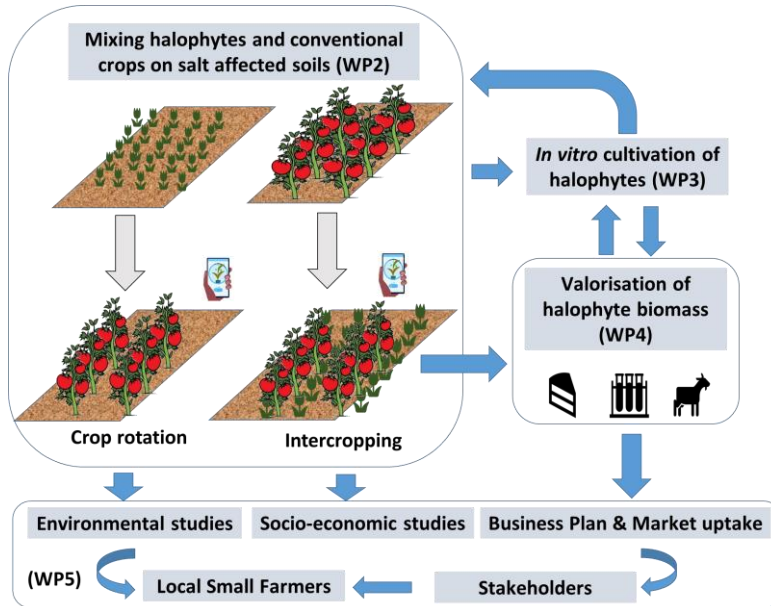
Saltwater infiltrates groundwater, gradually turning freshwater into brackish water



Development and optimization of Halophyte-based farming systems in salt-affected Mediterranean soils

HaloFarMs in brief

Development of eco-friendly and sustainable agricultural and production systems in salt-affected Mediterranean soils, using naturally salt tolerant plants, the halophytes.



Specific objectives

- ❑ Use of halophytes as NbS to allow cultivation of commercial crops on saline soils by mixed cropping or sequential cropping systems
- ❑ Characterization and valorization of halophyte biomass as feed, as source of nutraceuticals, and for veterinary uses
- ❑ *In vitro* cultivation of halophytes to provide elite clones for salt remediation and for commercial farming systems
- ❑ Enhance knowledge dissemination and capacity building in new farming systems in saline soils.

YIELD

opposite trend in different years

1st year

+22%, +19% (N° and weight fruits/plant)

2nd year

-56%, -85% (N° and weight fruits/plant)

COMMERCIAL QUALITY

always higher in intercropping

1st year

+16%, +18%, + 30% (° Brix, TA, firmness)

2nd year

+48%, +46% (° Brix, TA)



INTERCROPPING

**SALICORNIA
MONOCULTURE**

**TOMATO
MONOCULTURE**



Human consumption

Composition and antioxidant activity of the basal and apical part differ



feed



The basal part had less bioactive compounds and antioxidant activity

Potential use as feed supplement in the diet of small ruminants

DIET FORMULATION

g/100 g DM	0%	10%	20%	40%
Salicornia	0.00	10.00	20.00	40.00
Polyphyte hay	69.33	59.33	49.33	29.33
Other	30,67	30,67	30,67	30,67



up to 20% salicornia supplementation did not alter:

- ☐ the rumen pH (positive for rumen microorganisms)
- ☐ the degradation process of both total dry matter and total fiber

VFA production

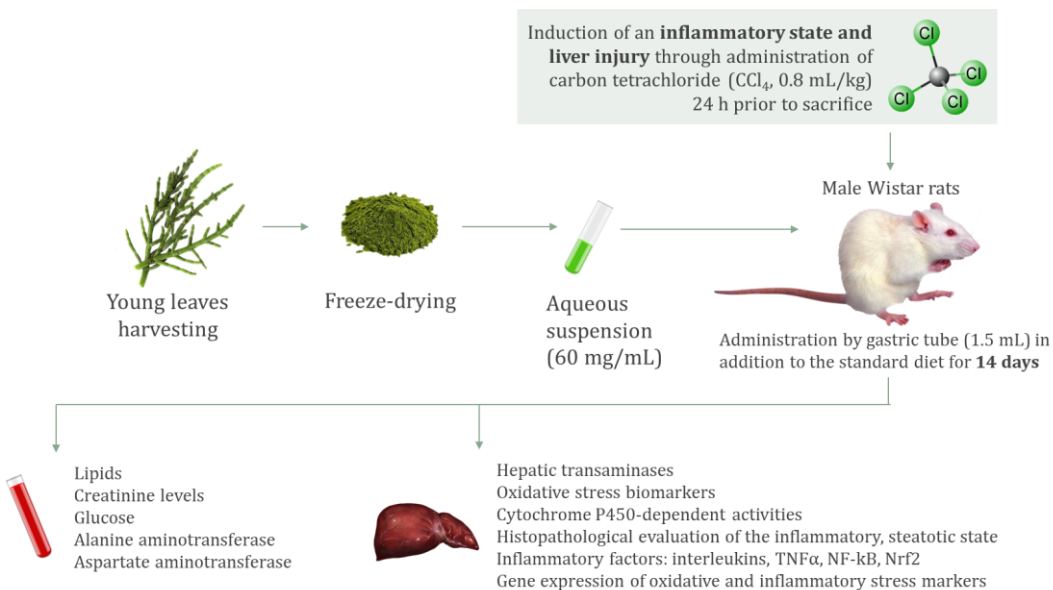
At any percentage, salicornia decreased propionate and butyrate production, that might lead to a:

- ☐ Decrease in milk performance and fat production
- ☐ Decrease in methane emission



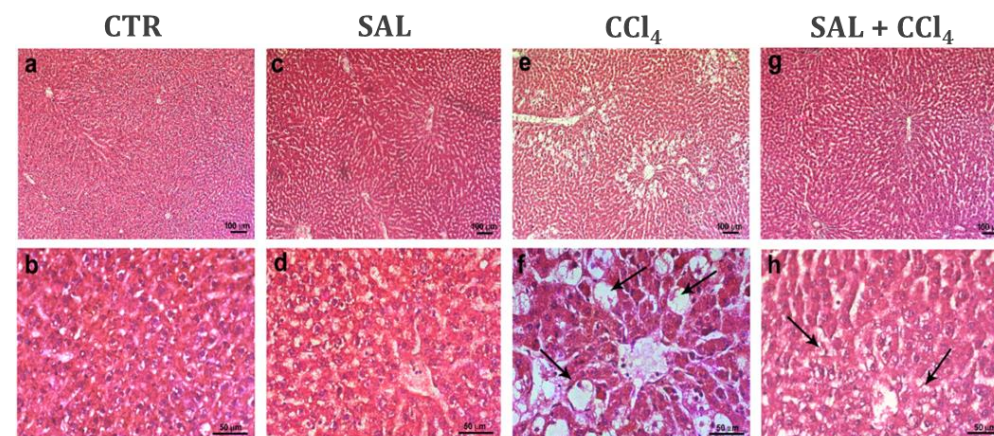
The apical part is richer in bioactive compounds and antioxidant activity

Potential use as source of nutraceuticals and pharmaceuticals



- ❑ Salicornia alone did not alter the plasma markers, suggesting the non-toxicity of the administered dose over the 14 days
- ❑ The pre-administration of Salicornia prevented the toxic effects of CCl_4 on plasma markers (e.g. cholesterol, triglycerides, transaminases, etc)

- ❑ Salicornia alleviated the severity of both hepatic steatosis and inflammatory cell infiltration present in the liver of CCl_4 -treated rats





A region under water stress

Europe: 28–33% of the territory and population experience seasonal water stress conditions (EEA)

North Africa and Middle East: availability of renewable water/person below 1000 m³/year (water stress)

Egypt and Morocco: 500–700 m³/year (severe water stress) (FAO)

Downward trend in per capita water availability

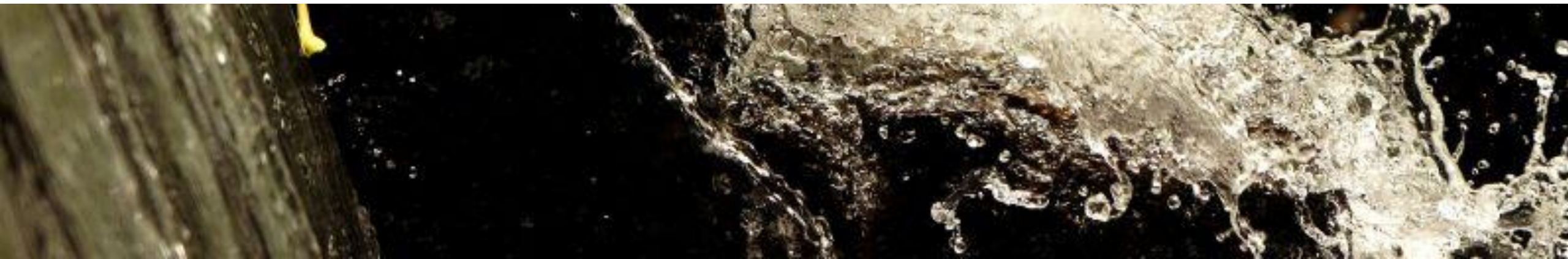




Water: strategic but limited resource

Chronic water scarcity in the Mediterranean area is intensified by climate change and increasing demand in agriculture, industry, tourism and expanding urban areas

Agriculture accounts for the dominant share of water withdrawal (around 70–85%) (FAO)





Water: increasingly scarce and increasingly polluted

Water is increasingly contaminated by new pollutants (e.g. plastics, PFAs, pharmaceuticals)

Innovation is essential to preserve and treat water, improve its use, and find alternative sources



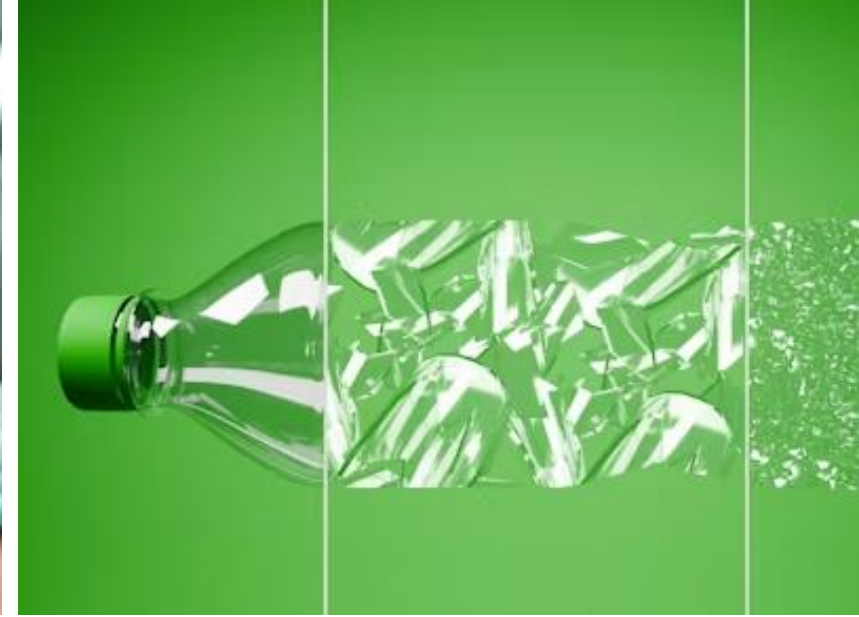
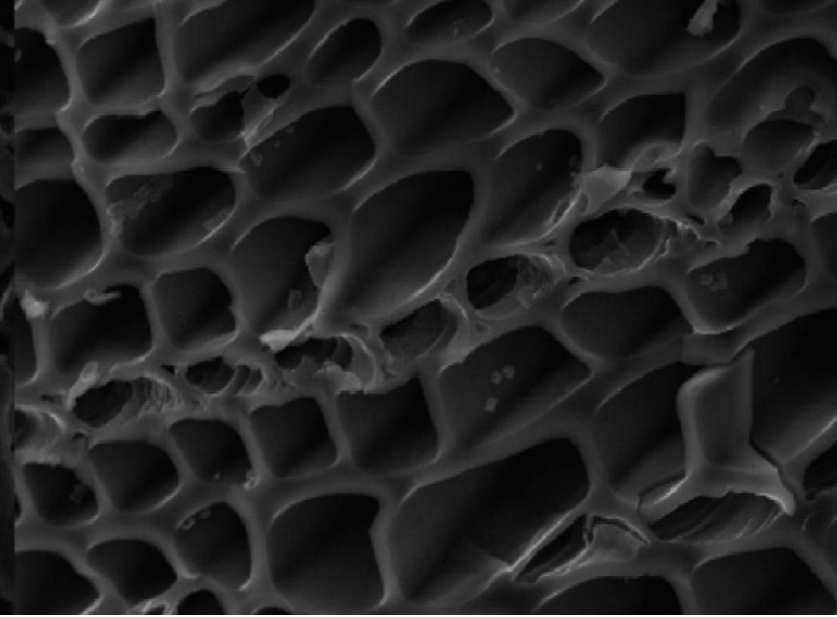


The Mediterranean agriculture generates large amounts of by-products

Strongly specialized in arboreal and permanent crops - high intensity of agri-food transformations

By-products and residues represent a major potential for circular bioeconomy





From waste management challenge to resource valorization

High-value bioactive compounds, biobased materials, bioenergy, biofertilizers, fibers, insect farming

**Interdisciplinarity as a key pillar of environmental, economic and social sustainability
in the Mediterranean**



From challenges to opportunities.

Mediterranean challenges (soil degradation, water scarcity, climate vulnerability and waste management) can be addressed through complementary and integrated approaches combining regenerative practices, NbS, digital and precision technologies, and circular bioeconomy strategies to enhance resilience, productivity, and ecosystem services

the Mediterranean is a natural laboratory for research and innovation



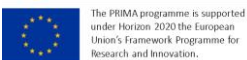


PLAMINPACK

PLAnt-based antiMIcrobial aNd circular PACKaging for plant products



Antonella Castagna
antonella.castagna@unipi.it



The PRIMA programme is supported under Horizon 2020 the European Union's Framework Programme for Research and Innovation.



The project is part of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) Programme supported by the European Union. Each partner is funded by its National Funding Agency (NFA): Ministero dell'Università e della Ricerca (MUR) is funding Italian entities, PRIMA23_00059

DIPARTIMENTO DI SCIENZE AGRARIE
ALIMENTARI E AGRO-AMBIENTALI
UNIVERSITÀ DI PISA



UNIVERSITÀ
DI PISA



Sustainable practises in research projects

Noemi Cei (NTT), Ilaria Canesi (NTT), Daniele Spinelli (NTT)

Pisa, December 17th 2025

About us | Next Technology Tecnotessile (NTT)



- Next Technology Tecnotessile | Società Nazionale di Ricerca r.l. is an Italian research center established in 1972 in Prato (Tuscany);
- Stakeholders | 40% Ministry of University and Research (MUR), 60% textile and machinery-textile industries;
- 30 employees;
- Technological priorities | Circular Economy, Sustainable textiles, Industry 4.0, Chemistry and Nanotechnology, ICT and Photonics.



Collaborative activities among 150 members in the fashion sector of the Tuscany region

- Strengthen the regional technology transfer,
- Support R&D collaborative activities for new sustainable technologies, products and services.



About us | Next Technology Tecnotessile (NTT)



HORIZON EUROPE



Circular
Bio-based
Europe
Joint Undertaking



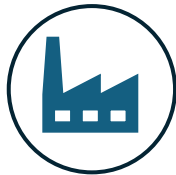
Consultancy services on textile technologies from raw materials to final products



Modification of materials, surface functionalization, development of novel chemical processes



Composites (packaging, automotive, furniture and building sectors)



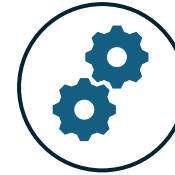
R&D on process automation and control systems



Circular economy and sustainable textile practices



R&D on treatment and reuse of textile wastes



Design of mechanical devices and machinery development



Environmental monitoring of textile value chain by Life Cycle Thinking methodologies (LCA, LCC, S-LCA, Emergy, TEA, Eco-Cost, etc.)



SimaPro

What does Sustainability mean to you?

Let's start with your perspective

Scan the **QR code** and share your idea of sustainability.

Your answers will shape our discussion and help us explore what sustainability really means for your generation.

→ *Open Mentimeter and answer the questions:*

When you hear the word sustainability, what's the first thing that comes to mind?

How has sustainability influenced your studies, lifestyle or career aspirations?

What is the biggest challenge to become more sustainable?



Join at menti.com | use code **3718 8960**



Sustainable Development

The epistemological basis, the “philosophy” on which the work is based, is **Sustainable Development**.

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Our Common Future, the “Brundtland Report”, 1987

It integrates three fundamental dimensions:

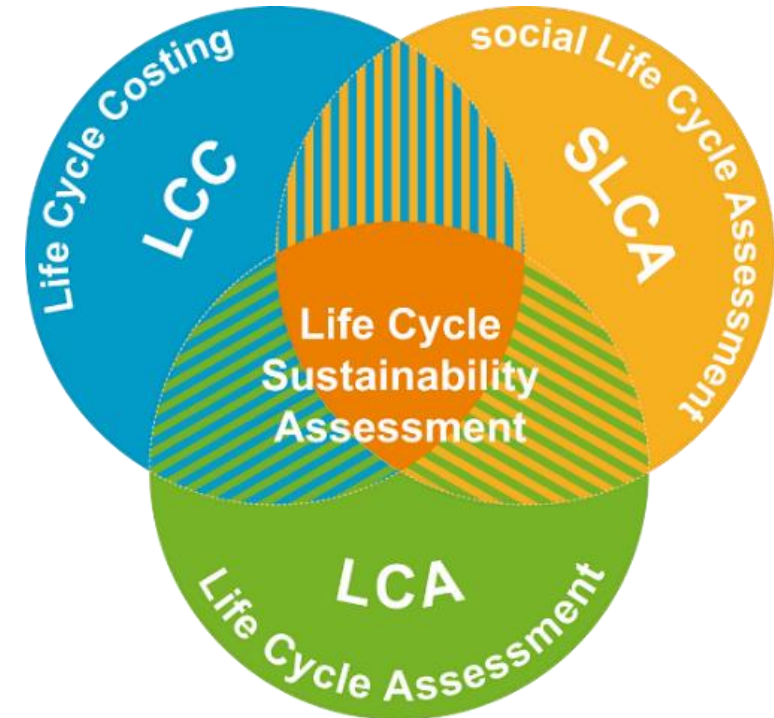
- **Environmental** – Protecting ecosystems and natural resources
- **Social** – Ensuring equity, rights, and inclusion
- **Economic** – Promoting long-term growth and prosperity

Balance between human progress, environmental protection, and social well-being

It is not only an environmental goal

It represents a paradigm shift in how we produce, consume, and live.

It is the path toward a more equitable, resilient, and prosperous future.



More sustainable practises in research projects

Material Selection and Management

- Use of recycled or secondary raw materials
- Preference for low-carbon, eco-certified, or biodegradable materials
- Minimization of hazardous substances in materials and processes
- Optimization of material efficiency to reduce waste

Energy Efficiency

- Use renewable energy sources
- Optimize energy consumption in processes

Resource Management

- Minimize waste and promote recycling and reuse
- Use more sustainable materials (recycled, eco-certified, low-carbon)
- Implement water-saving measures and sustainable water management

Circular Economy Practices

- Design projects to minimize waste and extend product life cycles
- Promote repair and repurposing of materials
- Integrate circular economy principles in project planning

Design of process

- Optimization of processes
- Choosing less impactful steps in the process
- Using cutting-edge technologies

Sustainable Communication & Education

- Raise awareness of sustainability among stakeholders
- Share best practices and lessons learned on sustainability
- Encourage participation in environmental initiatives



Our background | R&D Team

PhD fellowship in Chemical Science (University of Siena)

Senior Project Manager in NTT since 2017
Team Leader R&D Chemical Division

Responsibilities:

- Identification of new research funding opportunities;
 - Writing of new project proposals;
- Management of EU, national and regional funded projects.



Daniele Spinelli



Ilaria Canesi

Master's degree in Chemical Engineering (University of Pisa)

Project Manager in NTT since 2023

Responsibilities:

- Identification of new research funding opportunities;
- Writing of new project proposals;
- Management of EU, national and regional funded projects;
- Dissemination activities.



Noemi Cei

Master's degree in Industrial Chemistry and Material Science (University of Pisa)

Chemical researcher in NTT since 2023

Responsibilities:

- R&D activities;
- Writing of technical documents;
- Dissemination activities.



Carlotta D'Aleo

Master's degree in Environmental Chemistry (University of Florence)

Chemical researcher in NTT since 2024

Responsibilities:

- R&D activities;
- Writing of technical documents;
- Dissemination activities.



Elena Merli

Master's degree in Science and Materials for the Conservation and Restoration (University of Florence)

Chemical researcher in NTT since 2023

Responsibilities:

- R&D activities;
- Writing of technical documents;
- Dissemination activities.



Tommaso Nieri

Master's degree in Biotechnology for Environmental Management and Sustainable Agriculture (University of Florence)

Chemical researcher in NTT since 2024

Responsibilities:

- R&D activities;
- Writing of technical documents;
- Dissemination activities.

More sustainable practises | Recycling

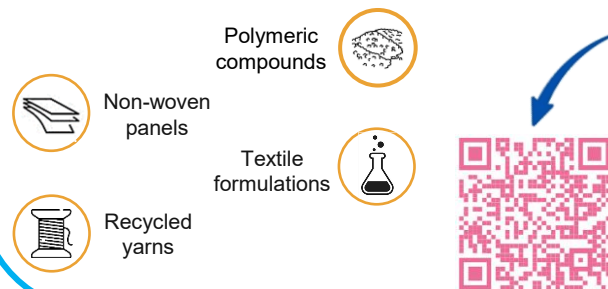
<https://www.solstice-project.eu/>



The SOLSTICE Project supports the **sustainable** growth in the **textile sector** by raising consumer awareness, improving recycling methods, and ensuring the traceability of raw materials.

Technologies & Expertise

- Textile sorting system
- Thermo-chemical pre-treatment for EL-based textiles
- S-LCA



<https://www.redolproject.eu/>



The REDOL Project will redesign 5 value chains for **solid urban waste**, implementing new solutions and ending-up in the production of 12 circular products.

Realization of geotextiles from recycled PES.



Technologies & Expertise

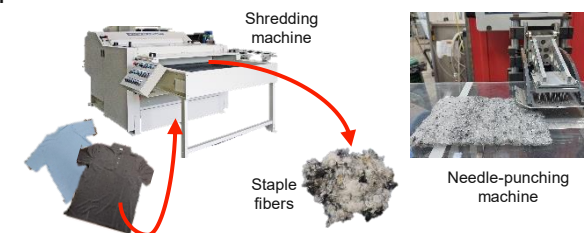
- Textile sorting system
- Thermo-chemical pre-treatment for EL-based textiles
- Shredding machine & mill



<https://moebios.eu/>



The MOEBIOS Project wants to demonstrate novel recycling processes for **bioplastics waste streams** (BIOs) along the EoL within 3 value chains, towards new upcycled high-value products.



Technologies & Expertise

- Shredding, carding, needle-punching and thermo-pressing machines
- Recycled granules for spinning process
- Textile sorting system



More sustainable practises | Alternative materials

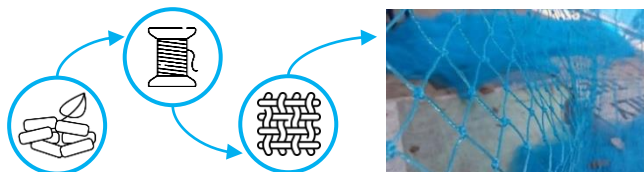
www.remedies-for-ocean.eu



REMEDIES

MEDITERRANEAN SEA BASIN LIGHTHOUSE

The REMEDIES Project proposes innovative solutions and technologies to monitor, collect, prevent and valorize **(micro)plastic litter** from our oceans.



Technologies & Expertise

- Optimisation of bio-based and recycled yarns for fishing nets and gear



<https://www.plaminpack.com/>



PLAMINPACK

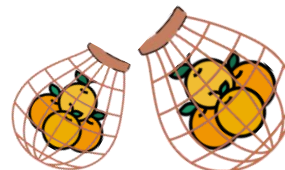
The PLAMINPACK Project aims to develop anti-microbial **packaging materials** (i.e. nets, films and trays) for perishable foods.



The products are made of biobased polymers and molecules derived from agricultural waste of the **Mediterranean area**.

Technologies & Expertise

- Development of bio-based nets for fruits and vegetables



<https://polymeerproject.eu/>



POLYMEER aims to establish a sustainable bio-based value chain for bioplastic products, using **brewers' spent grain (BSG)** as feedstock.

Focused on agricultural films, brewery tertiary packaging, and automotive textiles, the project designs **bioplastics** to be recyclable and/or biodegradable for environmental sustainability.



Technologies & Expertise

- Yarn and fabric development
- Mechanical recycling (EoL)

More sustainable practises | Bio-based solutions



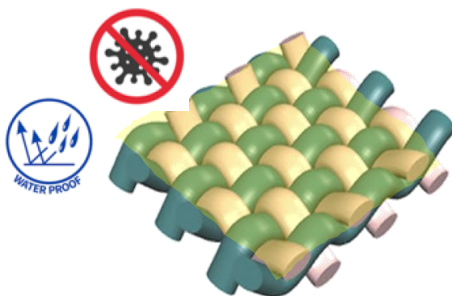
BLUECOAT

<https://bluecoat-project.eu/>

The aim of the BLUECOAT project is to develop a suite of **bio-based** and low-carbon emission **coatings** tailored for applications in marine, textile, and construction sectors, implementing and surpassing the most advanced SSbD guidance.

Technologies & Expertise

- Optimization of coating formulations for textiles
- Coating technologies for textiles



pHYBi

Phytomanagement for a bio-based textile industry

<https://www.phybi.eu/>

The pHYBi Project combines the **phytoremediation** of polluted soils with the lignocellulosic biomass valorisation to contribute to soil health and a bio-based circular textile industry.



The project aims to develop and optimize several phyto-management strategies and biomass extraction processes, reaching TRL5.

Technologies & Expertise

- Development of coating formulations
- Coating technologies for textiles
- LCA & S-LCA



TORNAD

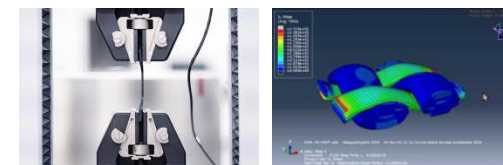
<https://tornado-project.eu/>

In the TORNADO Project, new organic and hybrid bio-based coatings with water and oil repellence properties are developed, following SSbD principles.

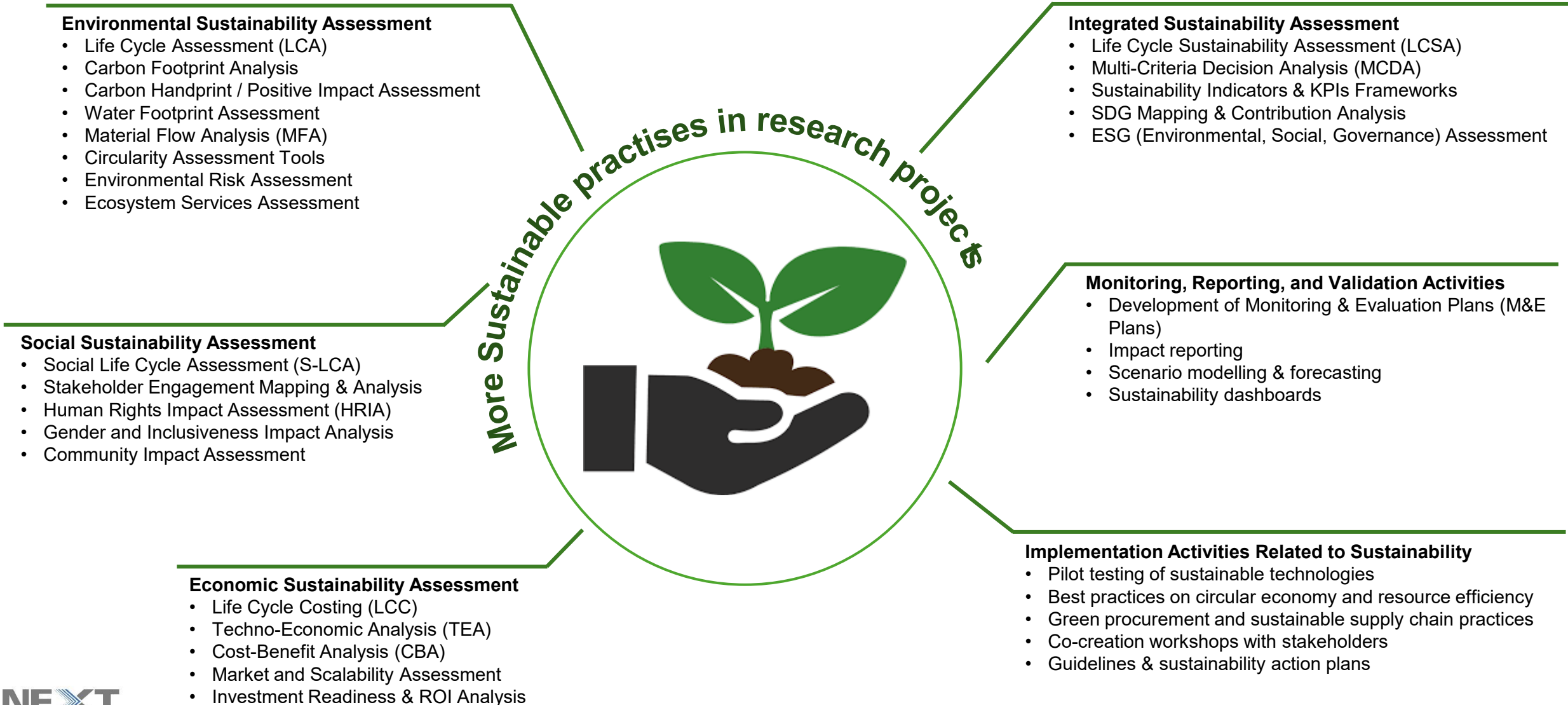
The novel proposed coatings are **PFAS-free** and intended for tree application sectors (including textile).

Technologies & Expertise

- Mechanical testing and validation
- FEM Simulation



More sustainable practises in research projects



Our background | Sustainability Team



Matteo Maccanti

Master's degree in Ecotoxicology and Environmental Sustainability (University of Siena)

PhD fellowship in Environmental, Geological and Polar Sciences and Technologies (University of Siena)

Environmental Researcher and LCA Analyst in NTT
since 2024

Responsibilities:

- Sustainability Assessment;
- Writing of technical documents;
- Dissemination activities.



Elena Marotto

Master's degree in Ecotoxicology and Environmental Sustainability (University of Siena)

Environmental Researcher and LCA Analyst in NTT
since 2025

Responsibilities:

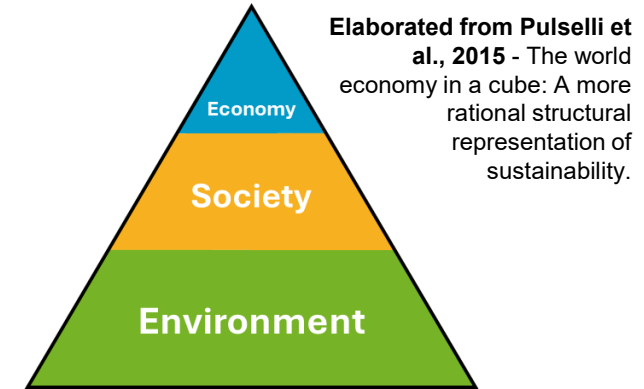
- Sustainability Assessment;
- Writing of technical documents;
- Dissemination activities.

Sustainable Development

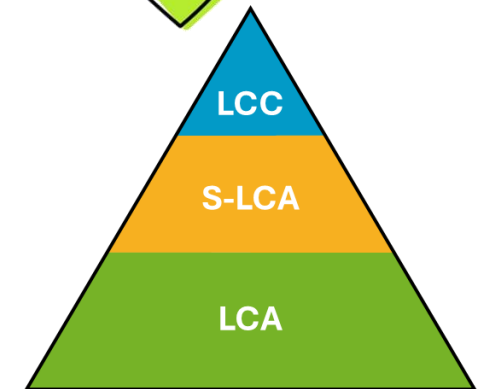
The epistemological basis, the “philosophy” on which the work is based, is **Sustainable Development**.

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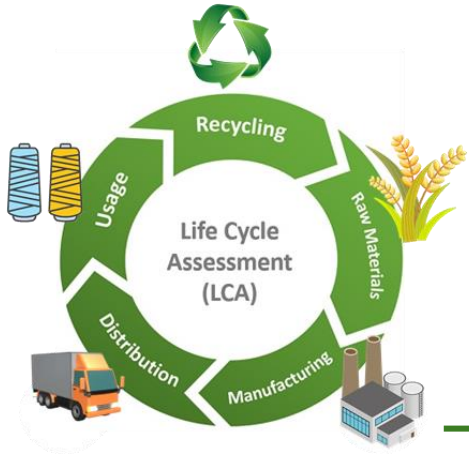


The Pillars



The Methodologies

Measure Sustainability | Life Cycle Thinking Methodologies



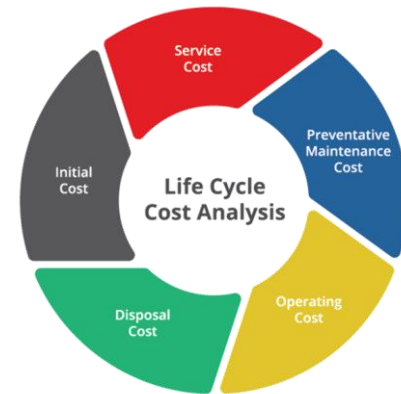
Life Cycle Assessment (LCA):

It is a standardized methodology (ISO 14040 and 14044) that evaluates the **environmental impact** of products or processes throughout their life cycle.

The study is based on a comprehensive assessment of the materials, energy consumption, and emissions to the environment (water, air, soil, waste) generated by the processes involved in the "life" of the product or service being assessed, from the extraction of the natural resources needed to produce it to the treatment of waste end-of-life.

Life Cycle Costing (LCC):

It takes into account the life cycle costs of a product incurred by the actors involved, including externalities. This analysis complements the LCA, considering the **costs** of product development, materials, energy, machinery, labour, waste management, emission control, transport, maintenance and repair, etc.



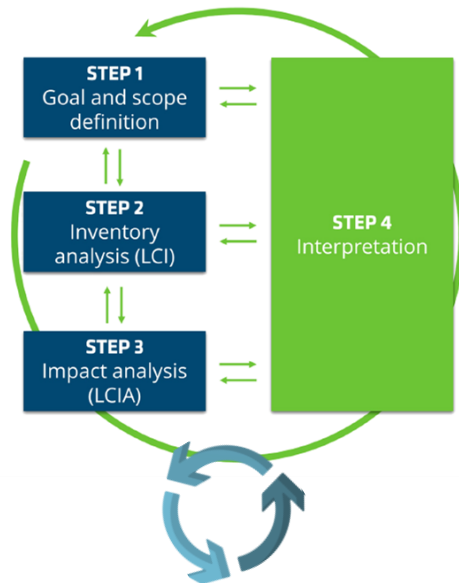
Social Life Cycle Assessment (S-LCA):

It is a technique for assessing **social impacts** (and potential impacts) by evaluating the social and socio-economic aspects of products and their positive and negative impacts throughout their entire life cycle, including raw material extraction and processing, production, use, reuse, maintenance, recycling and waste disposal.

Measure Sustainability | LCA approach as example



14040
14044



**Iterative
Process**



#1. Goal and Scope Definition

This step defines the **purpose, objectives, and boundaries** of the study. It establishes what system will be analyzed, the functional unit (what one unit of product/service represents), and the level of detail required. It also identifies the intended application of results and the target audience.



#2. Life Cycle Inventory (LCI) Analysis

In this phase, all input and output **data are collected and quantified** throughout the system's life cycle. This includes raw materials, energy use, emissions, and waste flows. The goal is to build a complete mass & energy balance of the process under study.



#3. Life Cycle Impact Assessment (LCIA)

The inventory data are translated into **environmental impact indicators** (e.g., climate change, water use, toxicity). Characterisation models such as ReCiPe or USEtox are applied to estimate potential impacts and identify environmental hotspots.



#4. Interpretation

The **results** from the LCI (#2) and LCIA (#3) are **analyzed and interpreted** to draw conclusions, identify key improvement areas, and support decision-making. Sensitivity and uncertainty analyses are often conducted to ensure robustness and transparency.

Measure Sustainability | BIORADAR Project

BIORADAR | *Monitoring system of the environmental and social sustainability and circularity of industrial bio-based systems*



<https://www.bioradar.org/>

The BIORADAR project develops indicators and digital monitoring tools that will enable policymakers and investors to gauge the environmental and social impact of **bio-based industrial systems**.

Call: HORIZON-JU-CBE-2022

Duration: 36 months

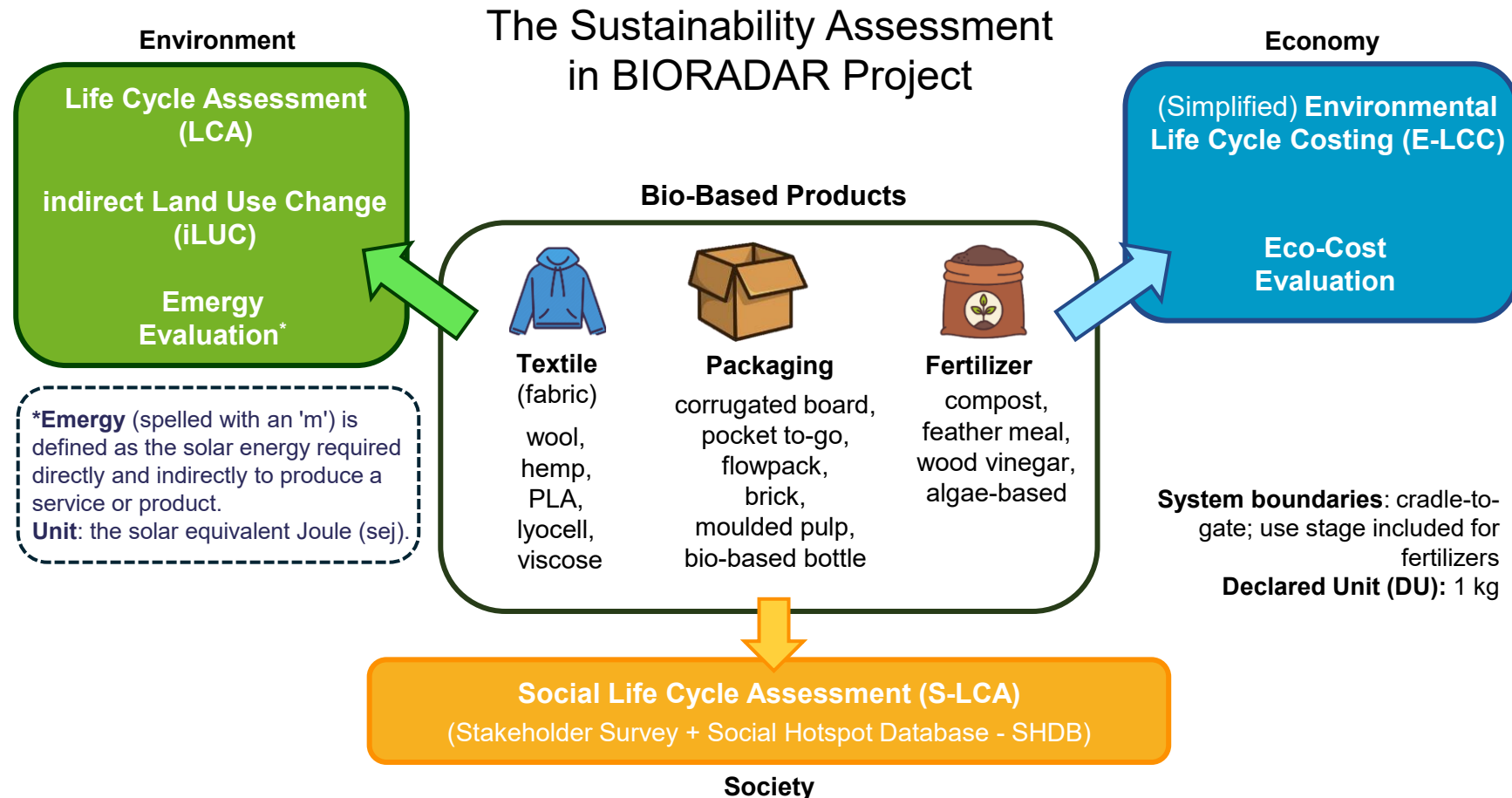
End: June 2026

WP1: *Identifying and Assessing Sustainability aspects (Environmental, Economic, Social) of Industrial Bio-based Systems and embedding them into BTI* Framework*

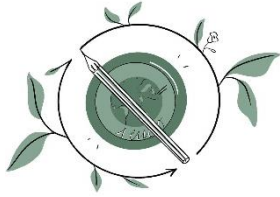
Lead: Next Technology Tecnotessile - NTT

Scope: Integrated sustainability assessment of bio-based products

Sectors: Textile, Packaging, Fertilizers



Eco-Design



Eco-design is the approach of **designing products and processes** with a focus on **minimizing environmental impact** throughout their entire lifecycle – from raw material extraction to production, use, and end-of-life management.

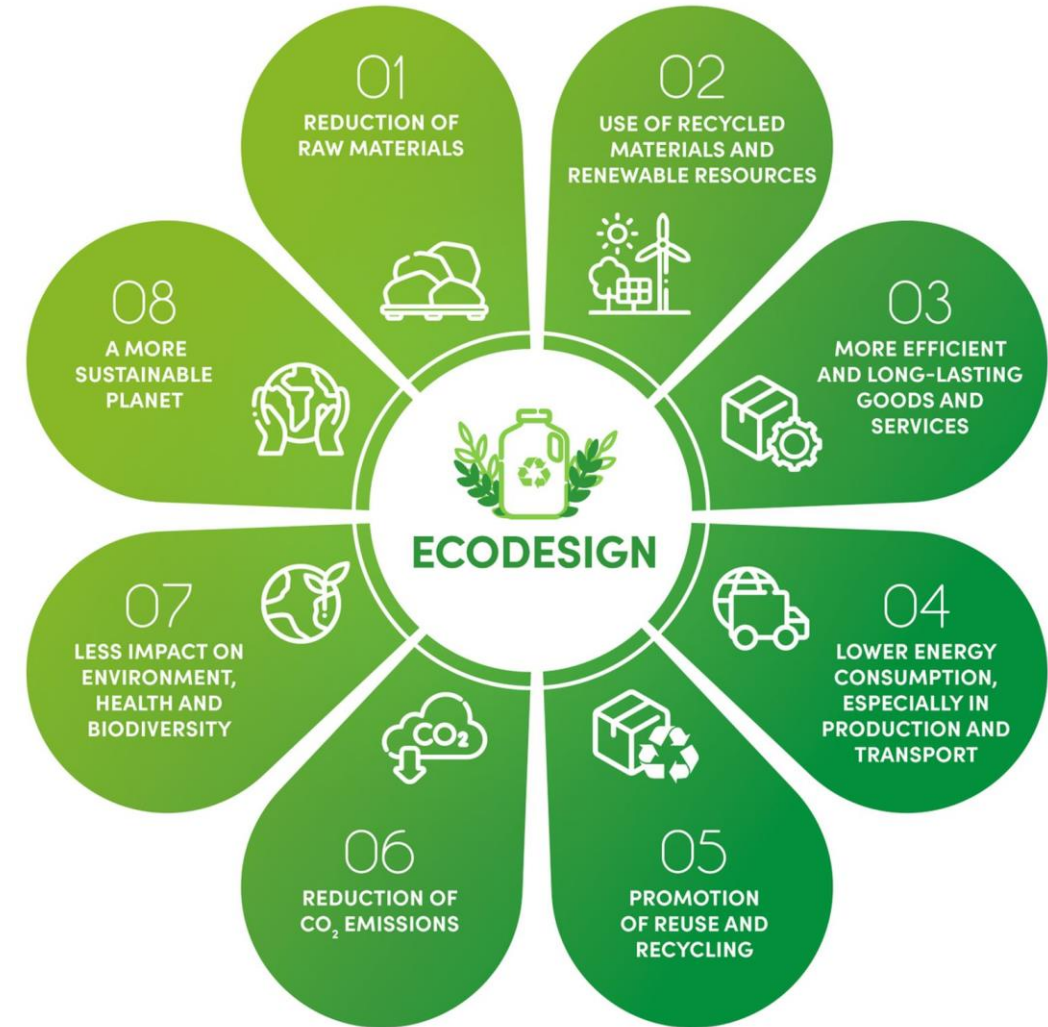
Main Objectives:

- Reduce energy and resource consumption
- Use sustainable and recyclable materials
- Extend product lifespan and improve durability
- Minimize waste generation and emissions
- Facilitate reuse, repair, and recycling

Key Results:

- Lower environmental footprint
- Improved efficiency and reduced costs over time
- Increased product sustainability and market value
- Higher compliance with environmental standards

*Eco-design has become a **crucial requirement in many European projects**, as the EU strongly promotes **sustainable innovation**. Integrating eco-design principles is now essential for supporting the circular economy and achieving the EU's long-term environmental goals.*



Eco-Design | GRAPHERGIA Project

GRAPHERGIA | *Innovative pilot lines for sustainable Graphene-based flexible and structural energy harvesting and storage devices*



GRAPHERGIA

<https://graphergia.eu/>

The GRAPHERGIA Project explores the potential of the application of graphene to shape the future of smart, **self-charging textiles** and next-generation **Li-ion batteries**.

Call: HORIZON-CL4-2022-DIGITAL-EMERGING-02

Duration: 42 months

End: March 2027

WP6: Life cycle assessment, *Sustainability analysis and Eco-design approach*

Lead: Next Technology Tecnotessile - NTT

Scope: To assess the environmental, social and economical aspects associated with the target products; To define and eco-design strategy in the technological development process

Sectors: Textile, Aerospace, Energy harvesting systems

The Demo Cases within the GRAPHERGIA project

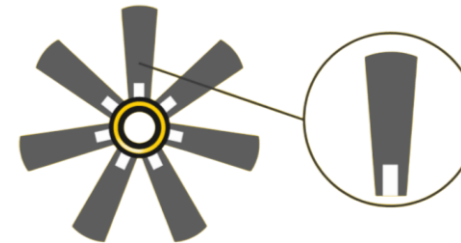
DEMO CASE #1

All-in-one self-charging textile capable of energy harvesting and storage



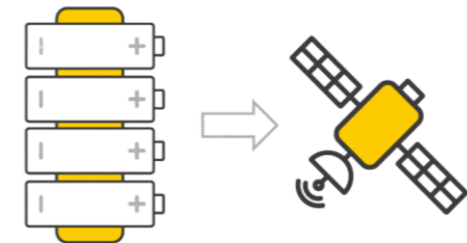
DEMO CASE #2

Self-powered structurally integrated sensor for aerospace structures



DEMO CASE #3

Advanced graphene-based LIB module prototype for space applications



Eco-Design insights suggest that solvent-free processes, such as laser-induced graphene, combined with bio-based precursors, can significantly reduce environmental impacts.



Deutsches Zentrum für Luft- und Raumfahrt e.V.



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www.tecnotex.it & www.ceq.it



<https://www.linkedin.com/company/nexttechnologytecnotessile/>



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Via Costituzione), 51015
Monsummano Terme (PT) –
Italy

Chemical R&D Team

Daniele Spinelli

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Ilaria Canesi

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Noemi Cei

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Thank you for your attention!



PLAMINPACK



Final Session: PRIMA projects in Pisa University as case studies



**SUS-
SOIL**



DIPARTIMENTO DI
SCIENZE VETERINARIE

Sergio Saia

l'esperienza dei progetti PRIMA
SHARInG-MeD e ProSmallAgriMed e del
progetto Horizon SUS-SOIL



Sergio SAIA (sergio.saia@unipi.it)

<https://linktr.ee/sergiosaia>

Project

1. **SHARInG-MeD** (PRIMA sect. 1): Soil Health and Agriculture Resilience through an Integrated Geographical information system of *Mediterranean Drylands* (**June 2023-May 2026**);
2. **PROSMALLAGRIMED** (PRIMA sect. 2): Promoting soil fertility, yield and income in smallholder agriculture of semiarid and arid Mediterranean regions by management of beneficial soil microbiota, conservation agriculture and intercropping (**June 2021-May 2025**) – **Jointly with I. Terracciano (CREA-CI)**;
3. **SUS-SOIL** (Horizon Europe): Sustainable Soil and Subsoil health promotion by implementing agroecological land use and management to enhance ecosystem services delivery for society (**Oct 2024-Sept 2028**);





SHARInG-MeD

Grant agreement number 2211 of 12/05/2023
*Research and Innovation Action funded under the
PRIMA-MED 2022 Topic 1.2.1*



Soil **H**ealth and **A**griculture **R**esilience through an **I**ntegrated
Geographical information system of **M**editerranean **D**rylands



<https://linktr.ee/sharingmed>

Sergio Saia and the SHARInG-MeD consortium

University of Pisa (UNIPi)



The PRIMA programme is supported under Horizon 2020 the European Union's Framework Programme for Research and Innovation.

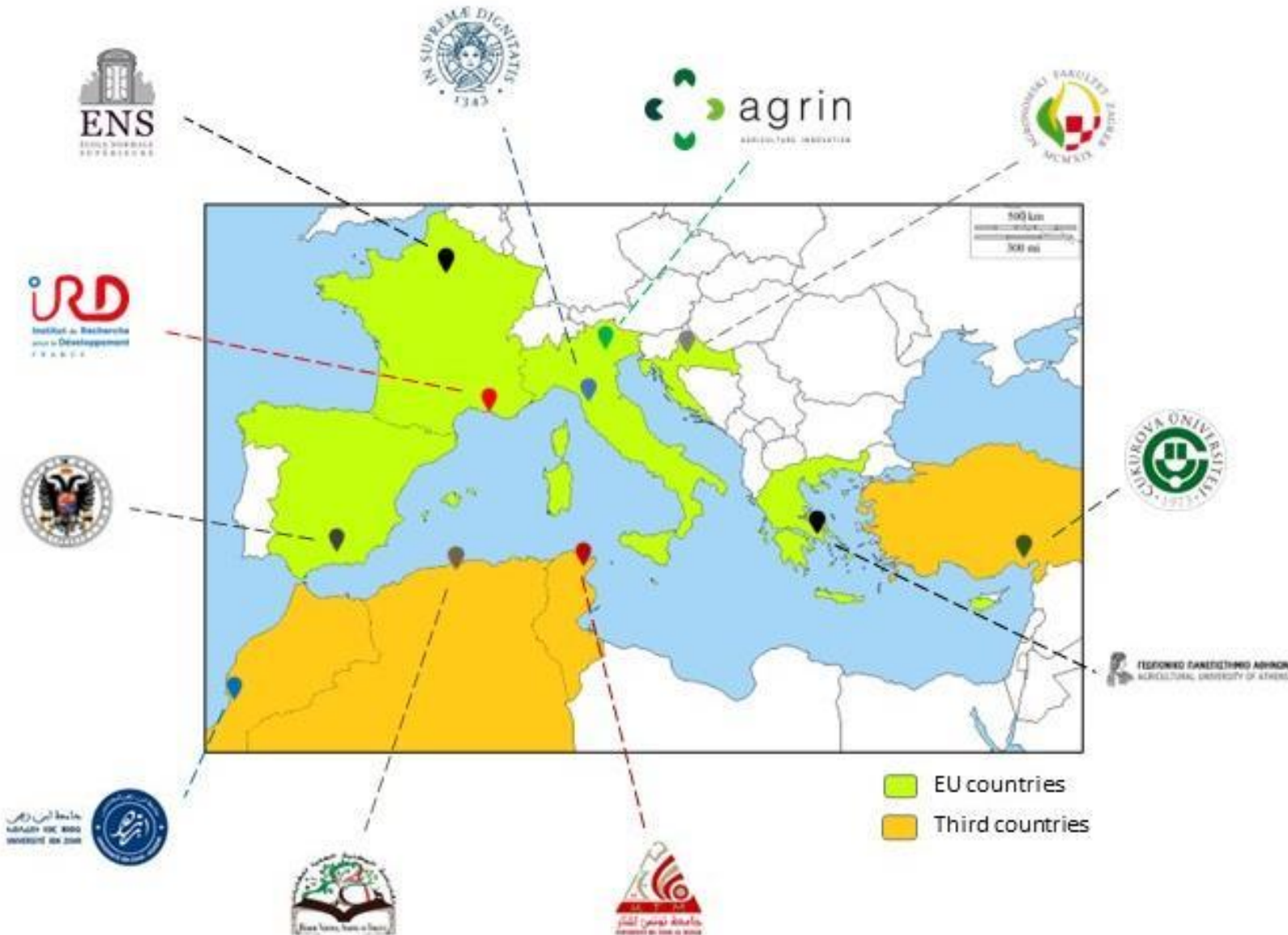


PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA



Consortium

1. Università di Pisa (UNIPi) - Italy
2. Agrin Soc. Cons. A R.L. (AGRIN) - Italy
3. University of Tunis El Manar (UTM-FST) - **Tunisia**
4. Çukurova University (CU) - **Turkey**
5. Agricultural University of Athens (AUA) - Greece
6. Faculty of Agriculture, University of Zagreb (FAZ) - Croatia
7. Ecole Nationale Supérieure des Forêts (ENSF) - **Algeria**
8. Universidad de Granada (UGR) - Spain
9. Ibn Zohr University (UIZ) - **Morocco**
10. Institut de Recherche pour le Développement (IRD) - France



High share of agriculture use of the total land

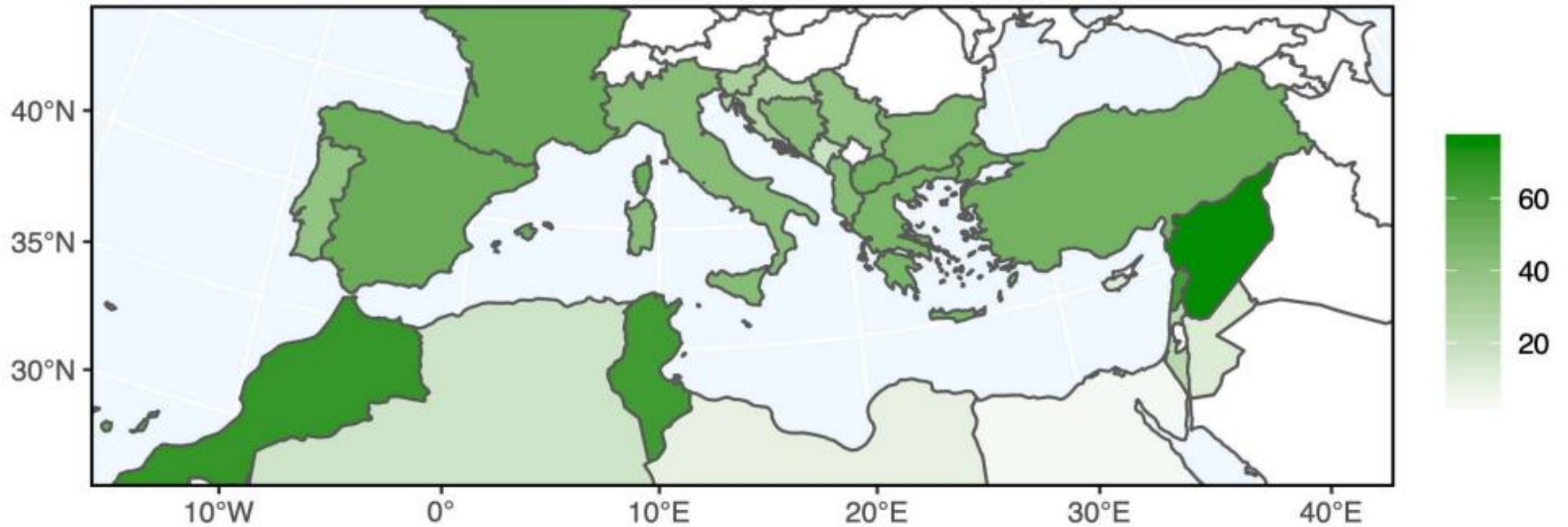


Figure 3.13 | Total agricultural land in the Mediterranean countries in 2016 (% with respect to the total land at country scale). Source: World Bank (accessed February 2020).

High need of food import

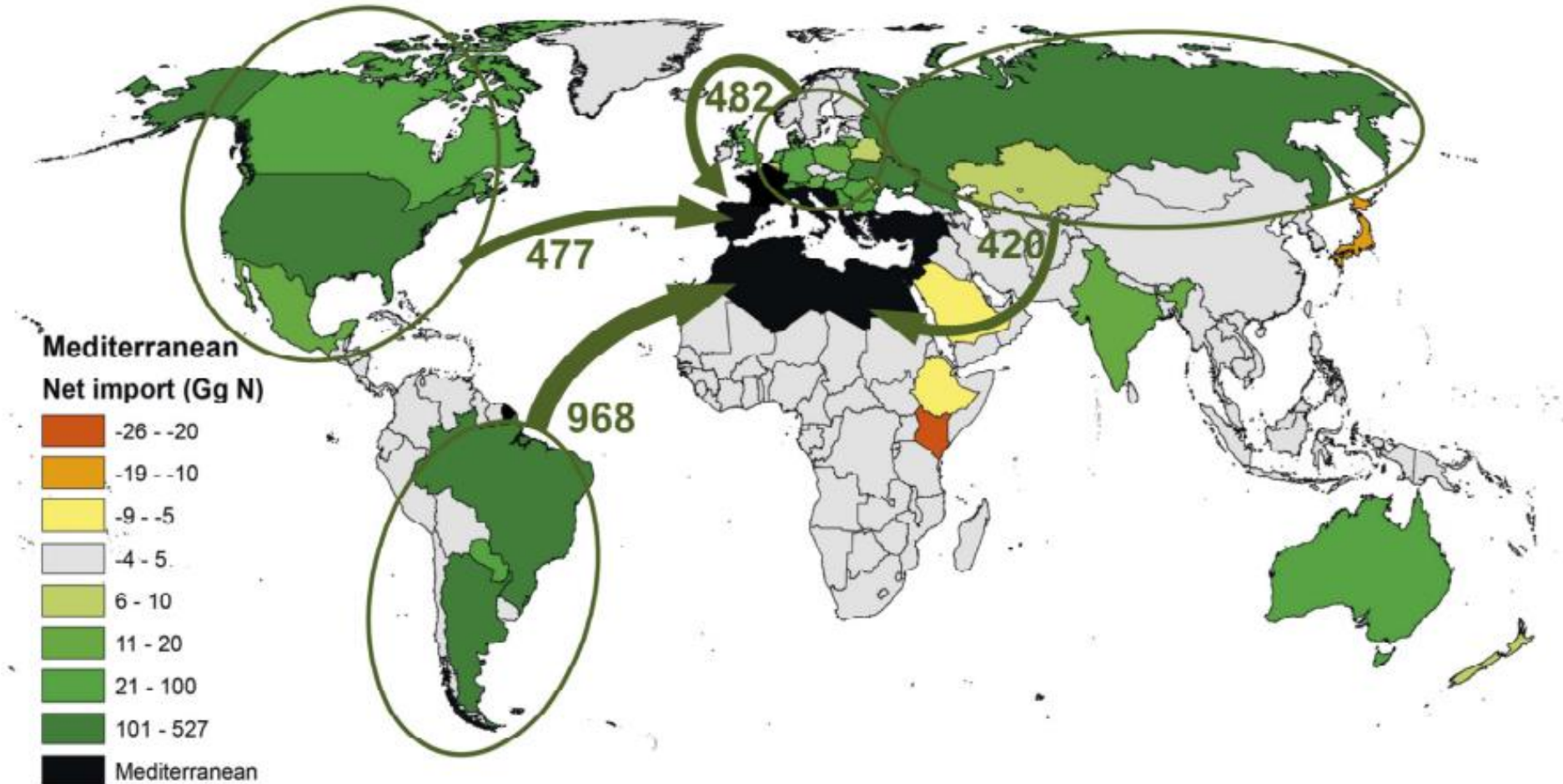


Figure 3.18 | Net protein fluxes (Gg N) of food and feed imported to the Mediterranean regions from the other countries in 2009. Green countries are net N exporters to the Mediterranean. Yellow/red countries are net N importing from the Mediterranean. Fluxes below 50 Gg N are not represented (adapted from Sanz-Cobena et al. 2017).

Temperature increase related to yield reduction

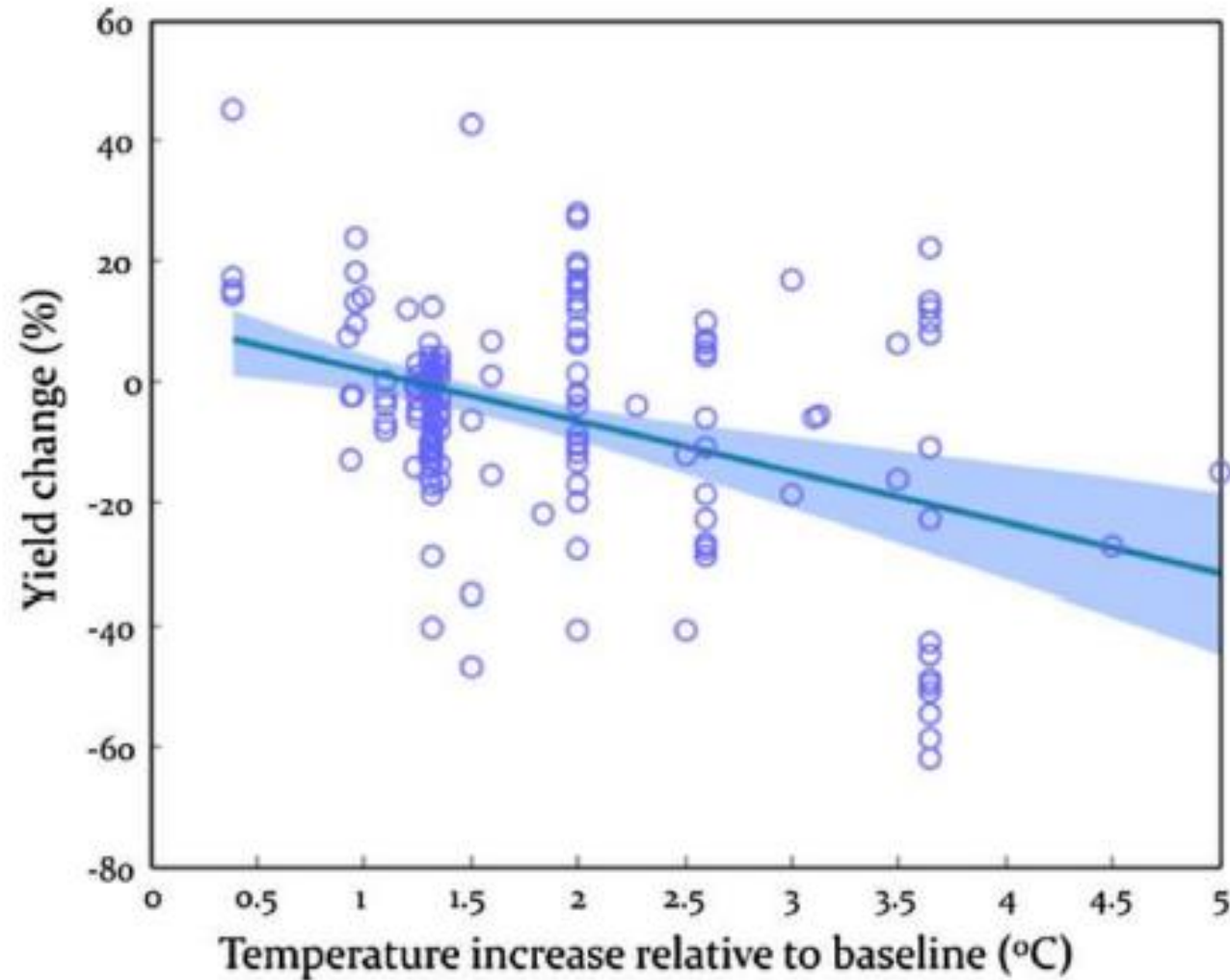
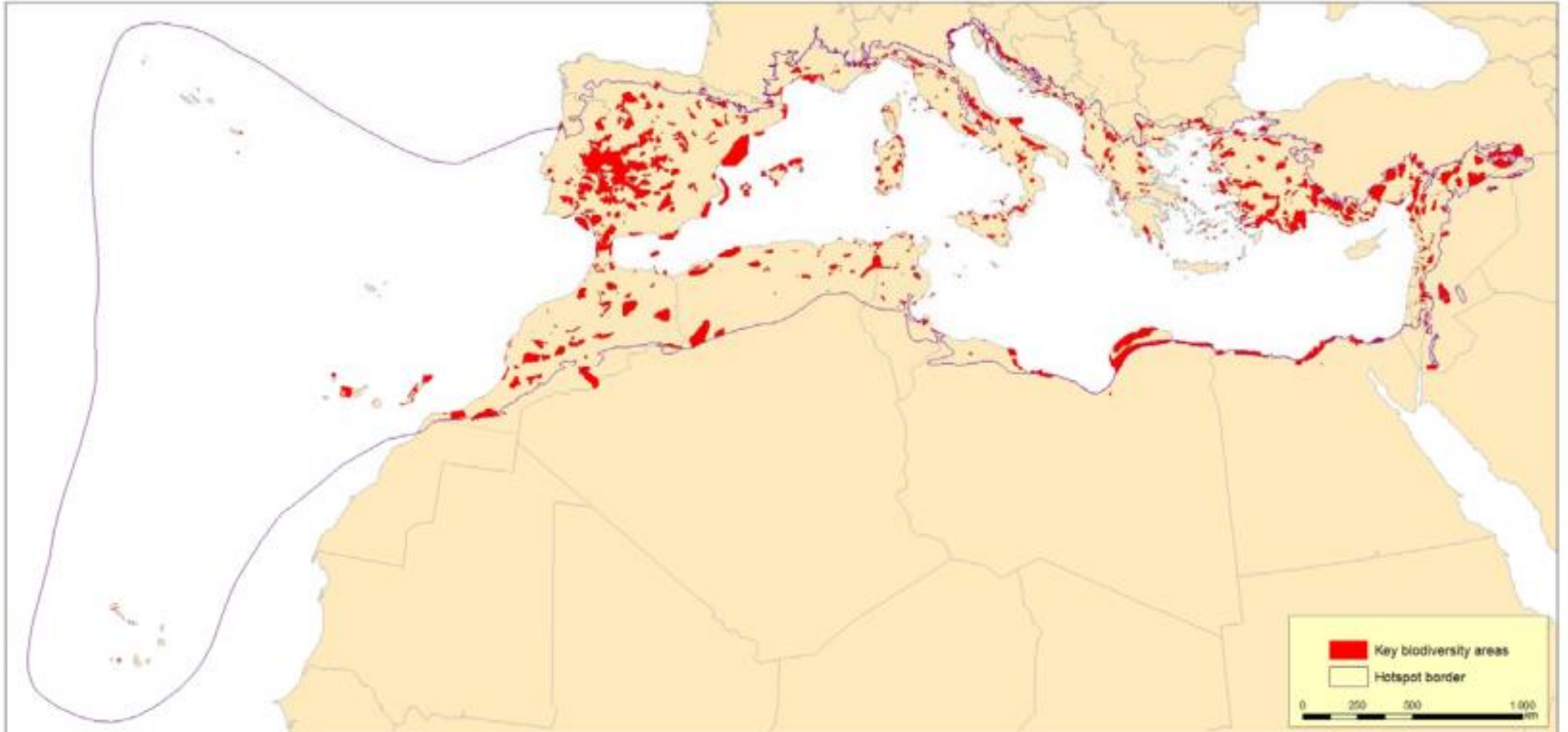


Figure 3.21 | Crop yield changes in the MENA region based on a meta-analysis of 16 different studies (Waha et al. 2017).

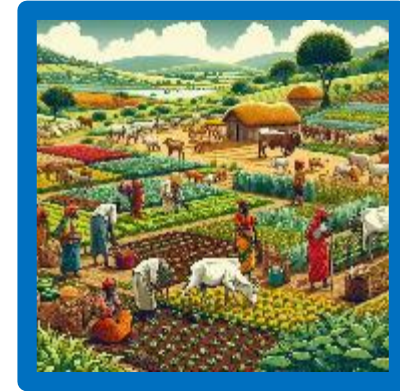
High biodiversity, but under threat

Figure 3. Map of Key Biodiversity Areas in the Mediterranean Basin Hotspot



General aim:

- Providing tools for
 - policy makers,
 - general population
 - and farmers
- to increase the rural development (with emphasis to the agriculture production) and farmer's profit
 - while improving soil health
 - and reducing the environmental impact of agriculture
- increase the agriculture sustainability by informing stakeholders (policy-makers, scientists, high school students, university students, farmers, soil end-users, etc.) on the use of and relationships among these indicators

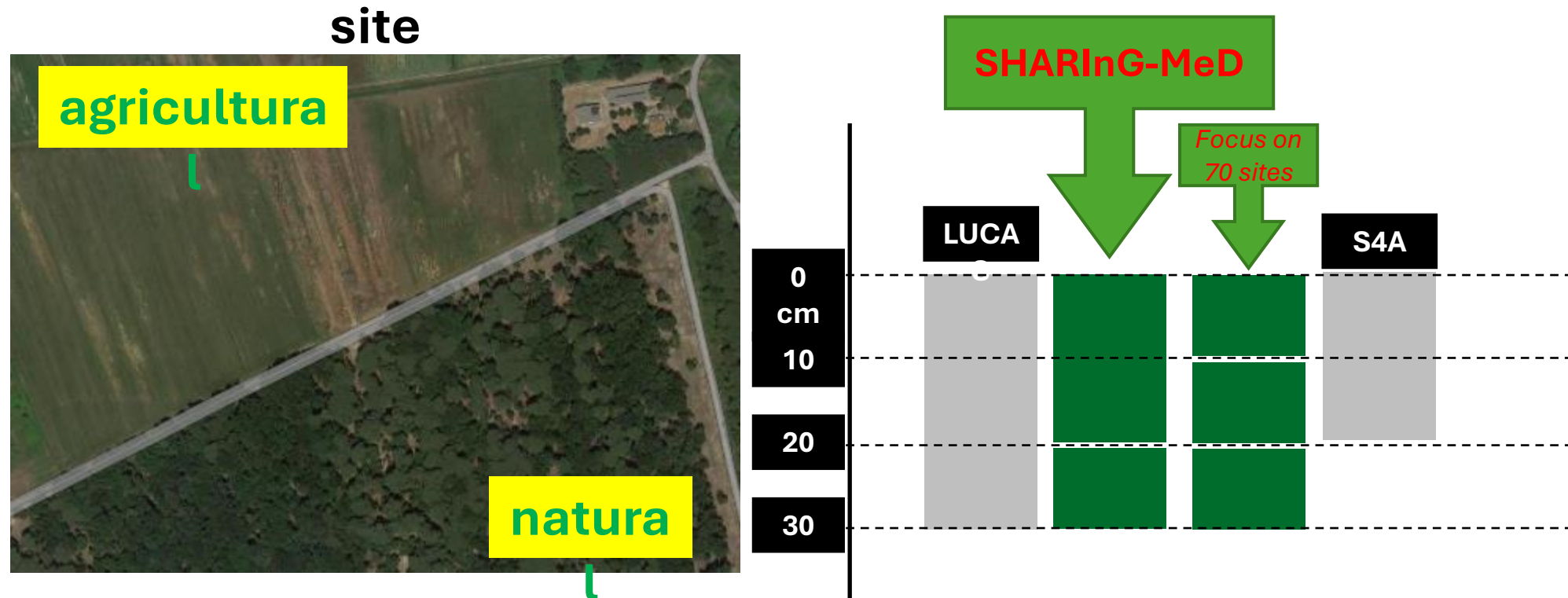


To do so, we will:

- **build a standardized soil monitoring scheme to integrate**
 - **physico-chemical** (SOC, SIC, pH, minerals, BD, texture, etc.)
 - **Biological** (Bacteria, Fungi, Nematodes, Soil invertebrates, weed flora)
 - **Agronomic** (crop yield and N turnover in the soil-plant-insect-soil system)
 - **Economic indicators (at NUT-3 and field level)**
 - **environmental indicators (at NUT-3 and field level)**
- 1. **Studying the role of Land Use and Land Use Change (LULUC) on soil properties**
- 2. **Analysing key soil improving management practices:**
 1. *Conservation agriculture*
 2. *Organic fertilization*
 3. *Beneficial microbes*

Standardise 2 strategies (from European community and Africa)

1. In each site at least 2 contrasting and PAIRED land uses according to the Corine land use system classification (CLC), one of which arable (CLC 2.1.x).
2. In each land use, according to 2 strategies: **JRC-LUCAS** and **Soil4Africa(S4A)**

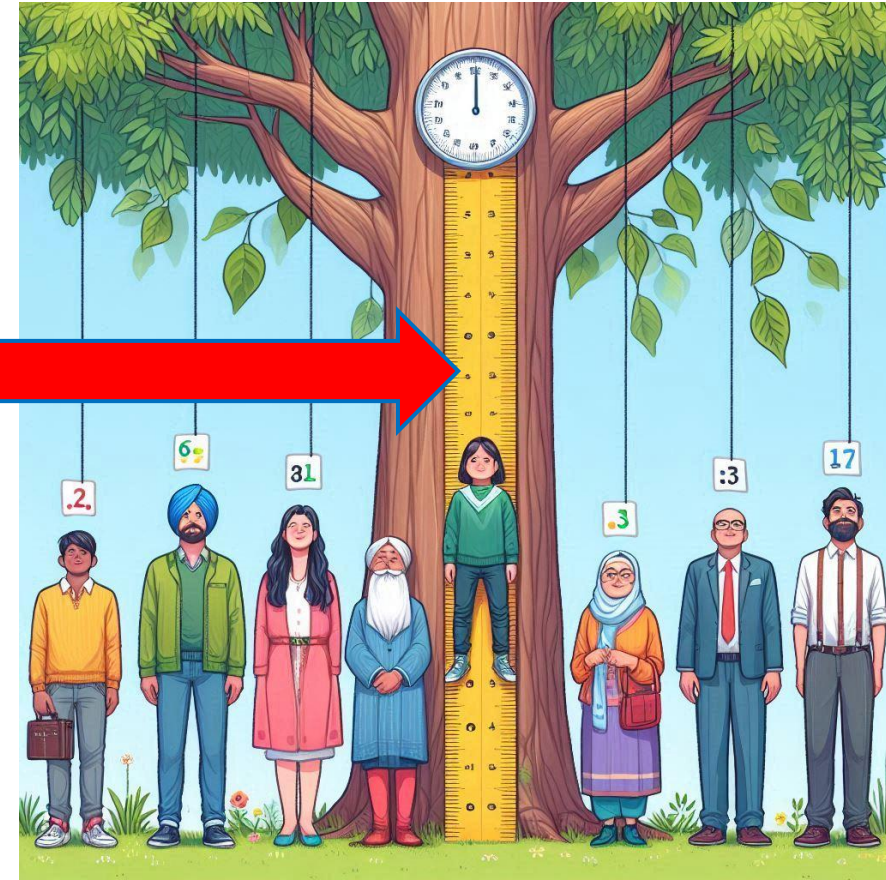


ADDITIONAL AIM (1):

- Harmonising the strategies of measurements of the soil status in North Africa and Southern Europe: *policy maker across the Mediterranean area should have comparable data to provide regulations*
- **providing a tool for the harmonization**
- while taking into account the FAO definition of the soil health, providing a tool to produce a soil health index tailored to each specific environment, and National conditions

SHARInG-MeD

National tools



Also, their impact can be from the plot to the global scale (especially the land use change)



Surface area [m ²]	10 ⁻⁶	10 ⁻²	10 ²	10 ⁴	10 ⁷	10 ¹⁰	10 ¹²	10 ¹⁴
Object of reference	particle	plot			catchment		continent	
		aggregate		farm		region		
		pedon			landscape			globe
Descriptive term	"Micro-scale"				"sub-regional"		"sub-continental"	
			"local"		"regional"			"global"
Driver of SOC storage								
							Climate	
							Topography	
							Vegetation	
							Microorganisms/Fauna	
							Soil physico-chemistry	Parent material
							Texture	
							Land-use and management	
Indicator								
							Elevation/MAT/MAP	
							Slope / Curvature / TWI	
							Vegetation type / biome	
							Microbial biomass	
							Ca, Mg Fe, Al, Si, aggregate content	
							SSA, clay mineralogy	Soil type
							Management intensity	
							Land-use class	
							Silt+clay content	

Why these practices?

Efficient in C sequestration

In reducing soil loss and fuel use, and improving the farmer's profit

Organic amendments vs mineral fertilizers

Organic amendments

Perennial crops/orchards

Agroforestry

Perennial energy crop

Crop residue retention

Cover crops

No/reduced tillage

Mineral fertilization

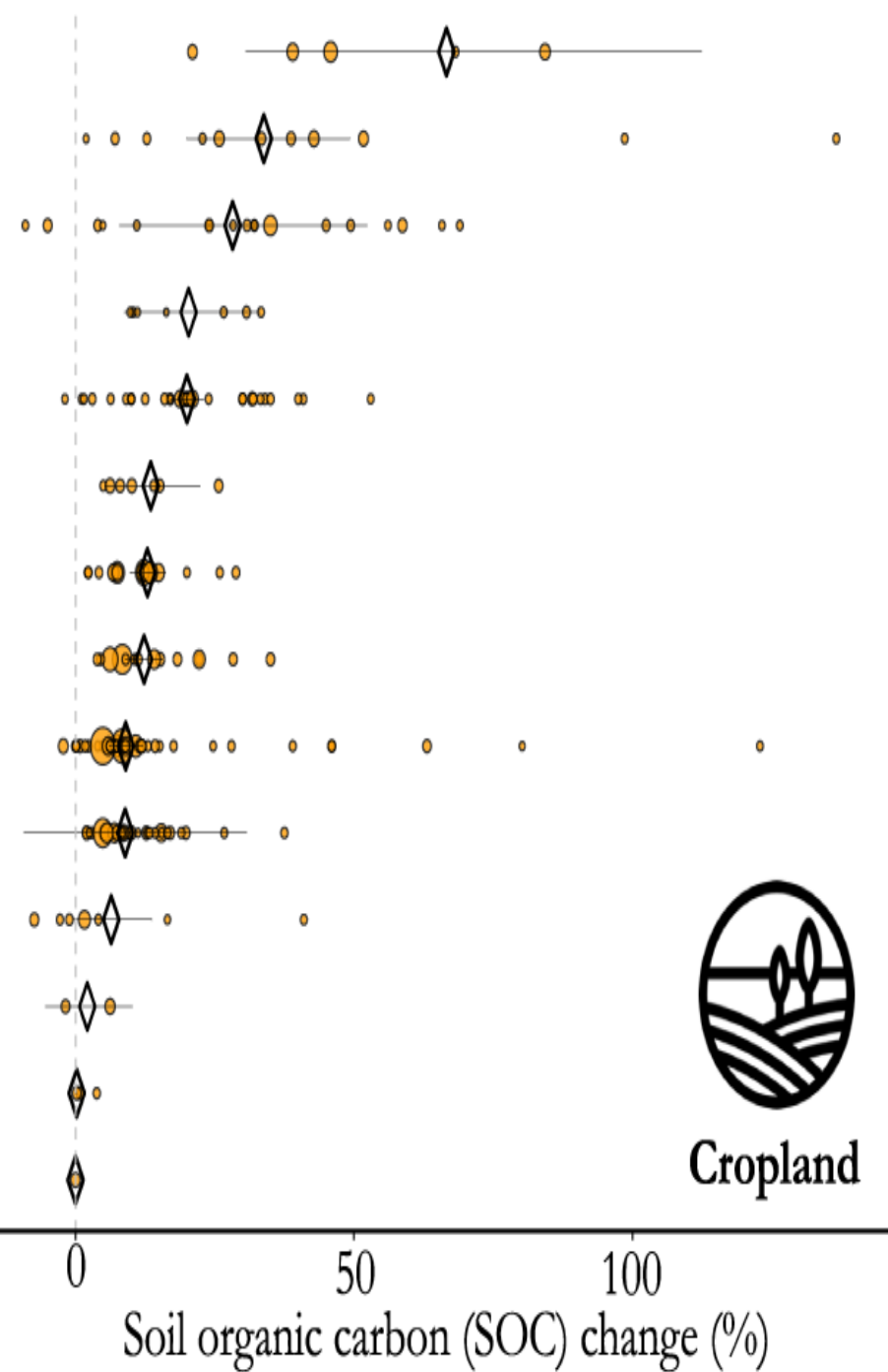
Crop rotation

Plastic film mulching

Species mixture

Liming

Biochar



Proposal

- For projects (EU, local, national, public and private)makers,
- For policy makers
- For farmers, and the general population, the high school managers, etc.
- to join in common dissemination and experimental activities on the soil health and agricultural resilience
- Exchanging data and information
- Performing common experiments
- Organizing common event for

If your productive or experimental field (especially long-term experiments) fit our aim (paired land uses or one of our management techniques), we can also sample soils and jointly create lighthouses of soil health and agricultural resilience.

Write to

sharingmed [AT] vet.unipi.it

or

sergio.saia [AT] unipi.it

[AT] = @

Follow the SHARInG-MeD activities

-  Linktree <https://linktr.ee/sharingmed>
-  YouTube <https://www.youtube.com/@sharingmed>
-  Instagram https://www.instagram.com/sharingmed_prima/
-  Twitter <https://twitter.com/sharingmed>
-  Facebook <https://www.facebook.com/SHARInGMeD>
-  LinkedIn <https://www.linkedin.com/company/sharingmed/>
-  Telegram <https://t.me/sharingmed>





SUS-
SOIL

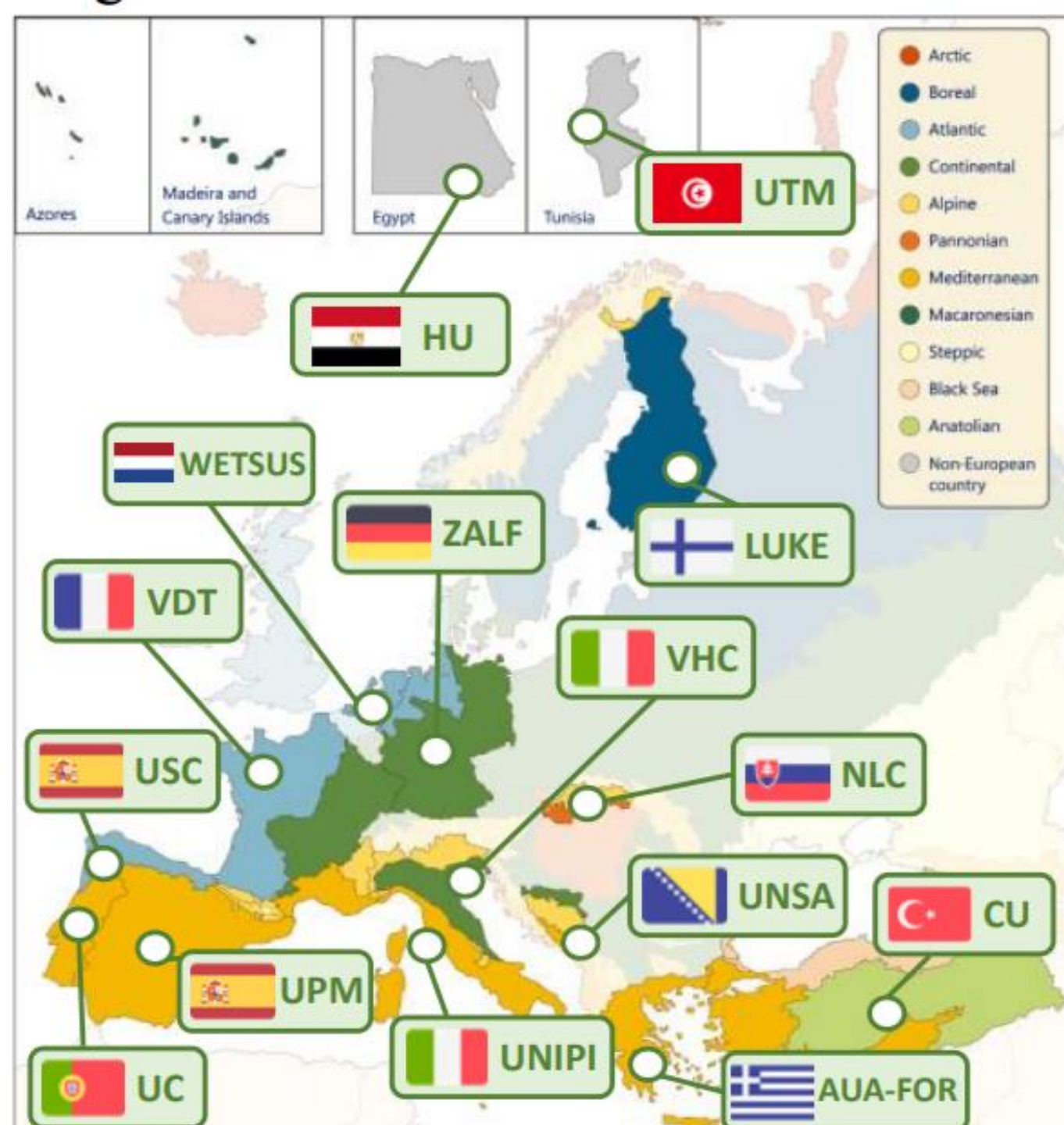
List of Participants

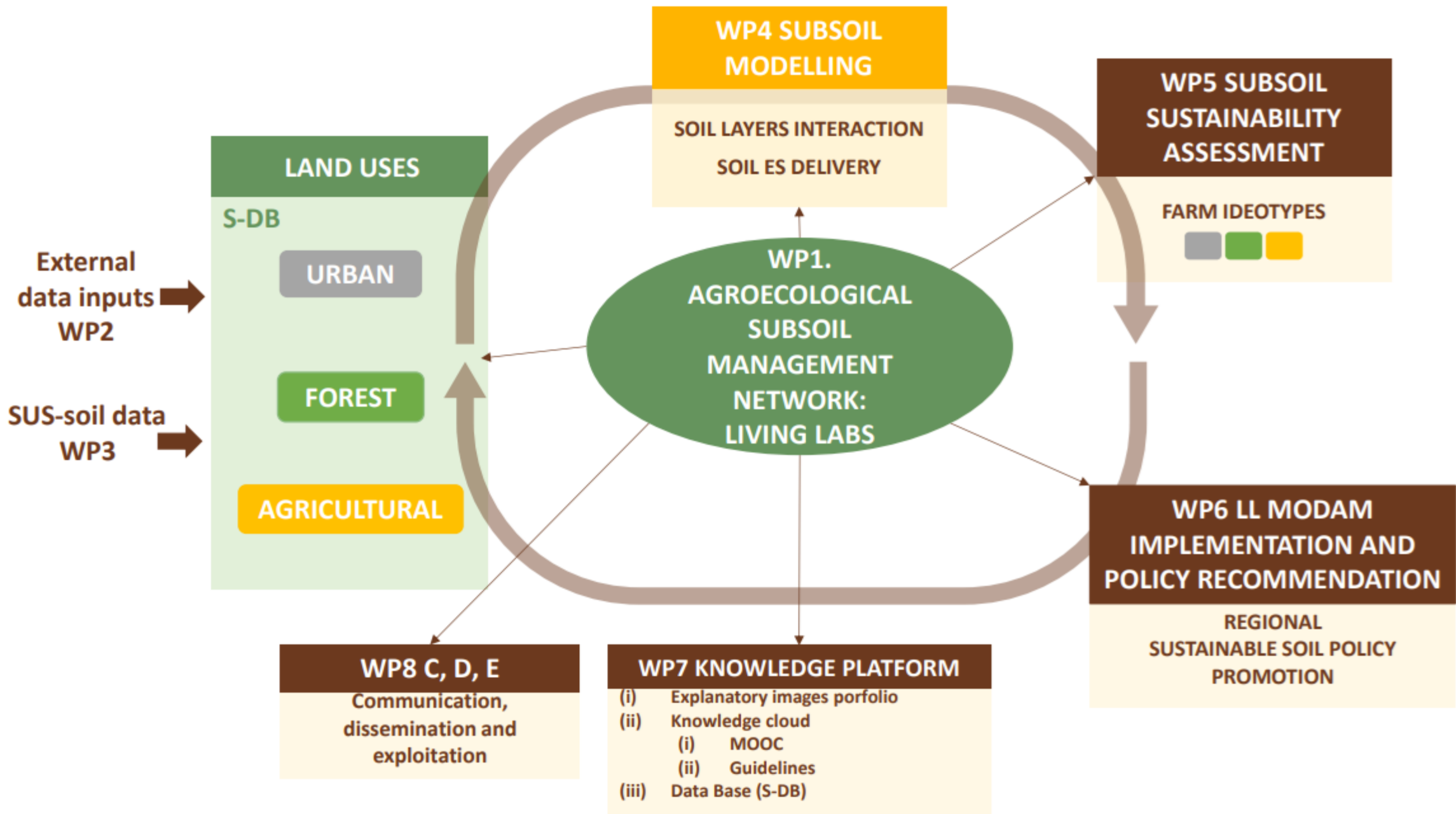
PARTICIPANTS					
Grant Preparation (Beneficiaries screen) — Enter the info.					
Number	Role	Short name	Legal name	Country	PIC
1	COO	USC	UNIVERSIDAD DE SANTIAGO DE COMPOSTELA	ES	999829635
2	BEN	CARM	REGION DE MURCIA	ES	997703492
3	BEN	ZALF	LEIBNIZ-ZENTRUM FUER AGRARLANDSCHAFTSFORSCHUNG (ZALF) e.V.	DE	999465885
4	BEN	UC	UNIVERSIDADE DE COIMBRA	PT	997826391
5	BEN	UNIPi	UNIVERSITA DI PISA	IT	999862712
6	BEN	UTM	UNIVERSITE DE TUNIS EL MANAR	TN	996621360
7	BEN	AUA	GEOPONIKO PANEPISTIMION ATHINON	EL	999872218
8	BEN	UNSA	UNIVERZITET U SARAJEVU	BA	995549995
9	BEN	UDC	UNIVERSIDADE DA CORUNA	ES	999629718
10	BEN	UPM	UNIVERSIDAD POLITECNICA DE MADRID	ES	999974844
11	BEN	LIFEWATCH ERIC	E-SCIENCE EUROPEAN INFRASTRUCTURE	ES	909022018

PARTICIPANTS					
Grant Preparation (Beneficiaries screen) — Enter the info.					
Number	Role	Short name	Legal name	Country	PIC
			FOR BIODIVERSITY AND ECOSYSTEM RESEARCH		
12	BEN	NLC	NARODNE LESNICKE CENTRUM	SK	998675238
13	BEN	VER DE TERRE	VER DE TERRE PRODUCTION	FR	892569363
14	BEN	VHC	VENETIAN CLUSTER SRL	IT	942750955
15	BEN	LUKE	LUONNONVARAKESKUS	FI	934887262
16	BEN	PEFC	PROGRAMME FOR THE ENDORSEMENT OF FOREST CERTIFICATION SCHEMES ITALIA	IT	942614185
17	BEN	FEUGA	FUNDACION EMPRESA UNIVERSIDAD GALLEGA	ES	951915806
18	BEN	CIHEAM-IAMB	CENTRO INTERNAZIONALE DI ALTISTUDI AGRONOMICI MEDITERRANEI	IT	999870375
19	BEN	CU	UNIVERSITY OF CUKUROVA	TR	999851072
20	BEN	SENSEEN	SENSEEN	FR	893018376
21	BEN	WETSUS	STICHTING WETSUS, EUROPEAN CENTRE OF EXCELLENCE FOR SUSTAINABLE WATER TECHNOLOGY	NL	990414039
22	BEN	HU	HELIOPOLIS UNIVERSITY ASSOCIATION	EG	967838453
23	AP	A CARQUEIXA	S.C.G A CARQUEIXA	ES	908953730
24	AP	AFG	Asociación Forestal de Galicia	ES	951241947

SUS-SOIL

Develop a set of 15 Subsoil-Living Labs (LLs) to inventory, analyse and benchmark different land uses and management and their impacts on the subsoil spatial variations and dynamics to best combine the sustainable practices in rural and urban areas within a global regional context.





MAIN OUTCOMES

1. Develop a subsoil/soil monitoring database (S-DB) able to be interoperable with the LUCAS and ESDAC databases
2. The analysis long-term ASM land use and management of 3 relevant types of soil per LL and the relationship with rural and urban ecosystem services delivery including modelling
3. Develop a set of farm idiotypes per LL mixing the ASM best practices as an alternative to conventional systems to enhance the ecosystem services provision at regional level for citizens through
4. A Subsoil Decision Support Tool (S-DST) considering soil degradation and relevant business models and propose
5. Subsoil policy strategy framework to foster ASM best practices

Channel	Link
Webpage	www.sus-soil.eu
Twitter (X)	https://x.com/SUSSOIL
LinkedIn	https://www.linkedin.com/company/sus-soil/
Facebook	https://www.facebook.com/SUSSOIL
Youtube	https://www.youtube.com/@sus-soil
Zenodo	To be created





“

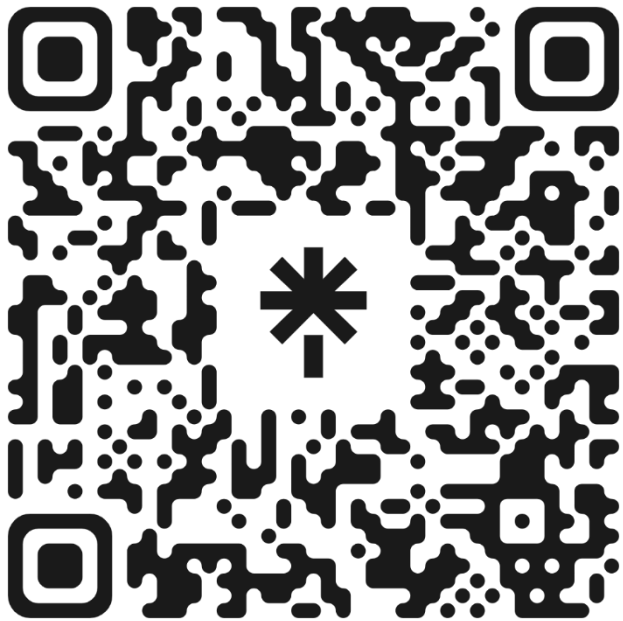
Agro-SALUTE

un laboratorio vivente che promuove soluzioni sostenibili integrando agricoltura, allevamento e ambiente naturale e urbano, con il coinvolgimento di comunità, ricercatori e istituzioni per migliorare resilienza, produttività, profitto e biodiversità e costruire insieme il futuro dei nostri territori

”

Agro-SALUTE: Agroecologia Sostenibile,
ALlevamenti, suoli Urbani ed ecosistemi Terrestri
per ricercare insieme modelli che favoriscano **sostenibilità,**
profitto e resilienza in 🌱 Agricoltura 🌳 Foreste 🏙️ Città
resilienti, profittevoli e sostenibili!

<https://linktr.ee/agrosalute>



Contatti: **sergio.saia** [rimuovere questo e
aggiungere @] **unipi.it**

Iscrizione

- **Agro-SALUTE: il nuovo spazio di collaborazione (living lab) per un'agricoltura più sana, sostenibile e innovativa**
 - Agro-SALUTE riunisce **agricoltori, allevatori, imprenditori della filiera agro-alimentare e agro-energetica, agronomi, tecnici, ricercatori, studenti, giornalisti, cittadini e decisori pubblici** per innovare insieme le pratiche agricole e ambientali.
 - Agro-SALUTE mira ad ottenere sistemi di 🌱 Agricoltura 🌳 Foreste 🏡 Città resilienti, profittevoli e sostenibili!
 - Un'iniziativa finanziata dal progetto **SUS-SOIL** e supportata dal progetto **SHARInG-MeD**, già attiva in diverse regioni italiane.
 - Trovate il form di iscrizione
 - sia nel sito del nostro dipartimento 🖱️ <https://www.vet.unipi.it/living-lab-agrosalute/>,
 - sia nel sito dell'Università di Pisa 🖱️ <https://www.unipi.it/avvisi/living-lab-agro-salute/>.
-
- **Qualora interessati, oltre a compilare il google form: <https://bit.ly/agrosalute>**
 - Vi preghiamo ***inoltre*** di compilare e firmare la lettera d'intenti allegata e reinviarla a **Sergio Saia** e mettendo in cc i dottori **Angeletti e Di Gregorio** (mail sergio.saia@unipi.it; milos.digregorio@vet.unipi.it; francesco.angeletti@phd.unipi.it; francesco.angeletti@vet.unipi.it)

Opportunità

- **Collaborazioni in azienda** per sperimentazioni, prove in campo e valutazioni pratiche
- **Scambio di esperienze e buone pratiche** con una rete nazionale
- **Accesso a una comunità in crescita** impegnata nella sostenibilità

Agricoltori e Allevatori

- Analisi GRATUITE del suolo e delle granelle, foraggi e biomasse (finanziate dai progetti SUS-SOIL e SHARInG-MeD)
- Migliorare la **fertilità del suolo** e ridurre i costi di produzione
- Avere supporto per **sperimentazioni dirette in azienda**
- Adottare tecniche sostenibili che aiutano **profitto, produttività e resilienza climatica**
- Entrare in una rete di valutazione della relazione tra impatto ambientale, impatto economico e servizi ecosistemici delle aziende, a scala regionale e nazionale

Imprenditori della filiera agro-alimentare e agro-energetica

- Accedere a dati scientifici utili per **innovare prodotti e processi**
- Conoscere nuove pratiche di gestione sostenibile con valore competitivo
- Trovare partner per **progetti innovativi** o per nuove catene del valore

Agronomi, consulenti e altri professionisti

- Ottenere **analisi del suolo e dei vegetali dettagliate**
- Aggiornarsi su tecniche sperimentate sul campo
- Entrare in una rete di collaborazione scientifico-professionale

Politici e Amministratori Pubblici

- Disporre di **dati reali e aggiornati** per politiche territoriali su suolo, ambiente e agricoltura
- Avere contatti diretti con imprese e ricercatori per **costruire strategie basate su evidenze**
- Promuovere iniziative che generano **benefici ambientali, economici e sociali**

Ricercatori e studenti

- Accedere a **campioni, dati e contesti reali** per attività di ricerca
- Collaborare con aziende agricole per sperimentazioni e validazioni
- Contribuire a un network nazionale con forte impatto scientifico
- *(per gli studenti, qualora minori di 18 anni di età, sarà richiesta autorizzazione dei genitori o del tutor legale)*

Popolazione generale / cittadini / giornalisti e altri professionisti della comunicazione

- Ottenere informazioni
- Sostenere un'agricoltura che tutela **salute, ambiente e qualità del cibo**
- Partecipare ad attività divulgative e conoscere il valore del suolo
- Contribuire allo sviluppo di comunità più sostenibili

Informazioni sul Living Lab

- Il Living Lab Agro-SALUTE è diretto dal **prof. Sergio Saia** (Agronomia e Coltivazioni Erbacee). Opera in **Toscana** per il progetto SUS-SOIL e a **scala nazionale** grazie al progetto SHARInG-MeD, che ha già raccolto campioni di suolo in: Sicilia, Puglia, Marche, Toscana, Umbria, Lazio, Lombardia.
- Fondato il **13/05/2025** (delibera 209, Consiglio del Dipartimento di Scienze Veterinarie, Università di Pisa).



Temi chiave

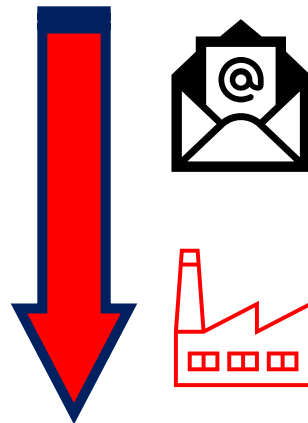
- **Integrazione Sostenibile Colture-Allevamenti**
- **Integrazione Sostenibile tra sistemi di Coltivazione e/o Allevamento ed ecosistemi naturali** [inclusa diffusione degli allevamenti e loro omogeneità spaziale]
- **Fertilizzazioni organiche e rapporto tra la gestione agricola e la fertilizzazione**
- **Sistemi conservativi e rigenerativi**
- **Diversificazione culturale**
- **Multifunzionalità, Circolarità e bilanci output/input.**
- **Sostenibilità e impatto ambientale**
- **Servizi Ecosistemici e Biodiversità**
- **Urbanizzazione e suolo**

my idea of multi-actor approach

1. Not simply making a research and innovation action (RIA) neither an innovation action (IA) with a company or a public administration;
2. Being contacted by company/public administration, to solve their needs or having scientific advices (**well, quite hard in agriculture**)
3. **Building a RIA or IA together, with their proposal to collaborate and their availability to fund;**
4. Disseminating any scientific results on both the general public (**social networks help**) and policy maker

NO

24/7



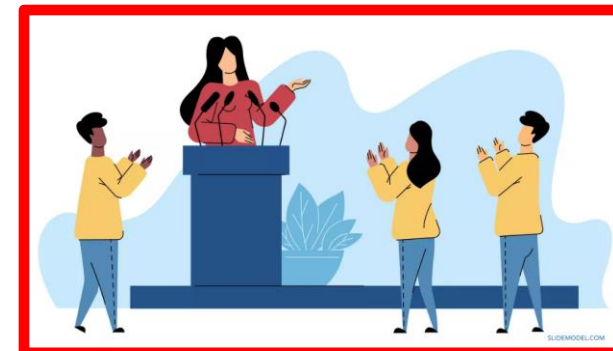
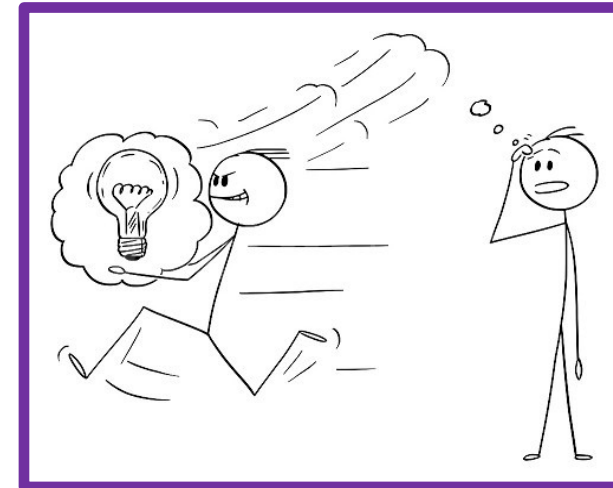
YES

Lab + public
engagement

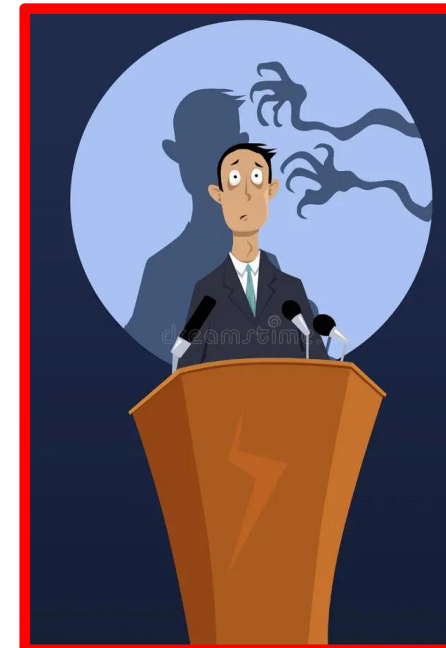
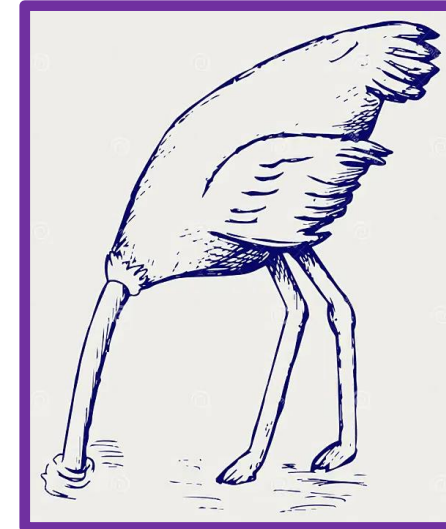


the barriers I experiment(ed) and perceive(ed) to participate in multi-actor proposals

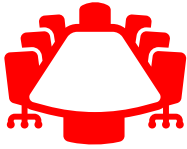
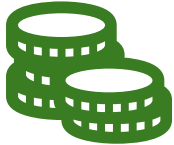
1. **Bureaucracy;**
2. Some companies don't see it as tool for their own growth, so they don't invest too much in the idea building:
 1. Big companies: **fear of an idea be "stolen"**
 2. **Small companies / farms, which are mostly needing innovation:** distance to the scientific sector
3. Many politicians and public administrators would rather the results be directly, and rapidly, profitable for their own parts;
4. **Hard to stimulate the research area to translate results in the public language (simple & straight), for the information lost during simplification;**
5. Engagement with company and policy makers requires a lot of time!!!



Images used: Aut: Irina Cheremisinova; Oleksandr Melnyk; Aleutie; Sources: Getty Images/iStockphoto; Dreamstime.com



(My) challenging points in multi-actor proposal

- **consortium formation;** 
 - Building a core group and expanding it after debate;
- **idea development;** 
 - Idea developed **irrespectively** of the calls
 - **Never** building an idea around the partners, always looking for partners fitting to the idea;
- **proposal concretion;** 
 - Look for calls (local, national, international) that may fit the idea. Horizon Europe and Prima planning help!
- **finalisation of work plan ;** 
 - The coordinator must have a clear idea of all the activities of each partner, assign it and discuss with partners for any change before the submission;
- **budget building;** 
 - With few exception, budget building depends on the person months and mean national salaries:

Follow the SHARInG-MeD activities

-  Linktree <https://linktr.ee/sharingmed>
-  YouTube <https://www.youtube.com/@sharingmed>
-  Instagram https://www.instagram.com/sharingmed_prima/
-  Twitter <https://twitter.com/sharingmed>
-  Facebook <https://www.facebook.com/SHARInGMeD>
-  LinkedIn <https://www.linkedin.com/company/sharingmed/>
-  Telegram <https://t.me/sharingmed>





**SUS-
SOIL**



DIPARTIMENTO DI
SCIENZE VETERINARIE

Sergio Saia

l'esperienza dei progetti PRIMA
SHARInG-MeD e ProSmallAgriMed e del
progetto Horizon SUS-SOIL



Sergio SAIA (sergio.saia@unipi.it)

<https://linktr.ee/sergiosaia>



PRIMA Programme for supporting the Mediterranean area: research about sustainable practises



The Fig Tree as a Strategic Crop for the Mediterranean: Insights from the AGROFIG Project

Fostering agroforestry benefits through fig tree cultivation in the Mediterranean



This project is part of the PRIMA Programme supported by the European Union

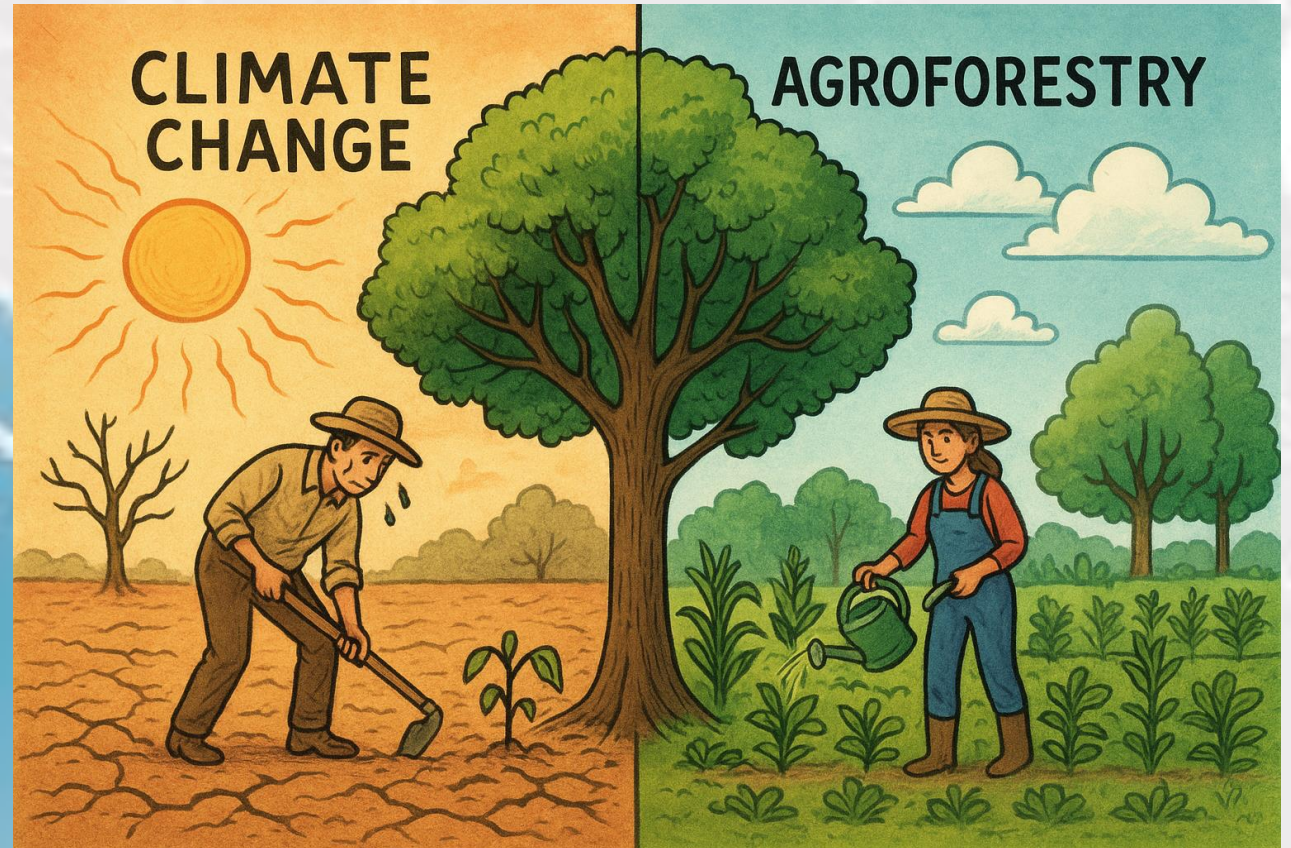
The project started on 1st June 2025 has a 36-months duration

**PLAMINPACK Training
Pisa 17th December, 2025**



Agroforestry: a promising farming system

Agroforestry is a farming system that promises to be sustainable and resilient to climate change



Why a project on the fig tree?

Valuable nutritional, nutraceutical and energetic characteristics of fig fruits



Valuable secondary metabolites produced in fruits as well as in leaves and latex



Why a project on the fig tree?

-Great ability to adapt to adverse climatic conditions such as drought and soil salinity

-Very low environmental impact



Promising as a sustainable crop in a context of **climate change** suggesting its employ in **agroforestry systems**



Ficus carica germplasm evaluation

- Low level of genetic improvement
- Populations include numerous cultivars that maintain high genetic diversity, which remains an underutilized resource.
- Germplasm characterization based on morphological and agronomic traits
- SSR markers



Ficus carica germplasm evaluation

- Low level of genetic improvement
- Populations include numerous cultivars that maintain high genetic diversity, which remains an underutilized resource.
- Germplasm characterization based on morphological and agronomic traits
- SSR markers



NEXT-GENERATION SEQUENCING TECHNOLOGIES

- population genetics
- evolutionary analyses
- trait mapping through Genome-Wide Association Studies

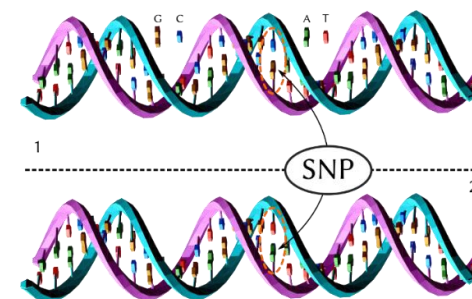


Objectives



Overall objective is promoting agroforestry systems in countries of the Mediterranean basin through the cultivation of the fig tree

- a) Test the fig tree in agroforestry systems in different **demonstration sites**
- b) Exploring and valorising the **genetic diversity** of the fig in an Italian collection, where fig genotypes suitable for agroforestry will be selected



Objectives

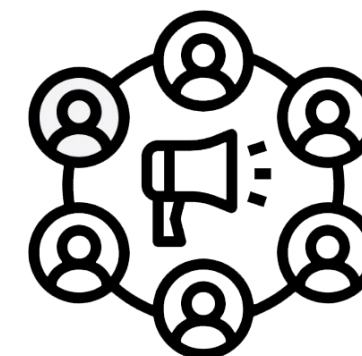


c) Promote agroforestry adoption

- organizing **living labs** with stakeholders
- establishing linkages with policy administration and market actors



d) Disseminating project's products and results to stakeholders



AGROFIG Consortium



PLAMINPACK Training
Pisa 17th December, 2025



WP2 Fig tree-based agroforestry **Demonstration Sites**

DEMONSTRATION SITES



Benefits

Farmer income

Soil fertility,

Crop yield and quality,

Environmental impact,

*Ecosystem services (soil
biodiversity conservation)*

WP2 Fig tree-based agroforestry Demonstration Sites

Soil sampling – October 2025

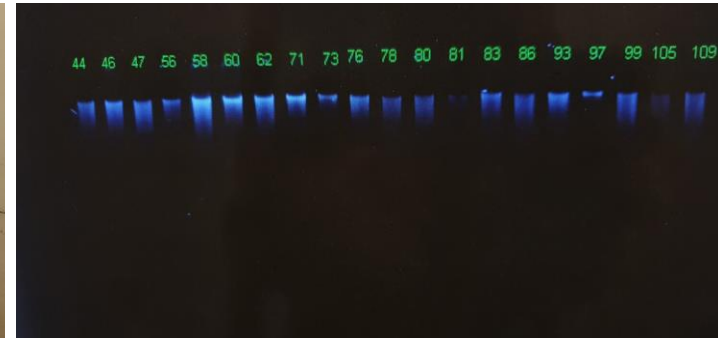


WP3 Characterization of fig genotypes from an Italian collection

Genotypic analysis : DNA extraction

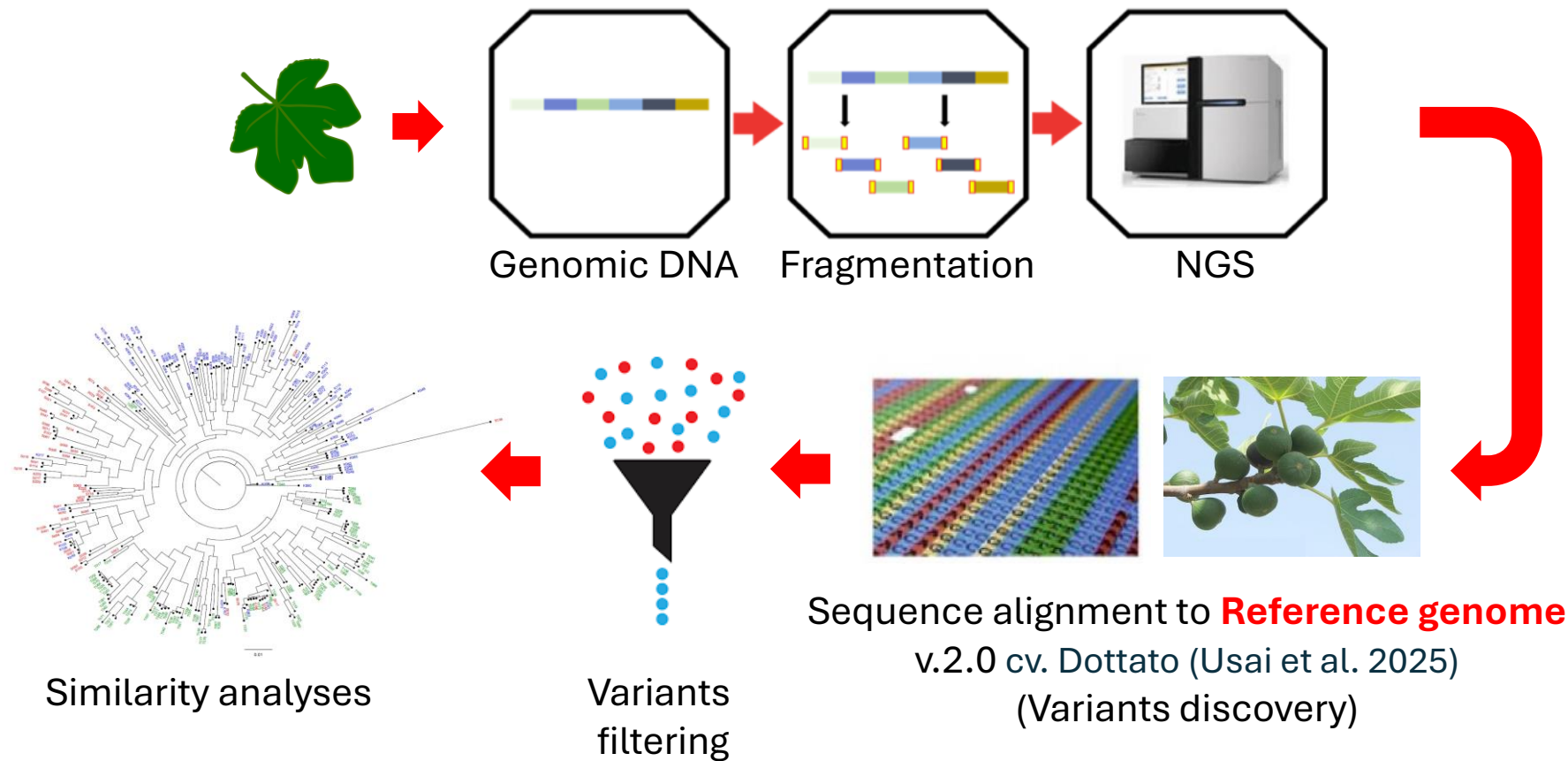
130 genotypes from
the Italian collection

«I Giardini di Pomona»
Cisternino (BR)



WP3 Characterization of fig genotypes from an Italian collection

Genotypic analysis: Whole-Genome Sequencing (WGS) approach



WP3 Characterization of fig genotypes from an Italian collection

Phenotypic analyses on fig plants

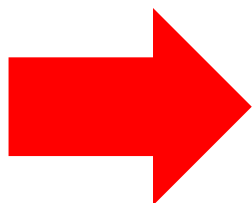
- **Qualitative traits** (kind of reproduction, harvesting date, fruit shape, fruit color, internal cavity)
- **Quantitative traits** (fruit weight, size, titratable acidity, total Soluble Solids (°Brix), firmness)



WP3 Characterization of fig genotypes from an Italian collection

Phenotypic analyses on fig plants

Catalog with a description of selected genotypes made available to stakeholders to test in **new agroforestry systems**



CORDOBIS

- | | |
|---------------------------|------------|
| 1. Productive type: | Unifera |
| 2. Harvesting date: | Medium |
| 3. Growth habit: | Spreading |
| 4. Vigor: | Medium |
| 5. Leaf predominant type: | Five-lobed |

FIGS 2021/2022

- | | |
|---------------------------------|--------------|
| 6. Attachment of stalk to stem: | Easy |
| 7. Shape: | Spherical |
| 8. Size: | Small |
| 9. Ostiole size: | Small |
| 10. Stalk length: | Medium |
| 11. Ground color of skin: | Green yellow |
| 12. Overcolor of skin: | None |
| 13. Cracking of skin: | Absent |
| 14. Ease of peeling: | Medium |
| 15. Color of pulp: | Red |
| 16. Internal cavity: | Medium |
| 17. Scratch resistance of skin: | Large |
| 18. Juiciness: | Medium |
| 19. Number of achenes: | Medium |
| 20. Weight (g): | 14,86/19,43 |
| 21. Length (mm): | 32,55/31,45 |
| 22. Width (mm): | 32,30/34,19 |
| 23. TSS (°Brix): | 15,39/25,13 |
| 24. TA (citric acid g /100g): | 0,17/0,16 |
| 25. MI (maturation index): | 91,98/168,01 |
| 26. Firmness (N/mm): | 0,31/0,41 |

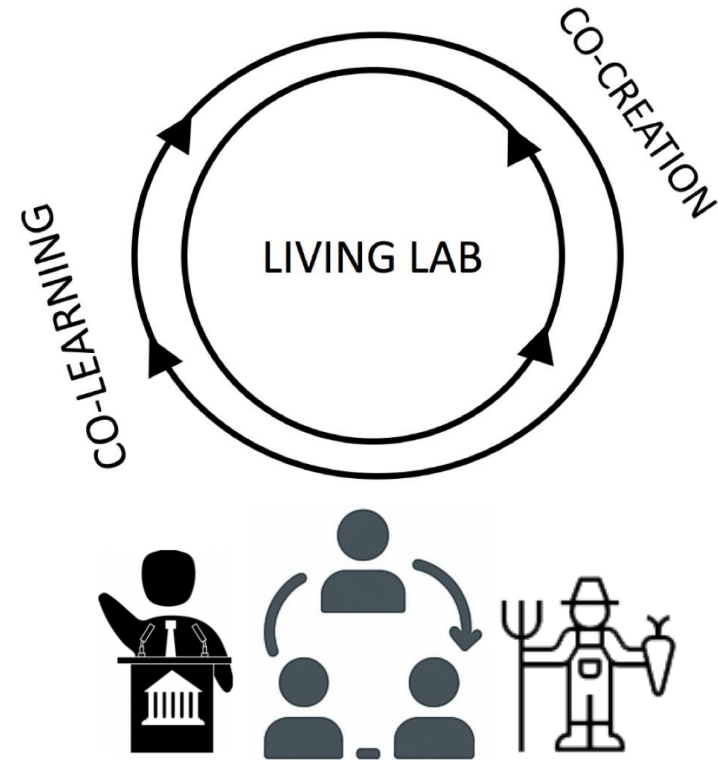


Observations: variety native to Extremadura. Its figs have medium to high yields and are small, with a tough skin but an internal cavity. Firmness and TSS are low. Fruits can be interesting for industrial consumption or for drying.

WP 1. Agroforestry in Mediterranean basin: issues, solutions and opportunities

Develop a **Living lab** in each participating country: a network of **researchers** and stakeholders, such as **farmers** and **policy makers**, to conduct **participatory research** activities (interviews, surveys, discussions)

- to understand and address challenges to agroforestry adoption in Mediterranean basin countries
- co-select fig cultivars reflecting stakeholders' needs and preferences
- co-design new agroforestry systems



Acknowledgements



This project is part of the PRIMA Programme supported by the European Union



Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy.

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Prof. Monica Agnolucci
Prof. Alessandra Turrini
Dr. Marco Castellacci
Dr. Gabriele Usai

Dr. Alberto Vangelisti
Dr. Samuel Simoni



Aydin Adnan Mendres University, Turkey

Prof. Engin Ertan



Centro de Investigaciones Científicas y
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<https://www.agrofig.eu>



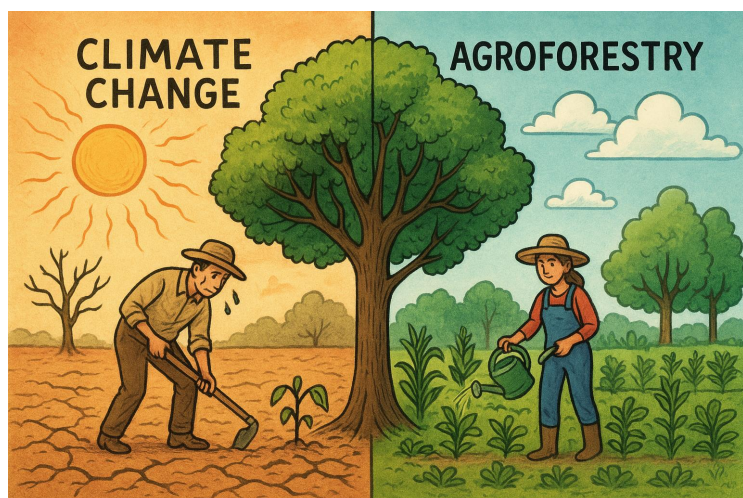
PLAMINPACK Training
Pisa 17th December, 2025



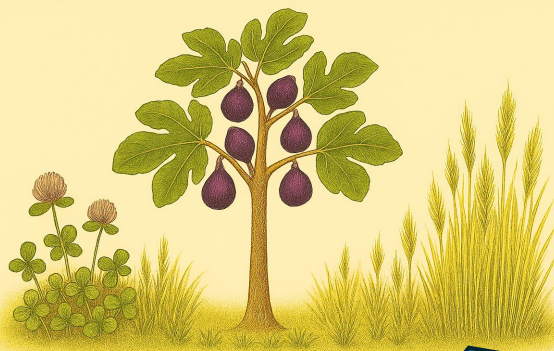


PROJECT **AGROFIG**

Fostering agroforestry benefits through fig tree cultivation in the Mediterranean



DEMONSTRATION SITES



Benefits

*Farmer income
Crop and Soil quality
Ecosystem services*

**Barriers, Issues,
Solutions
Opportunities**



Living labs



This project is part of the PRIMA Programme supported by the European Union



Dept. of Agriculture Food and Environment,
University of Pisa (Pisa-Italy)



Centro de Investigaciones Científicas y
Tecnológicas de Extremadura (Badajoz-Spain)



Aydın Adnan Menderes University (Aydın-Turkey)



Azienda Agricola dimostrativa I giardini di Pomona
(Brindisi-Italy)



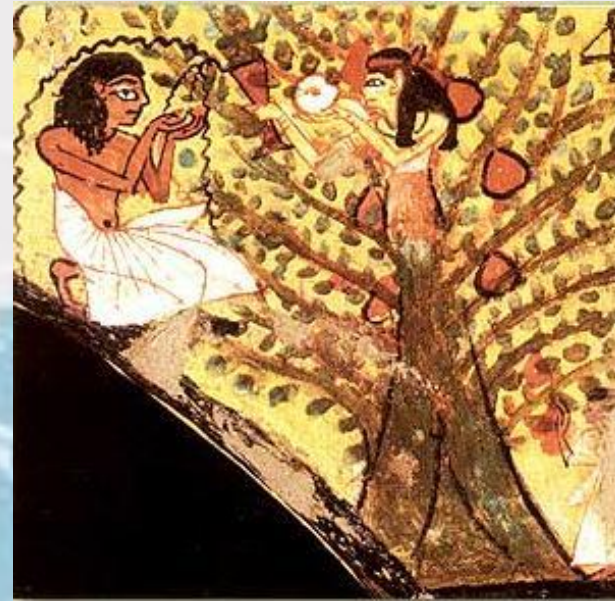
Université de Tunis El Manar (Tunis-Tunisia)

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<https://www.agrofig.eu>

Why a project on the fig tree?

The fig tree (*Ficus carica* L.) is one of the oldest known domesticated species, whose cultivation has been carried out for 12 000 years



Wall paintings in the pyramids dated 4.000 BC

WP2 Fig tree-based agroforestry **Demonstration Sites**

Soil analyses from Agroforestry-based Demonstration sites

Physical analyses: Texture, Bulk density, Humidity, Structure stability index
Visual soil structure assessment

Chemical analyses: Total Soil Organic Carbon (SOC), Dissolved SOC Total N, Available P, Exchangeable K, pH (potentiometric method), Cation Exchange Capacity (CEC), Electrical Conductivity (EC)

Biological analyses: Soil microbial C, respiration, metabolic quotient and microbial quotient. **Enzymatic activities** (Soil dehydrogenase, b-glucosidase), N (e.g., soil urease, protease), and P (e.g. soil phosphatase)

Arthropods: Biological Soil Quality Index based on **arthropods** (BSQ-ar)

Soil microbiome analyses Sequencing of DNA fragments from soil microorganisms, metagenomic analyses to monitor **microbial biodiversity** and dynamics of bacterial and fungal communities.



Agroforestry

VS



**No Agroforestry
(Control)**

WP2 Fig tree-based agroforestry **Demonstration Sites**

Crop analyses in Demonstration sites

FIGS

Yield

- number of fruits per plant
- mean fruit weight and diameter
- total Soluble Solids (°Brix)
- N content in leaves and fruits



Herbaceous crops

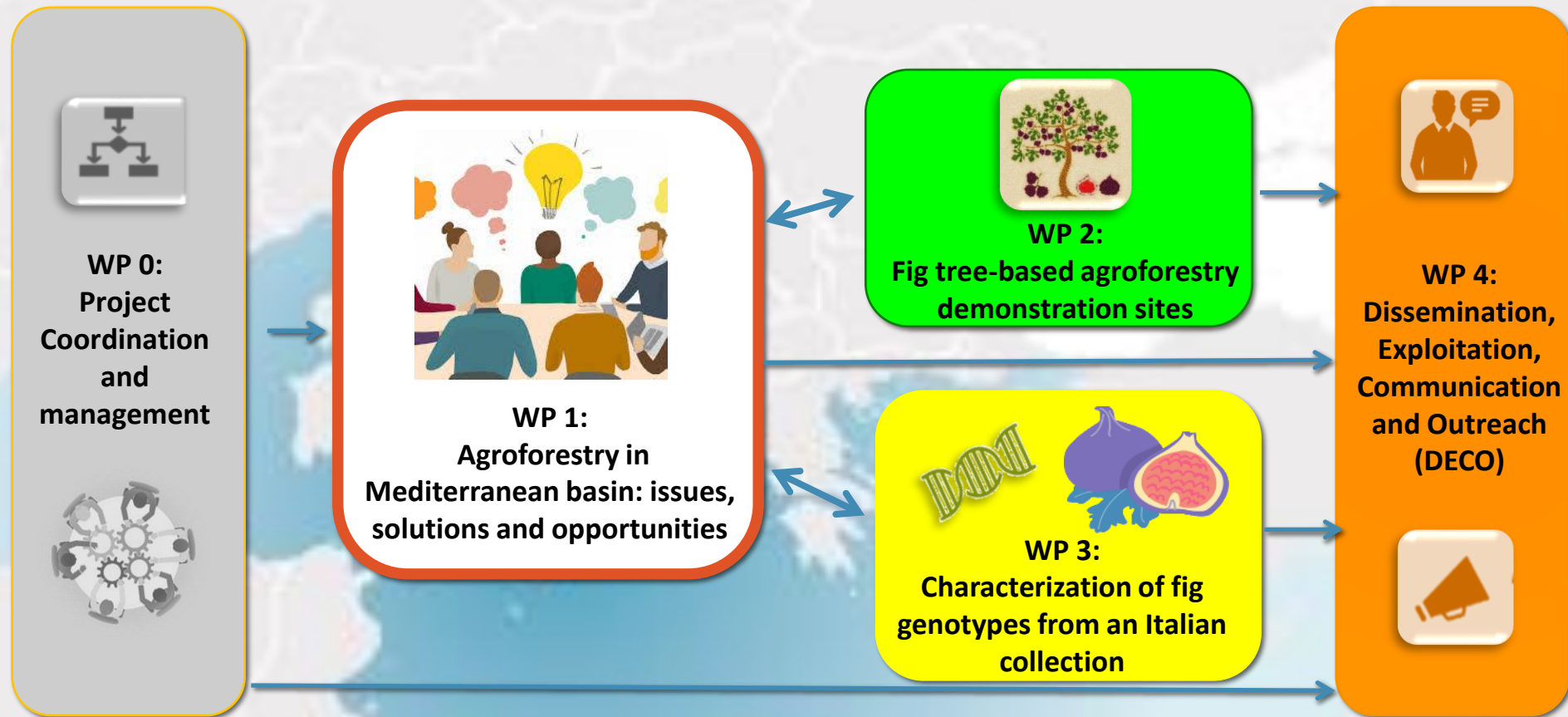
Yield, crop residue biomass

- number of pods/ears and seeds per plant
- thousand seed weight and quality
- seed protein and starch content
- forage quality parameters
- N content



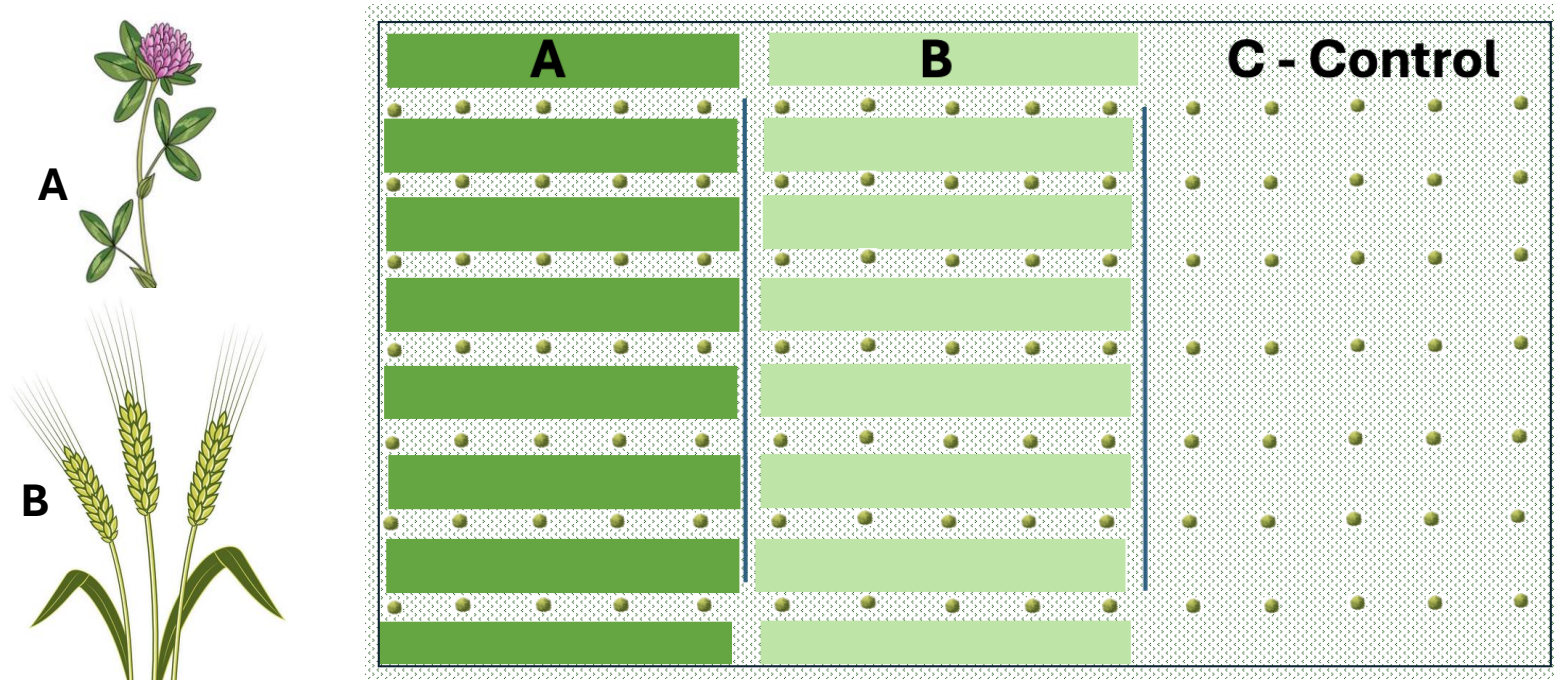
Environmental Life Cycle Assessment (LCA) per hectare

AGROFIG Workpackages



WP2 Fig tree-based agroforestry **Demonstration Sites**

Agroforestry-based Demonstration sites: Fig tree in association with other crops



- A: fig tree associated with legumes (vetch, clover)
- B: fig tree associated with grass species (oats, barley, triticale).
- C: Control: fig tree without crop association

WP2 Fig tree-based agroforestry demonstration sites

Soil analyses from Agroforestry-based Demonstration sites

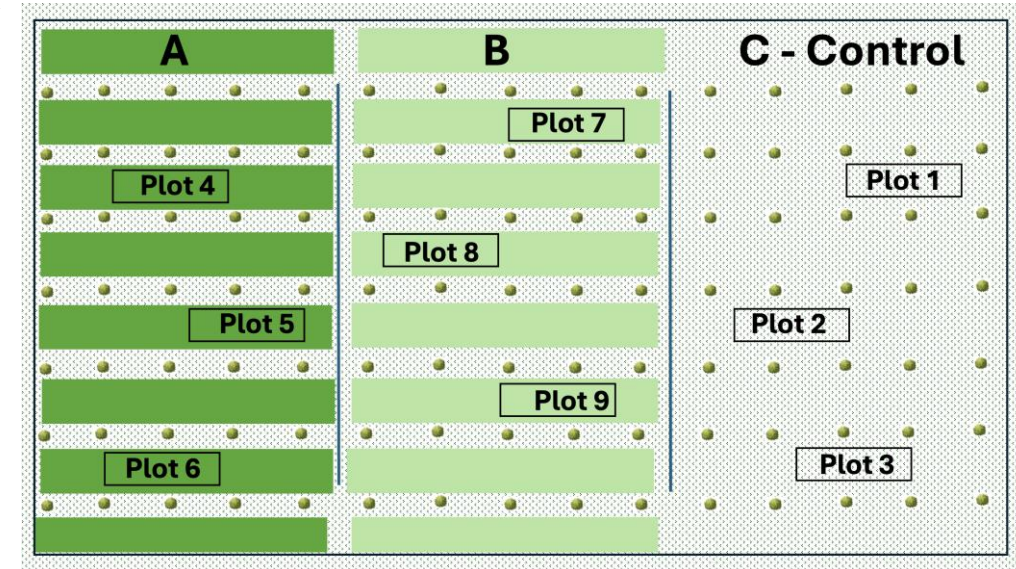
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Agroforestry (A or B)

VS



No agroforestry (Control)

UniPi's engagement in sustainable and safe fresh-food packaging: the FoWRSaP Project

Pisa, 17 dicembre 2025



UNIVERSITÀ DI PISA

DEPARTMENT OF AGRICULTURE,
FOOD AND ENVIRONMENT
UNIVERSITY OF PISA



FoWRSaP

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FoWRSaP

Agro Food Waste Recovery:
new processing technologies
for food Safety and Packaging



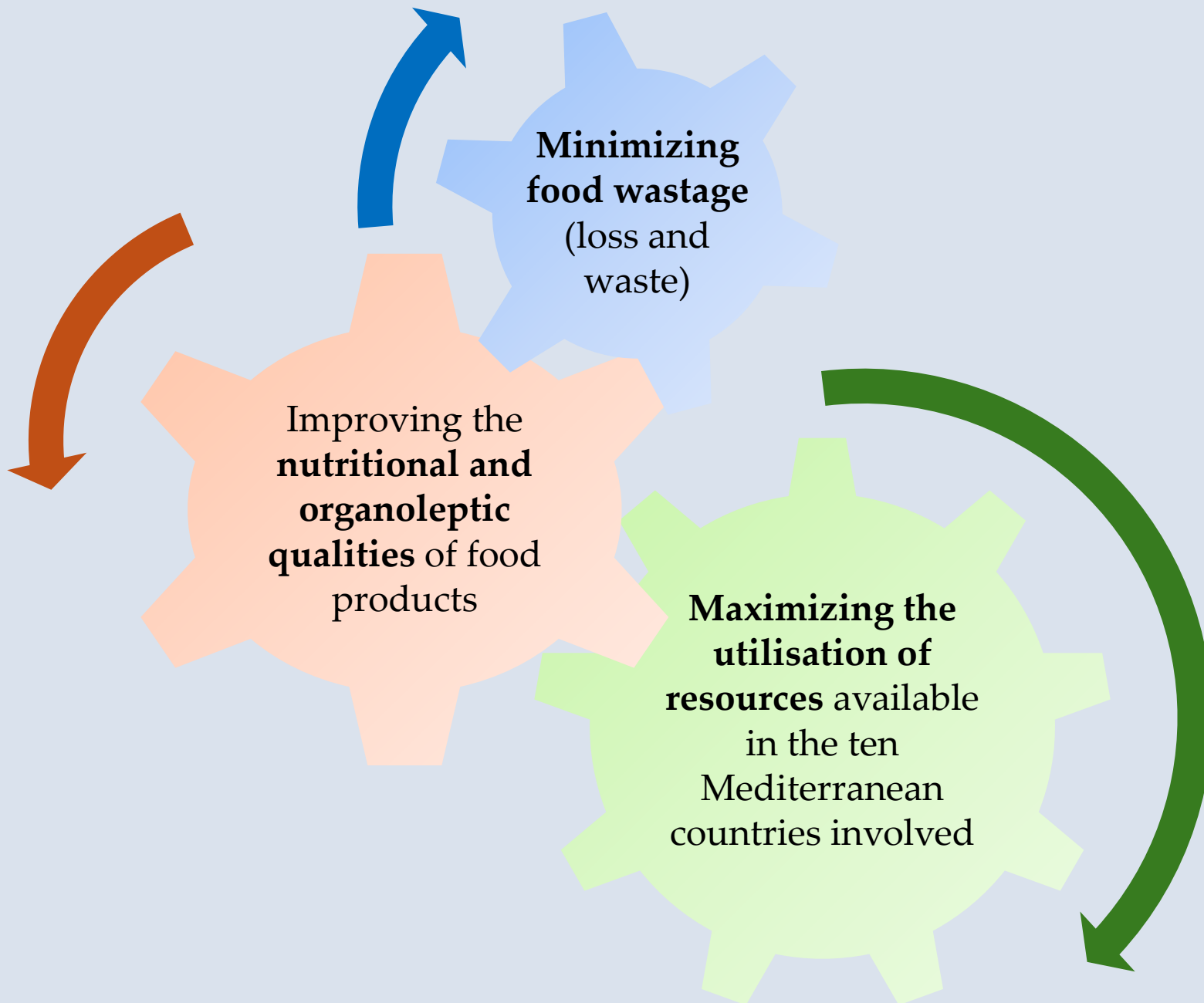
Prof. Najla Trebelsi
CBBC (Centre de
Biotechnologie de
Borj-Cédria, Tunisia)
Project Coordinator

Starting date: 19th June 2024
Ending date: 18th June 2024
Currently at month M18

Total budget: 1,652,349.00 €

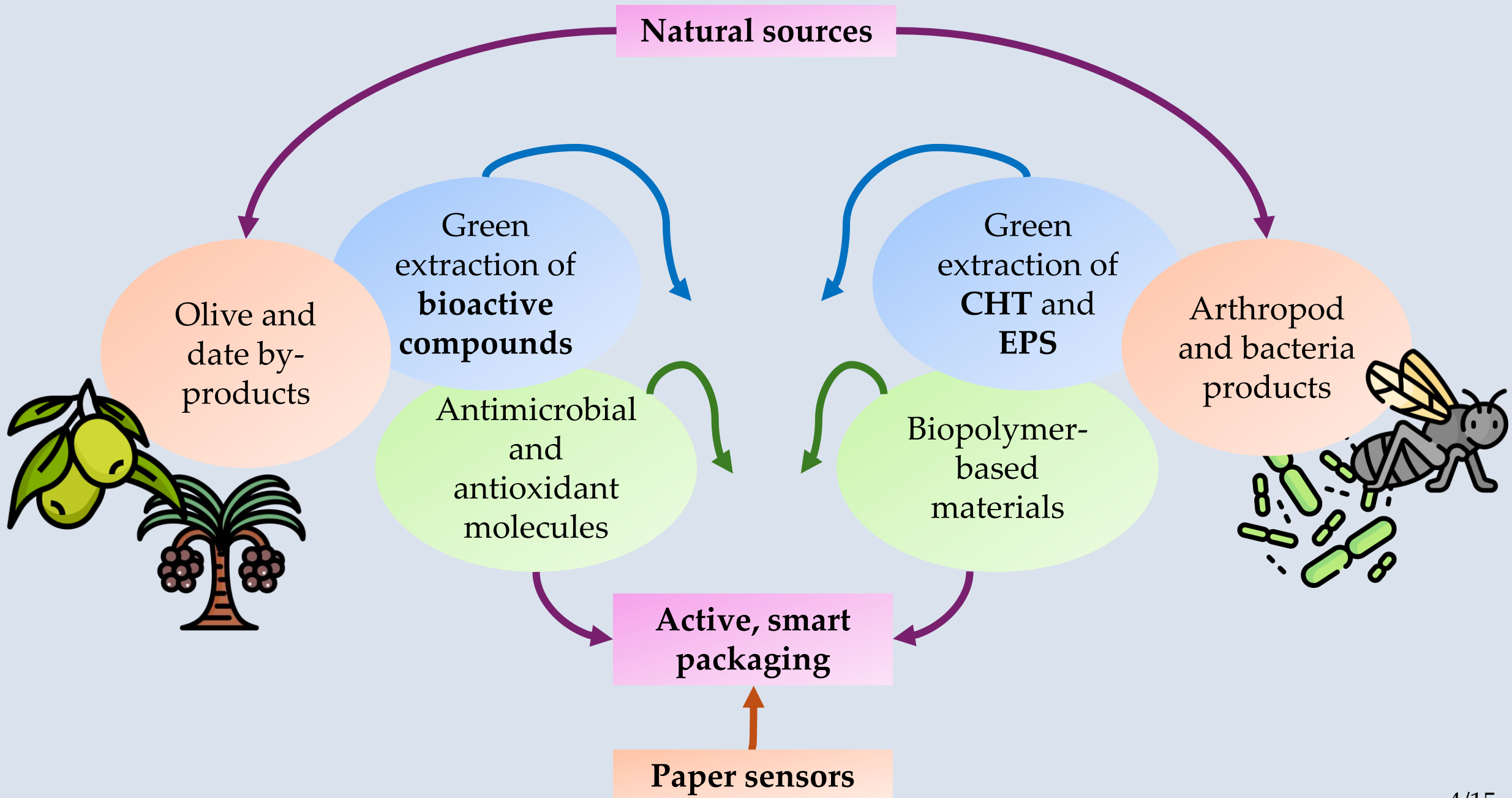


PI name	Organisation	Country
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2. Yassin Mabrouk	National Center for Nuclear Sciences and Technologies	Tunisia
3. Ioannis Mourtzinis	Aristotle University of Thessaloniki	Greece
4. Barbara Conti	University of Pisa	Italy
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6. Leyla Kahyaoglu	Middle East Technical University	Turkey
7. Márcio Carocho	Instituto Politécnico de Bragança	Portugal
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FoWRSaP goal:
enhancing the
**longevity of perishable
fresh food**

**How to achieve it: by
leveraging innovative
technologies to
implement bio-based,
active, smart packaging
solutions**





**Food and Soil
Microbiology**
Prof. Monica Agnolucci



Plant Pathology
Prof. Sabrina Sarrocco



**Food Science and
Technology**
Prof. Francesca Venturi



Entomology
Prof. Barbara Conti





WP1 Project coordination and management
Task 1.1 Technical **Coordination**
Task 1.2 Quality **Management** and Assurance
Task 1.3 Financial and Administrative **Management**

WP2 Classification of agri-food waste and extraction of natural target compounds

WP5 Impact of emerging processing technologies on shelf life, quality, safety and nutritional values of food

WP6 Commercialized, socio-economic and environmental aspects
Task 6.2 Multilateral Dialogue and **Stakeholder Engagement**
Task 6.3 **Living Lab** Implementation and Analysis
Task 6.4 Integration of Findings and **Reporting**

WP7 Exploitation, dissemination and communication
Task 7.1 **Scientific Community** Dissemination
Task 7.2 Stakeholder Engagement
Task 7.3 **Public awareness** campaign
Task 7.4 Intellectual property management
Task 7.5 Knowledge Transfer and Application
Task 7.6. Collaborative Involvement of Partners



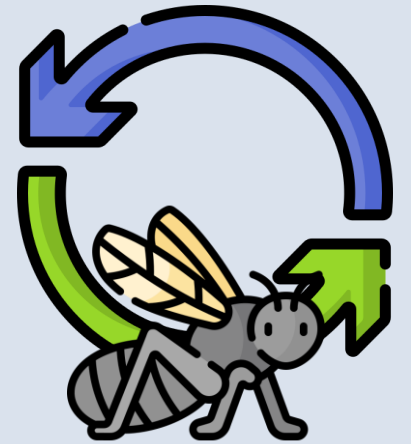
WP2 Classification of agri-food waste and **extraction of natural target compounds**

Task 2.1 Collection, classification and characterization of different **agri-food waste**

“... the bio-wastes of... the insect reared (*Hermetia illucens*) products will be collected, washed, and dried using lyophilization system to remove the entire water residue and then grounded for the **extraction of chitosan.**”

Task 2.3 Production and **extraction of chitosan**

“... the extraction of chitosan will be performed from... **mass reared** insects (*Hermetia illucens*) using the **deep eutectic solvents**. After the extraction, several techniques (FTIR, NMR) will be used to determine the structure, degree of deacetylation, and molecular weight of chitosan.”



The black soldier fly
Hermetia illucens
(Diptera Stratiomyidae)

Task 2.3 Production and extraction of chitosan



Chitin $3.3 \pm 0.2\%$
Chitosan $1.7 \pm 0.05\%$

Chitin $5.7 \pm 0.8\%$
Chitosan $3.8 \pm 0.4\%$

Chitin $22.1 \pm 0.9\%$
Chitosan $15.4 \pm 1.6\%$

Chitin $6.1 \pm 0.5\%$
Chitosan $3.4 \pm 0.6\%$



Hermetia illucens
pupae



Demineralization



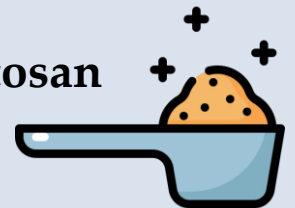
Deproteination



Deacetylation

Chitin

Chitosan

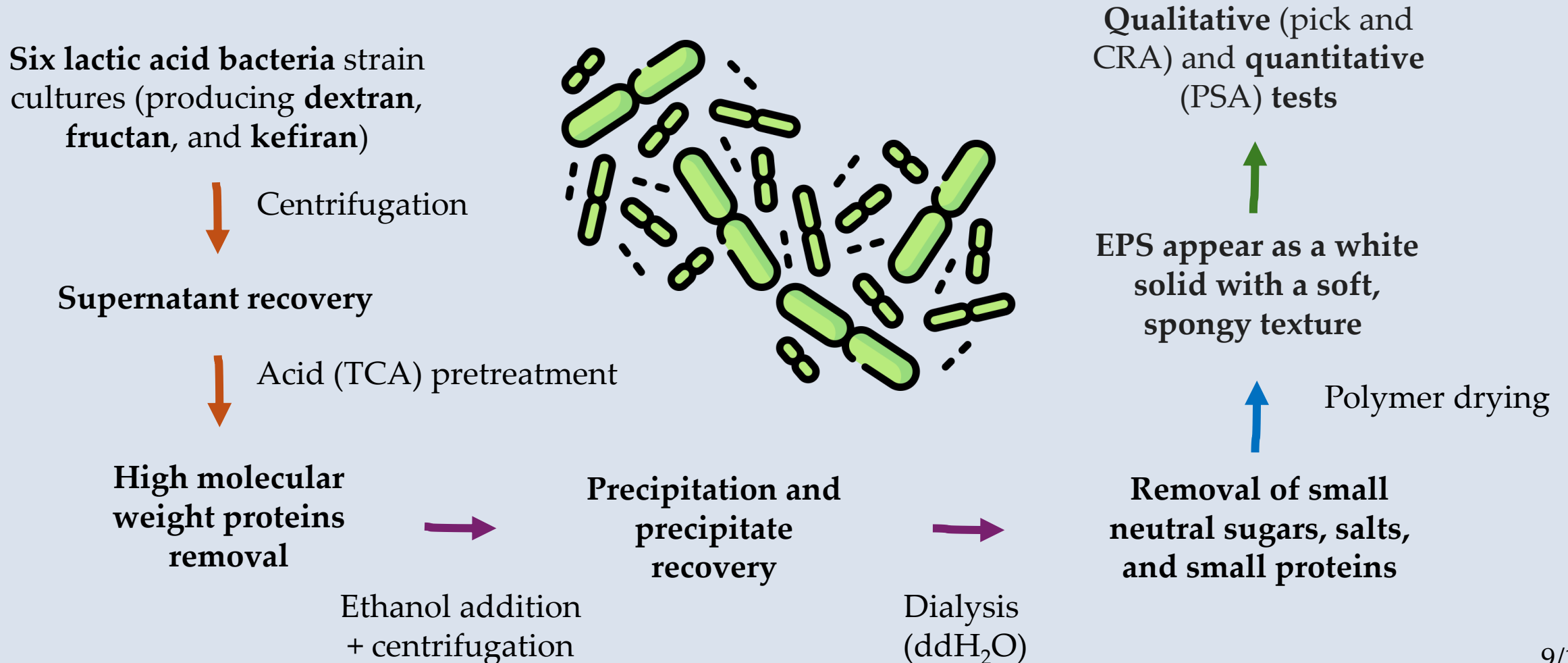


TRL from 3 to 5

WP2 Classification of agri-food waste and extraction of natural target compounds

Task 2.4 Production and extraction of exopolysaccharides from lactic acid bacteria

“EPS will be extracted from bacterial cultures by **alcohol precipitation**, followed by **acid treatment** to remove proteins, and **dialysis treatment** to remove small neutral sugars, salts, and proteins.”



Task 2.4 Production and extraction of exopolysaccharides from lactic acid bacteria

The two species selected: *Weissella cibaria* and *Leuconostoc pseudomesenteroides*

- ⌘ MRS broth supplemented with 20 g/L and 60 g/L sucrose
- ⌘ The supernatant is separated from the pellet by **centrifugation**



TRL from 2 to 5



EPS are recovered from the supernatant by **ethanol precipitation**



EPS are **dialyzed** against deionized water



EPS are **re-precipitated with ethanol**



EPS are eventually **grounded to powder**

WP2 Classification of agri-food waste and **extraction of natural target compounds**

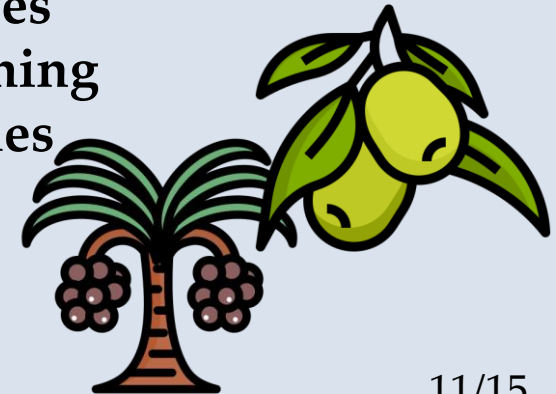
Task 2.6 Evaluation of **antimicrobial activity** of selected extracts and/or compounds

“... *in vitro* evaluation of the antimicrobial activity of the extracts and bioactive compounds obtained in the previous tasks. ... the tested microorganisms of interest include **common pathogens** and **spoilage microorganisms**, namely *Penicillium* and *Aspergillus* (**tomato**); *Pseudomonas* and *Botrytis cinerea* (**strawberry**); *Salmonella*, *Listeria*, *Escherichia*, and *Clostridium* (**meat and cheese**).”



Bioactive compounds (phenols, flavonoids, lignans) with potential **antimicrobial** and **antioxidant** properties extracted from:

- ✕ **Olive pomace:** solid residue remaining after oil extraction
- ✕ **Olive leaves**
- ✕ **Olive pruning**
- ✕ **Olive stones**
- ✕ **Date pits**



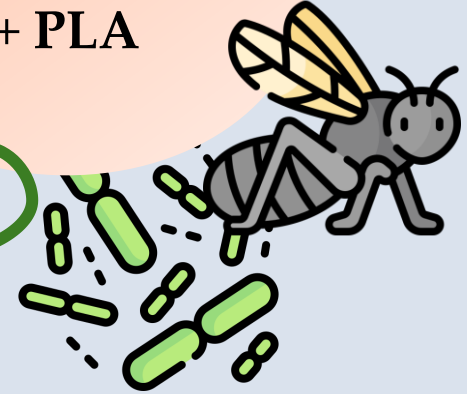
Olive and
date
extracts



Antimicrobial
and
antioxidant
agents

Biopolymer-
based
materials

CHT + EPS
+ PLA



Active, smart
packaging

TRL from 4-5 to 6

Complying with Commission Regulation
(EC) No 450/2009 on active and intelligent
materials and articles intended to come into
contact with food

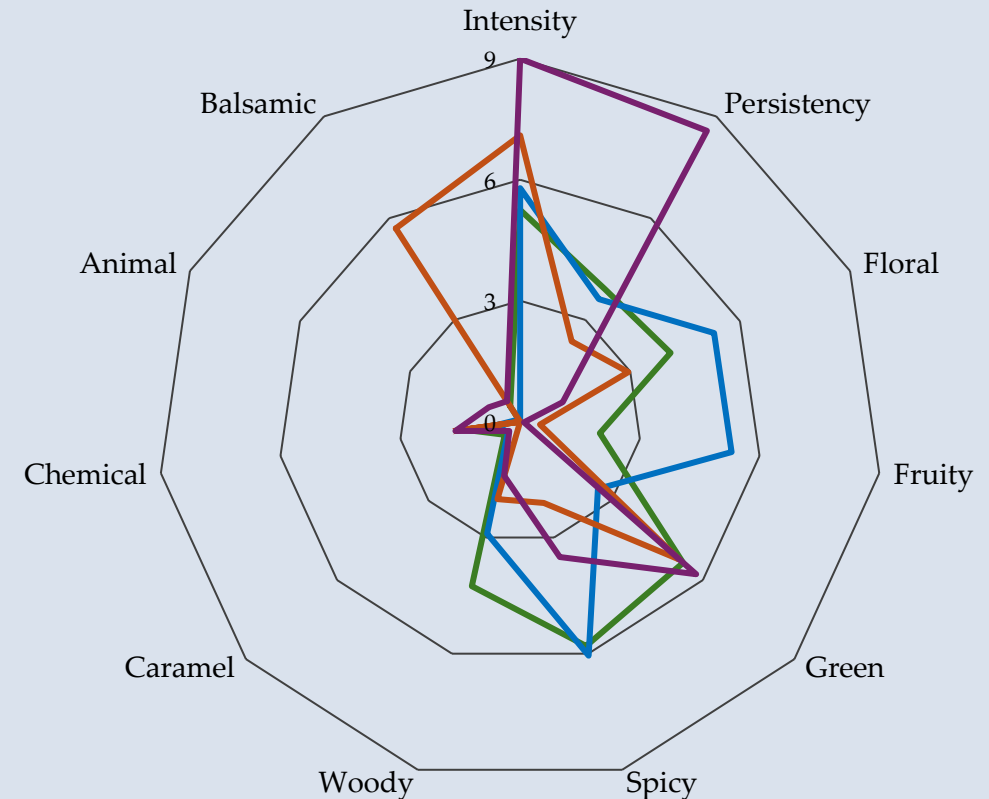
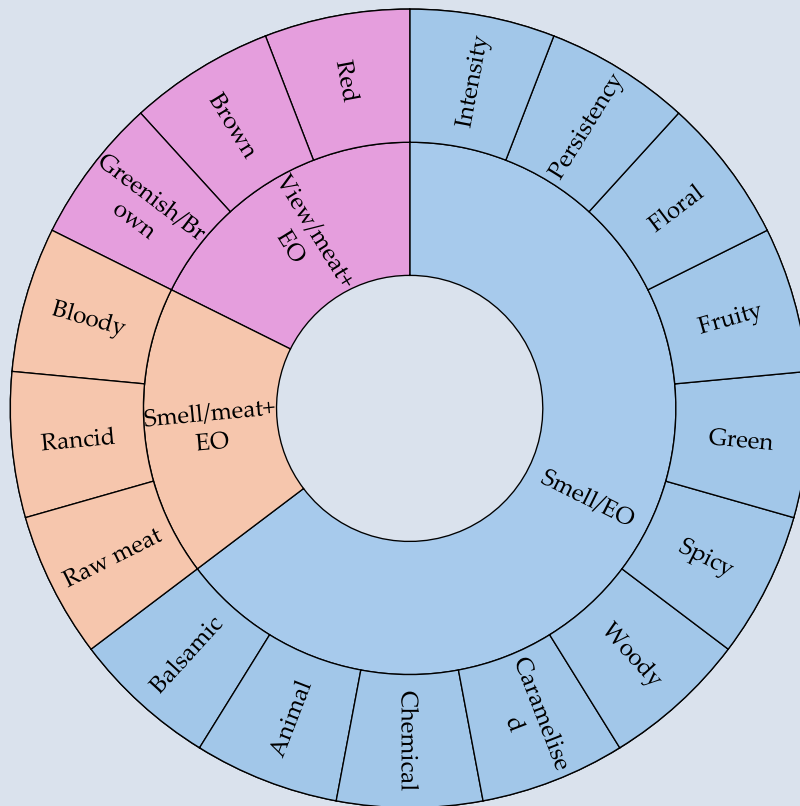
Tray
with lid

Film

WP5 Impact of emerging processing technologies on shelf life, quality, safety and nutritional values of food

Task 5.1 Effect of emerging packaging solution on food shelf life, quality, and nutritional value of food

“... evaluation of the impact of novel technologies on: ... (iii) **sensory attributes**... The sensory properties (**appearance**, **texture**, and **flavour** together with **hedonic parameters**) will be measured by technical panel tests performed by **expert judges**.”



WP5 Impact of emerging processing technologies on shelf life, quality, safety and nutritional values of food

Task 5.2 Study of the effect of bio-packaging on the **occurrence** and **abundance** of possible **microbial contaminants**

“Standard microbiological **quality parameters** and **safety indicators** will be assessed on fresh **meat, cheese, fruit, and vegetables** samples after the application of the different types of the developed bio-packaging... will be performed”

Microbiological quality indicators

- ✕ Aerobic microorganisms (ISO 4833-1:2013/Amd 1:2022)
- ✕ Yeasts and moulds (ISO 21527-1:2008)
- ✕ *Escherichia coli* (ISO 16649-1:2018/Amd 2:2023)
- ✕ Coagulase-Positive Staphylococci (ISO 6888-1:2021)

Microbiological safety indicators

- ✕ *Salmonella* spp. (ISO 6579-1:2017)
- ✕ *Listeria monocytogenes* (ISO 11290-1:2017)

Microbiological spoilage indicators

- ✕ *Pseudomonas* spp. (ISO 13720:2010 and ISO/TS 11059:2009)
- ✕ *Clostridium* spp. (ISO 15213-1:2023)





Food and Soil Microbiology

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Thank you for your kind attention