





ANNUAL REPORT 2021







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1. INTRODUCTION

In 2021, MED has developed its activities facing the challenges of significantly more virtual work and networking, both imposed by the continuation of the COVID crisis. New collaboration mechanism and forms have been explored, and we got used to have online, a large part of the networking and exchange activities that characterise the scientific community. We travelled less, but this did not meant that we reduced the national and international cooperation. We engaged in institutional partnerships. Diverse research projects were approved and started in 2021, as well as conferences and events were organized, mostly online.

The work productivity was in some cases affected as researchers were working from home and provinging support at the same time to their children or other family members who also were at home. But also new collaboration processes have been launched and in the long run we do not expect the effect on productivity to be relevant.

The integration between researchers of the three poles of MED was restrained by the COVID situation, but still new links were established and ongoing collaborations were strengthened.

In 2021 new researchers and technical staff with a MED contract started their activity. These contracts were planned as a way to strengthen research in the thematic lines of MED, and hopefully will show results in the short and medium term.

But furthermore, in 2021 we launched the Associated Lab CHANGE – Global Change and Sustainability Institute. This new Associated Lab is coordinated by MED and includes two other research units: CENSE (Centre for Environment and Sustainability Research), in Universidade Nova de Lisboa, and cE3c (Centre for Ecology, Evolution and Environmental Changes) in Universidade de Lisboa. Together, CHANGE includes more than 300 researchers. The Mission of CHANGE is to deliver realistic policy solutions that contribute to environmentally-friendly, resource-efficient and competitive economies under current and future global changes. The Vision is to become the go-to R&I hub for developing, evaluating and operationalizing innovative and improved public policies with impacts on Global Change and Sustainability. In CHANGE, the competencies covered in MED on agriculture and environment are combined with complementary knowledge and skills from the two other units. The fields covered span from biodiversity conservation and management, natural resource management, to circular economy, ecological economics, governance, among others. With this virtuous combination, more comprehensive responses can be provided to society and in particular can support evidence based public policies. We are confident that the effort required for the integration of all these different researchers and disciplinary fields will be compensated by fruitful results in the medium term.

The present report demonstrates the research activity and research outcomes of MED. Some more details are provided about CHANGE. But for sure the outcomes of the integration of MED in CHANGE will first be visible at a later stage.



2. ABOUT US

The aim of MED is both to increase excellence in research and to contribute with solutions to be applied by the private and public sectors to enhance the sustainability of agroecosystems, the environment and the supporting territories. Interaction with stakeholders and an increasing number of multi-actor projects, is key for identifying research needs and for securing dissemination of applicable results.

MED's 5 main goals are to:

- 1) improve resources use efficiency;
- 2) improve the sustainability of the food system and of the Mediterranean diet;
- 3) assure biodiversity conservation and landscape multi-functionality;
- 4) promote organizational capability and sound governance mechanisms;
- 5) identify pathways towards resilience and adaptation under known climate change scenarios.

MED is on the forefront of international research debate. The many H2020, Horizon Europe, and other European projects, as well as the networks where MED or its researchers are involved, document and create the conditions for this internationalization.

The eight Thematic Lines structure the research in MED so that questions from practice can be treated in an integrated perspective across disciplines and specialties. And so that more complete and comprehensive support can be given to practice, from the knowledge we produce. Research in MED is developed by different teams, in different research groups, supported by different labs, in a complex and dynamic structure. Nevertheless, there are clearly defined goals and the research developed, contributes to the goals of at least one of the Thematic Lines.

MED develops its activities based on multidisciplinary teams comprising researchers from multiple areas, as Agricultural Engineering, Biotechnology, Animal Science, Plant Production, Biology, Physics, Chemistry, Ecology, Economic, Social, Geography, Landscape and Territorial Sciences, Soil Sciences and Veterinary Medicine.

Through cooperation with other national and international I&D institutions, the work allows to achieve: understanding the complex Mediterranean production systems and to promote technological innovation as a means of responding in an integrated manner, to the social, economic and technical needs in the field of agriculture, while preserving natural resources and environmental quality.



3. STRUCTURE DESCRIPTION AND CHART

DIRECTIVE BOARD

Ensures the regular management of MED, according to the plans and budget approved by the Scientific Council. The Director is the elected President of the Scientific Council and nominates the Vice-Directors.

DIRECTOR



Teresa Pinto Correia (mtpc@uevora.pt), President of the Scientific Council Full Professor, PhD in Geography

VICE-DIRECTORS



Maria João Cabrita (mjbc@uevora.pt) Assistant Professor, PhD in Agricultural Sciences



Rui Charneca (rmcc@uevora.pt) Assistant Professor, PhD in Veterinary Sciences



Rui Lourenço (lourenco@uevora.pt) Researcher, PhD in Biology



SCIENTIFIC COUNCIL

MED's Scientific Council is composed of all eligible PhDs (i.e. PhDs who comply with predefined standards of scientific production – see Annex 2 of MED's Regulation). Its functions include the discussion and approval of scientific and financial reports, plan of activities and budget as well as the admission of new members. The President of the Scientific Council is elected for 3 years and assumes the functions of Director of the Institute.

PERMANENT COUNCIL OF THE SCIENTIFIC COUNCIL

The Permanent Council of the Scientific Council advises the Board of Direction on current affairs. It is formed by the members of the Board of Direction and by the Coordinators of the Research Groups and the Coordinators of the MED's Units (CEBAL and University of Algarve).

EXTERNAL SCIENTIFIC ADVISORY BOARD

Formed by international experts in the scientific areas of MED that periodically will evaluate MED's activity and achievements.

- Hubert Wiggering University of Postdam, Germany
- Gad Baneth Koret School of Veterinary Medicine Israel
- Jorgen Primdahl University of Copenhagen, Denmark
- Maria João Santos Utrecht University, Nederlands
- Javier Abadía Aula Dei Experimental Station Council for Scientific Research (EEAD-CSIC), Spain
- Francisco Antonio Macías University of Cadiz. School of Science. Institute of Biomolecules (INBIO), Spain



EXECUTIVE DIRECTOR

The Executive Director supports the daily management of MED. He promotes the management of scientific institutional networks (national and international), and the coordination of joint activities; represents the Board of Directors, researchers and research areas of MED in external events; promotes the inter-disciplinary research approaches and support to their implementation, within the research unit MED, among its researchers, and between the units of different managing institutions; and manages the administrative processes of research.



Nuno M. Pedroso (nmpsp@uevora.pt)

PhD in Biology

ADMINISTRATION AND FINANCE

The administrative team ensures communication with the central administration of the University of Évora in conformity with the established procedures.



Fernanda Seabra (fmos@uevora.pt; med@uevora.pt) Science and Cooperation Services, University of Évora



Célia Peralta (celiapr@uevora.pt) Science and Cooperation Services, University of Évora



COMMUNICATION OFFICE (UDIT)

The Office for Communication, Technology Transfer and Innovation (UDIT) is dedicated to the dissemination of Research & Development results and to the promotion and transfer of technologic innovation, thus contributing to science outreach and regional development. It is also this office that manages the database of researchers and their scientific production.



Luis Piteira Gomes (lag@uevora.pt; udit_med@uevora.pt) UDIT Coordinator PhD in Biology



Sofia Eufrázio (srle@uevora.pt; udit_med@uevora.pt) Senior staff member MSc in Conservation Biology



ORGANIZATION CHART





4. RESEARCH ORGANIZATION IN MED

MED's strategy is to promote interdisciplinary and problem-solving research at global, regional and local scale.

THEMATIC LINES

The research in MED and its heterogeneity are explored in eight Thematic Lines (TL). TL are organized in two complementary approaches centred on: a) a value chain or an agroecosystem and cross-cutting themes crucial for the sustainability of the Mediterranean ecosystems and landscapes.





RESEARCH GROUPS

MED's Research Groups bring together researchers who carry out their research activities in a certain knowledge area. Each researcher may belong to more than one Research Group (RG), but it's mandatory to dedicate more than 50% of research time to an only one RG. RG are formed in two ways:

- a) around a disciplinary area and a related methodological approach
- **b)** around a study object, combining diverse and complementary disciplines.



Researchers are encouraged to orient their investigation to feed into the TLs, and collaborate with researchers inside or outside the Groups. Each Group (and researcher) may contribute to one or more of the TLs. Flexibility and interaction are key concepts, and integration towards common goals (in the TLs) is a strategic positioning.



Contribution of the Research Groups to the Thematic Lines



INFRASTRUCTURES

MED Infrastructures area composed by the laboratories and experimental support units that are spread by the University of Évora, CEBAL and University of Algarve. The management of these infrastructures is dependent on each management unit (MED Headquarters manages the University of Évora Labs and MED nodes manages CEBAL and UAlg Labs, respectively).

UNIVERSITY OF ÉVORA

LABORATORY AREAS:

- FOOD AND NUTRITION TECHNOLOGY
 - Laboratory of Technology and Post-harvest
 - Nutrition and Metabolism Laboratory
 - Oenology Laboratory
 - Technology and Quality Laboratory of Regional Products
- PHYSIOLOGY, HEALTH AND ANIMAL BEHAVIOR
 - Laboratory of Applied Animal Physiology
 - Laboratory of Palynology and Aerobiology
 - o Laboratory of Reproduction and Lactation
 - Microbiology Laboratory
 - Parasitology Laboratory Victor Caeiro
- SOILS AND WATER
 - Rural Engineering Laboratory
- LANDSCAPE, ECOSYSTEMS AND BIODIVERSITY
 - Laboratory of Botany
 - Laboratory of Ornithology
 - Macromycology Laboratory
- VALORISATION OF GENETIC RESOURCES AND PLANT PROTECTION
 - Entomology Laboratory
 - Laboratory of Plant Virology
 - o Molecular Biology Laboratory
 - Mycology Laboratory
 - Nematology Laboratory
 - o Plant Breeding and Biotecnology Laboratory
 - o Soil Microbiology Laboratory

EXPERIMENTAL SUPPORT UNITS

- Plant Growth Chambers
- Ultrafreezers
- Experimental winepress
- Animal Testing
- Microscopy and Cytometry
- Geotechnologies Equipment
- Greenhouse Complex
- Processing of Plant Material
- Field Equipment
- Experimental Plots (Plots of Spontaneous Vegetation)







CEBAL - ALENTEJO BIOTECHNOLOGY CENTER FOR AGRICULTURE AND AGRO-FOOD

- Bioinformatics tools development unit
- Molecular biology and genomic tools unit
 - In vitro plant propagation room
 - Plant growing room
- Interdisciplinary Unit of Analytic chemistry
 - Chromatography room
- Food biotechnology unit
- Bioproducts unit
 - o Section of biological in vitro processes potential evaluation
 - Microbiology section
 - In-Out Unit experimentation and technological experience on a pilot scale:
 - o Food biotechnology climatized room
 - o Biohazard sample processing room
 - Process and extractive technologies room
 - Membrane technology room





UNIVERSITY OF ALGARVE

- Biopolymers and Rheology
- Molecular Biotechnology and Phytopathology
- Plant Biotechnology
- Food Science
- New Products Development and Sensory Analysis
- Oenology
- Post-harvest ID&T station
- Entomology
- Genomics and Genetic Improvement
- Horticulture and Post-Harvest
- Microbiology
- Plant nutrition
- Chemistry of natural products
- Processing
- Soils and waste
- Virology







RESEARCH GROUPS HIGHLIGHTS

GROUP: ANIMAL BIOSCIENCES (ABG)





HEAD OF GROUP: Elsa Leclerc Duarte [emld@uevora.pt] VICE-HEAD OF GROUP: Elvira Sales Baptista [elsaba@uevora.pt] INTEGRATED MEMBERS: 39 members PhD STUDENTS: 13 Students [See List point 14 - MED Members] Keywords: Animal diseases | Autochthonous animal breeds | One Health | Animal welfare

Major Competences of the Group

ABG is a multidisciplinary group that comprehensively covers all aspects of animal bioscience, from fundamental research in biochemistry, physiology, and genomics, to problem-based applied research on animal health, production systems, and related technologies. The disciplinary-based key competencies allow research at the molecular, cellular, and tissue level, as well as in-vivo approaches related to the farm, companion animals, and wildlife. ABG members have been developing cross-cutting approaches, particularly in the following areas:

- 1. Microbiome studies and health
- 2. Forensic Veterinary Pathology and comparative oncology
- 3. Veterinary immunoallergology
- 4. Animal welfare
- 5. Characterization of the salivary proteome and lipidome and their relation to health, taste, and feeding strategies
- 6. Equine reproduction
- 7. Trending and (re)emergent animal or zoonotic diseases in the Mediterranean context including farm, companion, wildlife, and game species.
- 8. Antimicrobial stewardship, alternative compounds, and delivery systems for antimicrobial treatment
- 9. Canine model for joint diseases
- 10. Genomic characteristics related to production performance and disease resistance

The Group holds specific competencies in resource efficiency (efficient and robust animals/efficient food chains), and healthy livestock and people (prevention, control, and eradication/ the microbiome animal and human health). The Group is actively committed to contributing to the three MED thematic lines: Animal Production and Health, Agro-Silvo-pastoral systems - Montado, and Biodiversity and Ecosystem Functioning.



MAJOR ACHIEVEMENTS IN 2021

The experimental farm facilities, MED laboratories, and CEBAL laboratory have allowed researchers to address transversal themes to human and animal health, as well as to perform research within the frame of several production systems. Particular research efforts have been made in the areas of new phytopharmaceutical compounds, genome studies, joint diseases, wildlife ecology, game species health, and new vaccine development. A research protocol was signed in 2021 with Cardiff University UK to study novel therapeutics approaches to degenerative joint diseases.

Research themes were aligned with the animal task force's top research priorities drawn by theEuropean Union, in particular resource efficiency (efficient and robust animals/efficient food chains) and healthy livestock and people (prevention, control, and eradication/ the microbiome, animal, and human health). Additionally, three group members regularly take part in the animal welfare body of the University of Évora, which certifies compliance with ethical standards in all projects involving animals.

The projects and publications of the group in 2021 reflect the fulfillment of the goals drawn by the three related thematic lines through the following funded projects: 1. NAQUIBIODPSA: Obtaining Veterinary Medicines from Silver Nanoparticles fixed in Polymeric Chitosan 2. vaccine development for wild rabbit 3. mycotoxins and microbiome. ABG members participated in the following ongoing COST ACTIONS: SOUND-CONTROL Standardizing output-based surveillance to control non-regulated diseases of cattle and ENOVAT European Network for Optimization of Veterinary Antimicrobial Treatment. Additionally, ABG participates in several interest NETWORKS: the European FABRE platform (an industry-led platform of breeding and reproduction organizations and institutes), in the Biodata.pt – Portuguese Infrastructure of Biological Data, in the National Network of Necropsy and Forensic Toxicology Centres, in Vet-Onconet, a surveillance network for veterinary oncology cases and also assures the coordination of the Interest Group on Comparative and Veterinary Immunoallergology of the Portuguese Society of Allergology and Clinical Immunology (SPAIC).

ABG members continued deeply committed to education, science communication, and public awareness throughout several outreaching activities for students and the general public. One ABG member is a One Health Ambassador awarded by the One Health Lessons and has been actively committed to One Health education for high school students. One ABG member lectures immunoallergology educational webinars and is drawing guidelines for veterinary allergy management. Additionally, Several ABG members participate in 2 Erasmus + funded programmes: 1-Critical Thinking for Successful Jobs and 2-Enhancing Food Safety in the Mediterranean. ABG members are dedicated to undergraduate and post-graduation education, in particular by supervising several Master students and PhD students from the PhD programme in Veterinary Science, Biology and Biochemistry of the University of Évora.

ISI / SCOPUS PUBLICATIONS - 24 [Numbers referring to the complete list in Point 14] 1; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 18; 24; 37; 40; 41; 51; 52; 53; 55; 54; 58; 61; 74; 95; 99; 100; 106; 107; 109; 112; 122; 123; 126; 127; 134; 135; 136; 138; 148; 165; 180; 199; 203; 206; 211; 214; 217; 66. BOOK AND BOOK CHAPTERS – 1 B7. RESEARCH PROJECTS – 10 [Numbers referring to the complete list in the Point 10] 14; 34; 44; 45; 58; 76; 78; 27; 28.



GROUP: FOOD SCIENCE AND TECHNOLOGY (FST)





HEAD OF GROUP: Maria João Lança [mjlanca@uevora.pt]

VICE-HEAD OF GROUP: Cristina Conceição [cristinaconceicao@uevora.pt]

INTEGRATED MEMBERS: 35 PhD STUDENTS: 11 [See List point 14 - MED Members]

> Keywords: Food Science | Food technology | Food safety and quality | Mediterranean Diet | Nutritional value | Composition of food | Sensory Assessment | Microbial quality

Major Competences of the Group

The Food Science and Technology group includes several members whose valences are very complete either in terms of food matrices or innovation in the food packaging sector. The group has knowhow in a wide range of laboratory analyses, including microbiological, physicochemical, spectrophotometric determinations, sensorial analysis, gas chromatography (GC and GC-TOF-MS), high-performance liquid chromatography (HPLC), pyrolysis-compound-specific isotopic analysis (Py-CSIA), NIR spectroscopy and stable isotope ratio mass spectrometry (SIRMS).

In 2021, the main matrices of animal origin under investigation included fish ham; traditional sausages; pork and beef meat from autochthones Portuguese breeds, sheep's milk in the manufacture of cheese, fillets of some freshwater fish species and honey. In terms of the matrix of vegetable origin, the most representative were wine, olive oil, wine brandy, spirit vinegars, brandy, and table grapes.

It should be noted that in addition to food matrices, the group developed work in the field of biodegradable and intelligent food packaging as well as in microalgae biofilms, pigments, and edible nanocoatings for improving the quality and storage ability of horticultural commodities.

The major areas under investigation in 2021 for the analyzed matrices comprised sensory analysis and consumer acceptability; product valorization, quality, and food safety; nutritional quality of meat and fillets for consumption; meat texture; the impact of new technologies in the composition of volatile wine products, methodologies for traditional dry-cured sausages, evaluation of final product quality by NIR spectroscopy, application of plant and algae natural compounds, aromatic and medicinal plants, essential oils and halophyte plants in food and health sectors and biochemical and pharmacological characterization of natural compounds of plants/algae and valorization for medical and agrochemical areas.

MAJOR ACHIEVEMENTS IN 2021

- a) Development of fish hams.
- b) Improvement techniques on nutritional quality, health indexes and persistent organic pollutants for fillets of wild freshwater fish species of commercial interest.
- c) Valuation of Malhado de Alcobaça swine traditional portuguese sausages.
- d) Development of Morcela de Arroz Sausage.
- e) Exploration of nonmeat ingredients and pig natural casings in dry-cured sausages.
- f) Investigation in microbial and chemical hazards in dry-cured sausages.
- g) Paio do Alentejo: evaluation of safety and quality.
- h) Investigating meat texture of Cachena.
- i) Development of an innovative feed mixture for outdoor finishing of males from local pig breeds.
- j) Improvement on marker identification genetics linked to meat quality.
- k) Development of a tenderness index for beef.
- I) Innovation on microbial foods/fermented foods.
- m) Cynara cardunculus and cheese making.
- n) Improvement of honey as a natural food source of antioxidant and phenolic compounds.
- o) Development of a sensor technology for the trace analysis of pesticide residues in olive oil samples.
- p) Implementation of a fast-screening method for the varietal origin of olive oil based on advanced spectroscopic techniques.
- q) Understanding the role of wine technology on wine's volatile composition.
- r) Developed research essentially on wine spirit new aging technologies.
- s) Development on phenolic composition of spirit vinegars.
- t) Advanced techniques of GC-TOF-MS for characterization of the volatile composition of several complex food matrices.
- u) Innovative approaches for selection, cultivation, and by-products valorization of Mediterranean microalgal strains for food, feed, and health applications.
- v) Quality assessment of red wine grapes through NIR Spectroscopy.
- w) Improvement methods for postharvest conservation of the Autumn crisp seedless grape
- x) Advancement on essential oils extraction processes.
- y) Production of an intelligent biodegradable film from microalgae residues and pigments.
- z) Development of biodegradable food packaging.
- aa) Innovative teaching methodologies for Master Programme on food safety.

ISI / SCOPUS PUBLICATIONS - 48

[Numbers referring to the complete list in Point 14]

1; 16; 18; 20; 22; 38; 40; 41; 43; 44; 51; 55; 54; 67; 69; 74; 63; 76; 85; 86; 87; 89; 103; 124; 145; 148; 157; 159; 160; 163; 168; 194; 203; 205; 206; 169; 164; 21; 23; 113; 72; 195; 31; 219; 167; 116; 172; 181.

BOOK AND BOOK CHAPTERS -0

RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 17 [Numbers referring to the complete list in Point 10] 22; 29; 33; 38; 56; 57; 61; 73; 79; 81; 82; 63; 64; 65; 66; 67; 68.



GROUP: PLANT PROTECTION (PP)





HEAD OF GROUP: Maria Rosário Félix [mrff@uevora.pt] VICE-HEAD OF GROUP: Ana Alexandre [anaalex@uevora.pt] INTEGRATED MEMBERS: 21 PhD STUDENTS: 7

[See List point 14 - MED Members]

Keywords: Beneficial soil microbes | Abiotic and biotic stresses | Low input strategies | Economic and environmental sustainability

Major Competences of the Group

The Plant Protection group is composed by researchers with different competencies in the research area having the common goal of finding new strategies to protect plants in a more competitive and sustainable agroecosystem.

The main areas and competencies of the research group are:

a) The use of beneficial microbes to improve plant growth and protect the crops against biotic and abiotic stresses. The group focuses on: (i) arbuscular mycorrhiza fungi (AMF) and how cultural practices (soil mobilization, weed control, use of cover crops) can enhance the benefits of mycorrhization and AMF functional diversity; (ii) soil beneficial bacteria and the molecular basis of their interaction with the host as well as the role of rhizobia and other plant-growth promotion bacteria in improving plant growth under stress conditions.

b) The study of plant pathogens associated with the causing the most devastating diseases in the Mediterranean crops, like olive, grapevine, almonds, and a new emergent crop in the Alentejo region is the cannabis medicinal crop. The research is focused on the molecular identification and characterization of the most prevalent plant pathogens associated with the key diseases and the design of rapid and sensitive diagnostic techniques. The group, based on the background knowledge in plant virology, is improving the use of the plant virus as plant protectors' vectors to induce resistance against several harmful and non-treatable plant pathogens and as a plant vaccine. Another research line that is continuing explored is the gene dynamics of the host responses against pathogens infection are being used to design new strategies for sustainable plant protection;

c) The research focused on diseases caused by plant-parasitic nematodes in important crops and forestry plants: (i) Combine molecular biology, cell biology, and Omics (genomics, transcriptomics) to understand molecular plant-nematode interactions and successful parasitism; (ii) Finding new sustainable and green solutions for plant-parasitic nematode control; iii) morphological and molecular diagnostic of plant-parasitic nematodes (annual national survey samples).

d) The study of the main pests in Mediterranean crops by: (i) addressing arthropod biodiversity and genetics; (ii) developing new control methods alternative to chemical control, using a holobiotic

approach of the pest organisms and focusing on the olive crops and particular challenges. The research focused thus on integrated genetic studies, ecologic methods, and field trials;

e) The use of antagonistic fungi isolated from organic composts for the biological control of plant-soil diseases and, simultaneously, reducing the application of pesticides;

f) The use of bioremediation processes in contaminated soils and water, removing drugs and respective metabolites using aquatic plants by optimization of biobeds performance using bioaugmentation processes and using naturally developed indigenous arbuscular mycorrhizal fungi to improve growth and metal toxicity tolerance of crops in acidic soils.

MAJOR ACHIEVEMENTS IN 2021

The group maintained all collaborations previously established with national and multinational companies, as for example with Fertiprado, Corteva Agriscience, Bayer-Monsanto, Fundação Eugénio de Almeida, Sociedade Agrícola Torre de Figueiras, North and Centre Regional Agencies of Agriculture Ministry, Technical Association of Winemakers of Alentejo (Associação Técnica dos Viticultores do Alentejo – ATEVA), Esporão S.A (Wine Company) and Sugal Group. New projects were financed in 2021 in competitive calls, and several other applied to national and European funds.

The researchers of plant virology and mycology laboratories still collaborate with farmers and agricultural companies in the diagnosis and advisement of plant disease in regional crops. The researchers of these laboratories joined the Collaborative Laboratory InnovPlantProtect in the application to research projects to PRR funds.

Entomology Laboratory researchers tested in field conditions the models of mass capture traps for fruit flies, for which there is an ongoing patent request.

The researchers of Soil Microbiology laboratory have the first year of field trial results of the knowledge-transfer project Bioprotomate, regarding the bioprotection effect of cover crop and agronomical practices alterations on tomato production (involving collaboration with Ag-Innov Centro de Excelência – Sugal Group) and participated in several proposals entailing different agro-ecosystems to investigate the role of soil microbes and specific microbial activity (PRR, Agenda TRANSFORM, services provision).

ISI / SCOPUS PUBLICATIONS - 29 Numbers referring to the complete list in Point 14) 1; 32; 41; 42; 45; 46; 47; 48; 53; 55; 54; 77; 79; 92; 93; 95; 120; 149; 158; 166; 202; 206; 221; 222; 223; 150; 121; 224; 94.

BOOK AND BOOK CHAPTERS - 0

RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 8 Numbers referring to the complete list in Point 10) 41; 46; 48; 49; 50; 62; 70; 80.

PLANT GENETICS AND BIOTECHNOLOGY (PGB)







Keyword(s): Plant biotechnology | Molecular diagnostics and markers | Phenotype-genotype associations| Gene functional analysis

Major Competences of the Group

In 2021 the Plant Genetics and Biotechnology group (PGBG) followed the development of its major research lines, which include plant omics, genetics and breeding, plant tissue culture, plant physiology, and developmental biology. The group continued focusing its research on the use and development of molecular and biotechnology tools, for characterization, propagation, and breeding of important Mediterranean forest and agricultural species, like the cork oak, olive, grapevine, strawberry tree, almond, and cardoon. From the developed work, some of the group competencies must be highlighted:

- Capacity to identify molecular pathways related to adventitious root formation in olive following a multi-omics approach (transcriptomics, proteomics, and metabolomics);
- Capacity to identify molecular mechanisms related to somatic embryogenesis efficiency in olive cultivars, and micrografting in almonds;
- Use of gene pyramiding techniques to improve grapevine resistance against powdery and downy mildew;
- Establishment of a grapevine genotyping platform based on SSR markers;
- The establishment of a strawberry tree and wild rocket germplasm collections was completely evaluated for main agronomical traits and characterized by randomly amplified and species-specific SSR and SNPs markers.
- Uncovering the transcriptome of wheat and grapevine miRNAs in response to abiotic stresses;
- Establishment of a phenotyping tool based on calorespirometry to assess seed vigor;
- Development of new strategies for almond, cardoon, walnut, and olive in vitro propagation;
- Characterization of molecular mechanisms involved in the plant's secondary metabolites, such as cynaropicrin in cardoon, and tocopherol in almond;
- Revealing of gene networks in stone pine and cork oak plant development;
- Uncovering the genetic basis of cork quality;
- Study of new economical processing strategies to improve cocoa quality;

- Development of bio-based materials from agroforest waste;
- Evaluation of plant response to environmental stress conditions;
- Chemical and biological characterization of plant extracts from Mediterranean plant species.

MAJOR ACHIEVEMENTS IN 2021

Apart from quantifiable outcomes directly related to research, such as the number of articles and book chapters in international peer-reviewed journals and the ongoing I&D projects, other highly relevant PGBG achievements must be highlighted:

- Genes involved in tocopherol biosynthesis pathway in almond trees were identified;
- An in vitro germplasm collection of almond trees was established by using an optimized protocol;
- SNPs associated with the cork quality were identified;
- A comprehensive transcriptome of stone pine was generated resulting in a total of 50,161 functionally annotated;
- Somatic embryogenic lines of Solanum lycopersicum were established to be used as model plant for functional validation of target genes involved in adventitious rooting;
- Somatic embryogenic lines of olive (Olea europaea L.) were established, and proteome differences putatively involved in olive somatic embryogenesis efficiency were identified for each line;
- A protocol for pea seed vigor phenotyping based on calorespirometry was established;
- A new olive cultivar ('Carrasquenha') was successfully established in vitro;
- miRNAs involved in grapevine heat stress tolerance were identified;
- The chemical composition of cocoa using new inexpensive postharvest pretreatments was improved;
- The non-host-pathogen interaction between Phlomis purpurea and Phytophthora cinnamomi was characterized using a mass spectrometry based untargeted metabolomics approach;
- A novel method of early biodetection of the highly aggressive phytopathogen Phytophthora cinnamomi, based on canine sense of smell, able to discriminate from other oomycete genera such as Pythium, was developed;
- Implementing novel "green" solvents for polyphenol extraction and developing novel lignin-based materials, such as foams, resins and films;
- Insights on the formation and stability of cellulose-based emulsions;
- Assessment of different metallic nanoparticles as chemical elicitors in in vitro shoot cultures of Lavandula viridis and Thymus lotocephalus;
- The effects of drought stress on morphological, physiological, chemical and biological characteristics of Thymus lotocephalus shoot cultures were assessed.

Finally, it is worth mentioning that in the scope of knowledge and technology transfer several group members were involved in the edition of special issues in international journals with impact factor:

 "Advances on the Biological Mechanisms Involved in Adventitious Root Formation: From Signalling to Morphogenesis" in Frontiers in Plant Science. https://www.frontiersin.org/research-topics/12529/advances-on-thebiologicalmechanisms-involved-in-adventitious-root-formation-from-signaling-to-morp

- "Molecular Breeding in Horticultural Plants" in Plants (MDPI) https://www.mdpi.com/journal/plants/special_issues/Molecular_Breeding_Horticultural
- "Powdery Mildew Resistance Genetics" in Genes (MDPI) https://www.mdpi.com/journal/genes/special_issues/mildew_resistance
- "Molecular Mechanisms Associated with Plant Plasticity upon Environmental Stresses" in Plants (MDPI) https://www.mdpi.com/journal/plants/special_issues/Plant_Plasticity_Environmental_S

tresses
"Micropropagation Research: Current Applications, Prospects, and Challenges" in

- Agronomy (MDPI) https://www.mdpi.com/journal/agronomy/special issues/micropropagation research
- "Advances on the Biological Mechanisms Involved in Adventitious Root Formation: From Signalling to Morphogenesis, Volume II" in Frontiers in Plant Science. https://www.frontiersin.org/research-topics/30108/advances-on-the-biologicalmechanisms-involved-in-adventitious-root-formation-from-signaling-to-morp
- "Phenolic Profiling and Antioxidant Capacity in Agrifood Products" in Processes. https://www.mdpi.com/journal/processes/special_issues/phenolic_antioxidant
- "The Metabolism and Health Benefits of Bioactive Compounds in Foods" in Foods. https://www.mdpi.com/journal/foods/special_issues/metabolism_health_food
- "Cellulose and Lignin Feedstock for Renewable Materials" in Polymers. https://www.mdpi.com/journal/polymers/special_issues/cellulose_lignin_feedstock

Also, some of the knowledge acquired within the PGBG's group, such as the walnut micrografting or the olive micropropagation techniques, is already being used by the University of Évora spinoff company, Despertafolia Lda., in its production processes. Moreover, the companies involved in the LIVESEED project are already using the phenotyping methodologies developed for both, plant stress tolerance, and seed viability evaluation.

ISI / SCOPUS PUBLICATIONS - 25 Numbers referring to the complete list in Point 14) 15; 24; 46; 47; 50; 48; 55; 54; 62; 68; 65; 78; 97; 125; 144; 147; 149; 153; 154; 159; 173; 194; 222; 195; 31; 219; 167; 27. BOOK AND BOOK CHAPTERS – 1 B4. RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 5 (Numbers referring to the complete list in Point 10) 3; 37; 59; 83; 84.



APPLIED ECOLOGY AND CONSERVATION (AEC)





HEAD OF GROUP: Carla Pinto-Cruz [ccruz@uevora.pt] VICE-HEAD OF GROUP: Carlos Godinho [capg@uevora.pt] INTEGRATED MEMBERS: 20

PhD STUDENTS: 6 [See List point 14 - MED Members]

Keyword(s): Biodiversity monitoring and conservation | Ecosystem processes and services | Habitat recovery | Landscape fragmentation and connectivity

MAJOR COMPETENCIES OF THE GROUP

The major competencies of the Applied Ecology and Conservation Research Group are Biodiversity monitoring and conservation, Sustainable management of natural resources, Ecosystem processes and services, and Linear infrastructures' impact on biodiversity. More specifically, group members focus their research on defining effective methods to monitor how human disturbance affects biodiversity (fungi, plants, freshwater communities, and terrestrial vertebrates), including the assessment and management of ecological impacts of biological invasions (mainly birds, fishes, and plants), and Integrated management of roads and other linear infrastructures. In most cases, this leads to the design and implementation of conservation measures for species and habitat ecological restoration. Special attention is dedicated to the interactions between species and ecosystem dynamics searching for applied solutions for sustainable management of natural resources, and also productive agroecosystems (Montado - cork oak woodlands, olive orchards and vineyards).

MAJOR ACHIEVEMENTS IN 2021

In 2021 the group increased their scientific production, publishing more research papers in indexed journals, and the knowledge transfer actions, through the increase of applied projects to and with the society. These projects engage a wide range of partners, from municipalities to the private sector, and subjects, from environmental education support to schools to applied management solutions. It was also a productive year in scientific communication, with most of the group members participating in international meetings, being also an opportunity to strengthen international collaborations.

One of the biggest achievements was the organization of the IENE International Conference 2020 whose theme was "LIFE LINES – Linear Infrastructure Networks with Ecological Solutions", and the Infrastructure and Ecology Network Europe (from 12 to 14 of January of 2021). This event accounted for 293 attendees from 40 different countries representing the five continents. Researchers,

practitioners, linear infrastructures operators and managers, NGO's representatives, and policymakers were involved in the event, highlighting the relevance and actuality of the research topic. During the three days, participants were able to assist to 115 full oral presentations, 36 lightning talks, and 13 workshops and chat with 40 posters authors, representing studies and projects worldwide.

Additionally, 150 participants from three continents and 21 different countries (e.g. Spain, the United Kingdom, Myanmar, Canada or Brazil, etc.) attend the LIFE LINES Final Seminar held in 13 January of 2021. This seminar highlighted the preliminary results of the LIFE LINES project, under which 35 actions were implemented over 5 years.

We have consolidated the research on ecological solutions, with several projects dedicated to evaluated and restore natural vegetation and habitats, and on interactions between exotic and native species.

ISI / SCOPUS PUBLICATIONS - 41

(Numbers referring to the complete list in Point 14) 25; 36; 34; 49; 50; 55; 54; 65; 80; 83; 115; 127; 131; 132; 133; 151; 161; 162;174;175; 182; 185; 187; 200; 201; 202; 220; 91; 196; 130; 28; 98; 210; 102; 183; 184; 186; 188; 190; 189; 152.

BOOK AND BOOK CHAPTERS – 12 B12; B13; B14; B15; B16; B17; B18; B19; B20; B21; B22.

RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 9 (Numbers referring to the complete list in Point 10) 4; 6; 7; 17; 30; 40; 53; 23; 24.



SOIL, WATER AND CLIMATE (SWC)



Water Wrater Change Soil Soil Soil Change Chan

HEAD OF GROUP: Gottlieb Basch [gb@uevora.pt]

VICE-HEAD OF GROUP: Carlos Alexandre [cal@uevora.pt]

INTEGRATED MEMBERS: 13 PhD STUDENTS: 4 [See List point 14 - MED Members]

Keyword(s): Soil science and soil and water conservation | Climate and agricultural change | Mediterranean Irrigated agriculture | Water resources planning and management

MAJOR COMPETENCIES OF THE GROUP

Soil Science and Applications, Hydrology and Water Resources Engineering, and Climate may be considered as the 3 disciplines constituting the scientific domain of the Group SWC. These disciplines are basic to any agroecological activity, as they provide basic scientific knowledge to agricultural, forest and animal production, as well as to any environmental impact assessment. This characteristic of fundamental sciences gives the group a special position among the MED research groups, as this pool of knowledge is required for the application of many project proposals in the frame of MED. Therefore, the members of this group may act as fundamental scientists specialized in one of the 3 disciplines or they may participate as researchers in almost any project of the institute.

MAJOR ACHIEVEMENTS IN 2021

In 2021, the vice-head of this research group continues to be the Chair of the Portuguese Soil Science Society (SPCS), and through this position, he is strongly engaged in the Portuguese Soil Partnership. In this role, he was coordinating the annual meeting of the SPCS held in October in Elvas under the topic of Soil Management Challenges in the Context of Climate Change.

The responsible of this research group has been re-elected chair of the European Conservation Agriculture Federation (occupying this position since 2011). As such he acted as chair of the Organizing Committee of the 8th World Congress on Conservation Agriculture, which, after a one-year delay was finally held in June 2021 in Berne/Switzerland (field days and coordination of the online event). Organized as an online event it gathered 783 participants from farmer associations, international organizations, scientific institutions, private sector, non-governmental, and civil society organizations, from more than 108 countries, in the developed and developing world (https://ecaf.org/8wcca/).

In April, the responsible of this group was called to collaborate with the WEF initiated EU Carbon+ Farming Coalition aiming at operationalizing an EU carbon farming initiative.

In September, we organized the annual conference of EURAGRI on the topic: Bringing science to society through co-innovation and co-creation - the soil-health and food mission (https://bit.ly/37Z55Wm).

A member of the UAlg research team, acting as vice-chair of the European Turfgrass Society, organized the European Turfgrass Society Webinar Series. (https://www.turfgrasssociety.eu/news/first-seminar-of-the-2021-european-turfgrass-society-webinar-series/).

Through its members, the SWC group of MED continues to be represented in two National Centres of Competencies, one on Corn and Sorghum, and the other on Climate Change in the Agroforestry Sector.

Other members participated in several activities, either national or international, in the scientific domains of soil and water resources and the climate, namely in what climate change mitigation and adaptation is concerned.

ISI / SCOPUS PUBLICATIONS - 17 (Numbers referring to the complete list in Point 15) 2; 17; 51; 73; 137; 139; 140; 141; 143; 156; 168; 204; 206; 218; 207; 94. BOOK AND BOOK CHAPTERS – 2 B5; B8. RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 6 (Numbers referring to the complete list in Point 10) 2; 9; 35; 47; 55; 74.



FARMING TECHNOLOGY AND ENERGY EFFICIENCY (FTE)





HEAD OF GROUP: José Rafael Marques da Silva [jmsilva@uevora.pt] VICE-HEAD OF GROUP: Fátima de Jesus Folgôa Baptista [fb@uevora.pt] INTEGRATED MEMBERS: 15

PhD STUDENTS: 2 [See List point 14 - MED Members]

Keyword(s) | Development of farm machinery | Precision agriculture and PLF | Energy efficiency in agro-production and industry | Material and energetic use of biomass

MAJOR COMPETENCIES OF THE GROUP

The group Farming Technology and Energy Efficiency (FTE) is a highly diverse group, which can be interpreted as both a problem or an advantage. Normally a high level of specialization is important for scientific research in specific areas of knowledge. So, to be productive in terms of research in science teams must be focused and highly specialized. However, innovation needs diversity because without diversity new ways of related things doesn't appear.

In resume, one can say that the major competence of FTE group is diverse as can be seen in the next diagram where the group have discussed their competencies (Agriculture, Engineering, Precision Agriculture, Soil, Water, Remote sensing, GIS, GNSS, Energy, Biotechnology, Residues and they valuation, Circular economy...).







MAJOR ACHIEVEMENTS IN 2021

Diversity has one major problem, integration. The risk could be that the FTE group can see a lot of things but can't work together.

Several sessions were made to test how the group could resolve a problem together and the following Figure was produced. In resume, the discussion was centred on a huge problem in terms of animal effluents of a particular region and how the group could resolve the problem as a research/innovation group?

At this stage, and we can realize it from the next schematic, there is a particular potential to solve problems together within. Next step is to find a real problem where the group can be evolved on, has a group.





LANDSCAPE DYNAMICS AND MANAGEMENT (LDM)





HEAD OF GROUP: José Muñoz-Rojas [jmrojas@uevora.pt] VICE-HEAD OF GROUP: Constança Camilo Alves [calves@uevora.pt] INTEGRATED MEMBERS: 16 PhD STUDENTS: 5

[See List point 14 - MED Members]

Keyword(s): Land use systems | Spatial analysis and modelling | Monitoring mechanisms | Public policies and planning | Adaptive management and governance | Co-construction of knowledge | Landscape functions | Ecosystems Physiology | Multi-functionality

MAJOR COMPETENCIES OF THE GROUP

This group, formed in the year 2020, is unique in the Portuguese context in bridging together landscape functions, modeling, management, and governance. The focus of the research group is on Mediterranean rural and farming landscapes and land-use systems. Members of the group include social, economic, agronomic, spatial, and ecological scientists, who employ distinctive methods, concepts, and techniques. This allows for an interdisciplinary approach that is essential for tackling complex social-ecological challenges arising in the landscapes and land-use systems of Mediterranean Portugal and Mediterranean Europe, and that is targeted in the EU's Green Deal and Climate Pact (2020), 2030 Biodiversity Strategy, Cohesion Policy (2020) and CAP reform 2021-2026. All of these are policies and funding programs that will determine Portugal's rural policies, public funding schemes, and action plans for years to come.

In addition to the diversity of approaches and concepts that researchers in the group jointly encompass, they also apply a multiplicity of techniques and tools, including quantitative and qualitative, social, economic, modeling, spatial and design-oriented, along with bio-physical and ecological ones.

Members of the group work in the lab, field, computer and also directly with stakeholders. An asset of this group is its experience and expertise in working with trans-disciplinary processes to progress towards knowledge co-construction and action-oriented research. This multiplicity of skills, tools, and approaches has secured its success in gaining external funding, with its members having been involved in 10 international projects (https://www.med.uevora.pt/international-projects/) funded at the EU level during 2021.

Furthermore, members of this group are also involved in international networks aiming at knowledge exchange and joint action, including UNIMED, LRG, and COST. At the National level, team members have contributed or co-led 4 projects and initiatives during 2021, funded by the FCT and other regional and national agencies. The team has worked since its inception on delivering advice and co-

constructing knowledge that is useful for informing better land-use governance and management options that can contribute to the sustainability and resilience of Mediterranean rural landscapes.

To help achieve this, the group plans on delivering, in 2022, a joint position paper and contributing to various new research project proposals. We expect that these joint outputs can help clarify where our distinctiveness and value as a group lies in comparison with other equivalent research groups, whilst they also help us disseminate our values, competencies, and potentialities more widely.

MAJOR ACHIEVEMENTS IN 2021

The approach of this team to the Montado silvopastoral and other farming systems of central and South Portugal (e.g., olive groves, horticulture, mountain agriculture) through a combined socialecological and largely trans-disciplinary perspective that brings together multiple disciplines and scientific paradigms, actors, networks, operational approaches, and spatial-temporal scales. This entails the continuous need for different methods and infrastructures used by the different members of the group being combined. This combination of methods, levels, and approaches becomes apparent through the set of multiple projects and publications that are synthesized as follows. Ultimately, the current approach of this group is to apply this complex multi-level and trans-disciplinary approach to study and move rural land-use systems and landscapes toward enhanced sustainability and resilience levels to other systems of relevance in Alentejo and the wider Mediterranean macro-region, including (but unrestricted to): olive groves, small-agriculture, montado and mountain farming systems. Last, it ought to be pointed out that this team is especially active in engaging and liaising with diverse actors and stakeholders acting across governance levels from the farm to the region to jointly co-construct new theories and operational programs for land-use sustainability.

ISI / SCOPUS PUBLICATIONS - 33

(Numbers referring to the complete list in Point 14) 19; 26; 30; 34; 39; 41; 63; 64; 101; 88; 90; 96; 108; 110; 112; 117; 142; 146; 162; 162; 175; 176; 177; 178; 179; 182; 187; 193; 194; 213; 214; 190; 35

BOOK AND BOOK CHAPTERS – 4 B1; B3; B6; B9; B23; B24.

RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 21 (Numbers referring to the complete list in Point 10) 1; 8; 10; 11; 12; 13; 15; 18; 21; 31; 36; 39; 42; 43; 51; 52; 54; 60; 69; 71; 71; 23.



BIODIVERSITY AND CLIMATE CHANGE (BCG)





HEAD OF GROUP: José M. Herrera [jmherrera@uevora.pt] VICE-HEAD OF GROUP: Diogo Alagador [alagador@uevora.pt] INTEGRATED MEMBERS: 9

PhD STUDENTS: 2 [See List point 14 - MED Members]

Keyword(s): Biogeography | Ecosystem Services | Ecosystem Resilience and Resistance | Global Environmental Change | Modelling

MAJOR COMPETENCIES OF THE GROUP

The Biodiversity and Climate Change (BCC) group follows a multidisciplinary approach to investigating the impact of the major drivers of global environmental change (particularly, landscape modification and climate change) on biodiversity as well as on ecosystem processes and services (BEPS). This group has also strong competencies to develop spatially explicit conservation plans to promote the persistence of BEPS in current and future landscape scenarios undergoing environmental changes. Cross-cutting approaches to the conservation of BEPS have been addressed, particularly:

- 1. species distribution model development
- 2. climate-driven predictions of the impact of invasive species
- **3.** eco physiological experiments
- 4. phylogenetic and trait-based approaches to species extinction
- 5. ecosystem services modelling
- **6.** conservation management
- 7. disentangling food-web environment relationships
- 8. statistical tools development

The BCC Group holds specific competencies in ecological and statistical modelling, agroecology thermal ecophysiology and experimental biogeography. It is also actively committed to contributing to the thematic line on Biodiversity and Ecosystem Functioning, but also others such as those focused on Olive Groves and Olive oil and Rural Dynamics and Governance.

MAJOR ACHIEVEMENTS IN 2021

The Biodiversity and Climate Change (BCC) group aggregates a total of 9 integrated members, and it is a very active group in terms of scientific productivity. Thus, the total number of manuscripts published during 2021 was 16, all of them published in top-ranked (1st quartile) SCI journals including Ecology, Scientific Reports, Global Ecology and Biogeography, Journal of Applied Ecology and Proceedings of the National Academy of Science.

Researchers from the BCC Group have also actively participated in national and international research projects. As an example, a BCC researcher is the national coordinator of Olivares Vivos +, a LIFE project that integrates a total of 4 European countries. The BCC group is also highly committed to training a new generation of researchers, and now integrates a total of 3 PhD students all of which are awarded with highly competitive research grants funded by the FCT.

The BCC group is similarly highly committed to training a new generation of researchers. Thus, at this moment there are a total of two PhD students granted with highly competitive studentship programmes and two more are expected to be integrated this very year of 2021.

ISI / SCOPUS PUBLICATIONS - 21 (Numbers referring to the complete list in Point 14) 30; 57; 111; 170; 212; 215; 216; 223; 155; 197; 33; 71; 70; 81; 118; 119; 56; 191; 208; 114; 209. BOOK AND BOOK CHAPTERS – 1 B10 RESEARCH PROJECTS COORDINATED BY A MEMBER OF THE GROUP - 2 (Numbers referring to the complete list in Point 10) 20; 66.



THEMATIC LINES STRATEGY 2021

OLIVE GROVES E OLIVE OIL

Boost quality and notoriety of olive groves and olive oil production mainly from Portuguese olive varieties, increasing competitiveness of the sector



Coordinator: António Bento Dias [adias@uevora.pt]

Co-Coordinator: Raquel Garcia [raquelg@uevora.pt]

GOALS - The main goal is to enhance sustainability of olive groves and olive oil production, mainly from Portuguese olive varieties. The rapid growth of olives in Alentejo was based in imported varieties with different organoleptic characteristics of the Portuguese ones. To preserve the specificity of Portuguese varieties, there is an urgent need to overcome the difficulties associated to their use in intensive production.

RESEARCH STRATEGIES:

There are different research problems to tackle according to the research focus

• For olive groves are the lack of quality of plant material; phytosanitary limitations of Portuguese varieties; lack of knowledge of production techniques more suitable for intensive production of these varieties.

RESEARCH QUESTIONS: 1) selection, genetic improvement, and propagation of these varieties; 2) evaluation of varietal behaviour to optimize end-product production; 3) biology of key pests and diseases, developing alternative methods to chemical fight and evaluation of functional diversity of the ecosystem; 4) adequate olive canopy to continuous canopy shaking harvesting; 5) development of techniques and technologies for the use of by-products of olive groves.

• For olive oils, the main problems are the quality certification, guaranty of its authenticity and geographical and varietal traceability and genuineness (in terms of adulterations). Some drawbacks related to mill wastes could be also appointed.

RESEARCH QUESTIONS: 1) metabolomic studies involving "profiling" and "fingerprinting" approaches of Portuguese olive oil varieties; 2) assessment of food safety in terms of pesticide residues and other contaminants; 3) treatment and recovery of mill wastes promoting their valorization.

The sustainability of the Portuguese olive oil sector constitutes a key factor for its competitiveness.
VITICULTURE AND ENOLOGY

Optimize management strategies to improve the efficiency and productivity of Alentejo vineyard and enhance wine quality, addressing the plant and its environment (soil and climate), the wine and the technology and the market and consumption

Annual Report 2021



Co-coordinator: Ana Elisa Rato [aerato@uevora.pt]



GOALS: The main goal of the thematic line is optimizing management strategies to improve the efficiency and productivity of Alentejo vineyard and enhance wine quality, addressing the plant and its environment (soil and climate), the wine and the technology and the market and consumption. Baring this in mind, increasing wine (and wine-related products) quality and typicity, while increasing the knowledge on new technologies, understanding the plant-pathogen interactions, achieve a better knowledge of grapevine trunk diseases and underlying mechanisms associated with the expression of trunk diseases symptoms in different vineyards in Alentejo, were the main areas of research activity during 2021.

RESEARCH STRATEGIES: 1) the sustainability of viticulture through the promotion and development of integrated sustainable management strategies for the control of pathologies associated with vineyards, aiming the acquisition of new knowledge about the pathogenic fungi involved in GTDs, as well as a better understanding of the mechanisms of tolerance and/or susceptibility of Vitis vinifera L. to infection by trunk pathogens, and a better understanding of small RNAs in response to heat stress in mycorrhizal grapevines (contributing to research questions: how to increase plant resilience to biotic or abiotic stress). 2) the impact of technologies in wine and wine spirits characteristics and the development of quick methods to quantify grape main compounds using FT-NIR and spectrophotometry UV-Vis, aiming grape quality evaluation (contributing to research questions: how to improve quality and added value of products (table grapes, wines, spirits), taking advantages of the differentiation provided by Portuguese varieties and new technologies)

During 2021, researchers were mainly focused on:

a) strategies to increase plant resilience, namely by assessing if arbuscular mycorrhizal fungi inoculation increases plant tolerance to high temperatures and increasing knowledge on grapevine trunk diseases and the phytopathogenic fungi associated with it in vineyards in Alentejo;

b) strategies to improve and measure quality of grapes and wine products, namely by increasing knowledge on volatile composition of wines and spirits addressing also alternative ageing technologies for wine spirits and phenolic composition of vinegars.

Two more PhD were engaged in this research line: a PhD student working in wine grape quality, studying the anthocyanins, phenols, flavonoids and tannins evolution during ripening as well as the impact of weather conditions in its evolution and a PhD studying the Influence of soil management practices on the Terroir microbiome definition aiming to characterize the soil microbiome associated to specific vineyard varieties and evaluate the influence of presence and the absence of inter-row

cover crop on the grapevine nutritional status, grape-associated microbiome and wine quality. Two other PhD students are ongoing: "Molecular basis of resistance/susceptibility of Vitis vinifera L. to wood infection by fungal trunk pathogens in Alentejo region and "Comprehensive study of varietal wines from Alentejo, for robust practices towards climate change"

Research outcomes contributed to increased knowledge on the complex disease associated with the decline of grapevine in Portugal, particularly in Alentejo region; establishment of sustainable management strategies and control methods against these pathogens including the exploitation of symbiosis with beneficial microbes; and increasing knowledge on varietal wines and the impact of news technologies on its quality. Results were published in 11 articles in peer review journals and 15 presentations in meetings



ANIMAL PRODUCTION AND HEALTH

Optimize animal production by the rational use of natural resources, the adaptation of species/breeds to a changing environment and production systems, taking into account both animal and human health, and food quality and safety



Coordinator: Rui Charneca [rmcc@uevora.pt]

Co-Coordinator: Ricardo Romão [rjromao@uevora.pt]

GOALS: Due to the high diverse scientific interests and skills of the MED members contributing for the MED's Animal Production and Health Thematic Line, three comprehensive main goals were defined in order to include, as much as possible, the different types of research both on course or forecasted. These goals were:

1) The development of nutritional, "omics", reproductive and management tools to optimize Mediterranean animal production systems towards sustainability (ecological and economic) and resilience, focusing on a circular economy approach;

2) The development of nutritional, "omics", ecological, epidemiological and technological tools to address animal welfare and environment adaptation problems, and promote healthier animals reducing the use of antimicrobials in a "One health" approach;

3) The improvement of quality assessment and safety of existing and new animal products, coming from animals bred according to the new practices developed in goal 1 or from technological innovations (reduction of salt and other additives, study of alternative natural additives, use of recent preservation technologies, etc);

The first two goals are specially focused on knowledge that allows the optimization at multiple levels of the Mediterranean animal production systems while considering the European Union Farm to Fork Strategy. The third goal is more specific as it addresses explicitly to the animal products, both raw or transformed, regarding their differentiated qualitative characteristics and safety.

RESEARCH STRATEGIES: Based on their interests and skills of the MED's researchers contributing to the Animal Production and Health Thematic Line, several research projects were carried out and proposed and approved during 2021. The 2021 ongoing research included projects focus on the use of vegetal by-products or alternative feeds on animal nutrition, especially in ruminants; animal health topics both on domestic and wild species and on the quality and safety of animal products. The approved and, in some cases, started research projects during 2021 included the study of alternative feeds for swine nutrition; reproductive efficiency of horses; sustainable meat production and study of quality and safety of animal products of several species in order to their valorisation. Most of the research is made using local breeds of the different species in order to answer to national farmer's needs. In order to achieve both scientific excellence and to address the main questions and problems of animal breeders and animal products industry, MED researchers participate and apply to different projects typologies as the National and European Research and Innovation projects (FCT and EU calls), Co-promotion projects (led by enterprises but involving knowledge institutes (KI) as scientific partners) and Demonstration and Knowledge and Technology Transfer projects. As much as possible, MED researchers are encouraged to involve in the projects the higher number of disciplines/themes

and also to involve MED colleagues working in other Thematic Lines in order to potentiate synergies between research teams and to obtain more wide-ranging results. Finally, and in order to expand the research possibilities and to maintain or increase the contacts and relationships with other KI's, MED has an active participation on several networks being the most related to the Animal Production and Health thematic line, the European FABRE platform, the ECOGRAM network, the Global Network on Silvopastoral Systems and the EURAGRI consortium. MED members were also involved in ongoing and proposed COST actions.



AGRO-SILVO PASTORAL SYSTEMS – MONTADO

Optimize sustainability and support adaptive management of the Montado, by combining its different components and integrating ecosystem services, products' added value, landscape multifunctionality, and better informed public policies, ultimately reducing the loss in tree canopy density and total area

Coordinator: Nuno Guiomar Gracinhas [rmcc@uevora.pt] Co-Coordinator: Carlos Godinho [capg@uevora.pt]



GOALS: The resilience of agro-silvo-pastoral systems (hereafter Montados) is determined by a regime of ecological disturbances and land uses within specific thresholds. Exceeding these limits leads to imbalances in the interactions between its three fundamental components: trees, understory vegetation and livestock. The lack of detailed monitoring data on the spatial and temporal dynamics of these components was identified as the two highest-ranking priorities, among the objectives previously set for this Thematic Line, the development of (1) spatially explicit databases of structural characteristics of Montados and test of indicators (2) to assess the quality of pastures and soil health in Montados. According to the previous results, the tree layer varies in composition, density and age structure, but its global decline is evident and widespread. In most cases, this decline proceeds slowly by decreasing tree density at the stands' level, but the (3) assessment of the relative importance of factors on cork oak dieback showed high spatial variability. Sudden death, clear cuts to promote other land uses, and the loss of large areas after stochastic disturbances, i.e. wildfires, are also not negligible. These losses result in increased fragmentation of Montado patches, which increase their vulnerability to future disturbances, and require (4) spatial and temporal approaches to changes in Montado connectivity. The heterogeneity of the Montados is extremely high, regardless of the spatial and temporal scales at which it is observed, analyzed or assessed. This variability is determined by the diversity of biophysical characteristics over which these land-use systems are distributed, and by the different management models, not always adjusted to their carrying capacity. However, this system carrying capacity can be enhanced by improving soil fertility and soil biological activity to (5) increase plant growth and nutritive value of pastures, reducing production costs, or through cork oak irrigation to (6) increase the success of future afforestation initiatives and also tree growth in drought-prone regions. Knowledge building on the above-mentioned components of Montados is critical to (7) promote adaptive management, increase the competitiveness of production systems and optimize governance strategies and simultaneously reduce risks and reverse tree decline. Such diversity of characteristics, needs and goals require us to (8) identify and classify the different types of Montados; (9) promote co-construction with stakeholders to find well-adapted solutions for each context and speed-up changes; (10) import knowledge more effectively into private and public managers and decision-makers; and (11) implement clear and easy-to-measure indicators for system-wide assessment to monitor efficiently land-use activities, policy strategies and consequent changes and to support adaptive management and adjustments in financing schemes.

RESEARCH STRATEGIES: The Research Strategy relied on applying multiple and innovative techniques for collecting and analyzing quantitative and qualitative data, and on strengthening cooperation with other institutions and researchers both at national and international levels. Cross-disciplinary collaboration was a striking feature of this Thematic Line (TL), which is reflected both in the

methodological approaches carried out in 13 papers already published (plus 8 submitted) in peerreviewed scientific journals and in the topics covered by the 8 projects (plus 5 submitted to competitive funding) that allowed to reach the main findings (6 PDR, 2 POCTEP-INTERREG, 1 LIFE, 1 Arimnet2). Applied research to support management decisions in Montados was conducted to assess (1) pasture quality through combined instrumental and laboratory research methods and remote sensing-based metrics to evaluate its potential use for upscaling in situ measurements; (2) the effects of chemicals on soil fertility and pasture quality to reduce animal supplementation needs; (3) the diversity of benefits resulting from different grazing schemes; (4) precision agriculture technologies to face challenges imposed by climate change; (5) innovative methodologies and technologies for diagnosis, monitoring and control the flathead oak borer (Coraebus undatus Fab.), a biotic agent that affects cork production; (6) the competitiveness of Montado production systems. Field-based experimental research supported by funding designed for implementing experimental plots allowed to assess (1) the effects of irrigation and fertigation of cork oak trees on tree growth aimed at reducing the time until the first cork stripping, and (2) the effectiveness of Keyline design for Montado restoration. Participatory research was also applied in the scope of Tertúlias do Montado, where knowledge on specific topics was shared and discussed to search for solutions to the multiple challenges faced in Montado areas. Regarding the monitoring process, two independent approaches were carried out: (1) estimation of structural characteristics at tree level (canopy cover, tree height and biomass) based on advanced remote sensing approaches using multi-sensor data provided by different satellites; (2) identification of dieback trees through high-resolution images using standard Web Mapping Services in QGIS to promote spatial-explicit assessments of tree mortality and related factors. International cooperation was strengthened through the participation of MED in international networks such as the Global Network on Silvopastoral Systems (107 members of 29 countries worldwide) to promote and scaling up of silvopastoral systems worldwide; and the EcoGram Network (11 Ibero-American countries) embedded in the CYTED programme (Ibero-American Programme on Science and Technology for Development) to enhance innovative management practices in silvopastoral systems. At national level, dissemination and outreach activities were also carried out in the scope of different projects, and concerning the objectives of this TL, MED is represented in 4 Competence Centers (CS): CS for Alentejano Pig and the Montado; CS for Cork tree and Cork; CS for Climate Change in the Agro-Forestry Sector and CS for Extensive Grazing.

IRRIGATED AGRICULTURE

Support a strategic use of the available irrigation water and facing climate change trends, by assessing water availability and productivity, soil and water conservation

Annual Report 2021



Coordination: Gottlieb Basch [gb@uevora.pt]

Co-Coordinator: Luis Leopoldo [llsilva@uevora.pt]

GOALS: This Line tackles three major PROBLEMS in Irrigation Agriculture, which are: 1) limited availability of water in all Mediterranean regions, 2) lack of a territorial/regional strategies to coordinate the use of the available water resources, and 3) low added value of the irrigated crops.

RESEARCH STRATEGIES:

Proposal of research lines to be followed:

- Water availability in the territory: How much water is available for agriculture (including treated waste water) and how will climate change impact this availability? To answer this question, the efficiency and management of water distribution networks must be assessed.
- What benefits in terms of agronomic productivity and economic return could be attained through the integration between rainfed and irrigated agriculture, when compared to purely irrigated summer crops. I.e., through complementary irrigation of traditionally rainfed-grown crops.
- Considering irrigation water availability is limited shortly, how to evaluate the rational/best use of the water available. How and what priorities need to be set?
- o What agricultural management practices allow for more efficient use of irrigation water?
- Economic assessment of the use of irrigation in animal-based production systems.
- Besides soil degradation through erosion in both rainfed and irrigated systems, the additional impact of irrigation on the degradation of soil structure and the threat of salinization are real concerns and must be addressed.

In 2020, MED was granted a proposal (ALT20-46-2018-13) to set up a small irrigation agriculture centre, envisaging 3 types of irrigation: mobile, variable overhead irrigation (Centre pivot) (8 ha), fixed overhead irrigation (2.5 ha) and drip irrigation (0.65 ha). The setting-up of this centre has been followed by the coordination of these thematic research lines and a proposal for contracting e dedicated technician was submitted successfully.



BIODIVERSITY & ECOSYSTEM FUNCTIONING

Contribute to a more sustainable future that fosters human wellbeing through appropriate biodiversity and ecosystem management.

Coordination: Diogo Alagador [alagador@uevora.pt]



Co-Coordinator: Frederico Mestre [fmestre@uevora.pt]

GOALS: During 2021, studies in the research line of "Biodiversity and Ecosystem Functioning" have continued to be undertaken under the three strategic goals, with advances in the: 1) fundamental; 2) applied, and; 3) technological study lines. Those research activities were complemented with several dissemination and academic initiatives and collaborations.

Approximately 40 scientific papers were published in peer-reviewed journals (accommodated under the research groups of Biodiversity and Climate Change, Applied Ecology and Conservation, Plant Protection and Landscape Dynamics and Management). These studies have covered a wide set of contents, all of them integrated within the large tag of MED: "to provide a basis for the knowledge, use and sustainable management of Mediterranean ecosystems and landscapes". The knowledge of biodiversity mechanisms, their modelling and analytical tools have been conducted at several geographical (e.g. the Alentejo region, the Iberian Peninsula, the whole of Europe) and functional scales (implemented for terrestrial, freshwater and soil species assemblages, Mediterranean habitats and for particular species mainly concerned with nematodes, plants, fungi, mycorrhiza, birds, small and meso mammals). The line was involved in the organization of special issues in international scientific journals.

Conservation-concerns were also part of the studies, with the development of strategic plans to protect adaptive responses of biodiversity under climate change; assessments on the functional connectivity of landscapes and the impacts of linear structures; the role of invasive plant species in ecosystems; and the use of species as indicators of particular environmental conditions (e.g., fungi and raptor species). There were also several studies linking biodiversity with ecosystem functions and with services for society. Functions and services were mainly focused on the role of birds and mammals as buffers for the control of infectious plant diseases (with relevancy for olive oil and wine production); the robustness of agrosilvopastoral systems under several landscape pressure; carbon retention by soils; the ecology of Mediterranean vegetation and invasive plant species; plant-pathogen associations and plant-insect interactions; services linked with biotechnological opportunities (eg, physiology studies on the cardoon and the understanding of biodiversity soil processes have been particularly explored); and, not less important, the cultural value of the Montado systems as benchmarks for a sustainable and profitable development.

Researchers in the line have also been involved in several international and national projects (as project leaders or collaborators) thus enforcing research quality and expanding knowledge networks which will potentially scale up scientific achievement in the line in the medium to long term. With many of those projects being concluded in 2021, several researchers have applied for project funding under distinct national and international-based funding programs.

During 2021 the "Biodiversity and Ecosystem Functioning" research line was also active in supervising and co-supervising master and doctoral students, many researchers and professors were enrolled in ecology-based classes (e.g. agro-ecology, biodiversity conservation, biogeography, botany, genetics, landscape ecology, zoology, among others) in the 1st, 2nd and 3rd academic cycles (mainly in the University of Évora, UE) and members were also involved in other academic initiatives like the UE's

Summer School 2021 courses and several stands organized at the national level (eg. "Noite Europeia dos Investigadores"). Researchers and teachers were also involved in the MED inner initiative "MED às 4as".

Activities of the line were disseminated in international and national scientific meetings (although the CoVID-19 pandemics has substantially reduced those events) and research has also been presented through media platforms such as the "Ciência com Impacto" and the "Naturae Digital". Studies in the line were also publicized through interviews in Portuguese TV programs and newspapers.

RESEARCH STRATEGIES: In 2021, studies have been aligned with the research strategies defined for the "Biodiversity and Ecosystem Functioning research line". Because the main focus of the line is expressed by research activities, the great majority of the goals fulfilled in 2021 (see above) are directly concerned with the research strategic plan. Like in 2020, fundamental, applied and biotechnological advances were fulfilled, with research mainly focused on the landscapes, the habitats, the flora, the fauna, the genetic lines and the socio-ecological systems found in Southern Portugal Mediterranean biome.

On the most fundamental side, innovation emerged mainly through the introduction of new perspectives, models and experimental designs to study biodiversity in general. Those findings bound with the conservation requirements of many of the analyzed biodiversity elements and functions. Here, studies endorsing predictions on the effects of climate change over multiple ecological traits of species, over species interaction networks and over conservation planning designs have been a priority. Many of these fundamental studies are of clear relevancy for the agriculture sector. The importance of insects, birds and mammals (in particular rodents and bats) to plant dispersal processes and their action as biocontrols agents have been largely covered for olive tree cultures and vineyards, from which a large fraction of the Alentejo region GDP depends on. The sustainable uses of soil in the region, and their effects on fauna, flora and habitats also translate into the cultural and socioeconomic dimensions of the Mediterranean Montado landscape, which covers the greatest fraction of Alentejo. The biodiversity of soils, in particular with studies on nematodes, fungi and mycorrhiza as well as plantinsect associations have been quite active in 2021. Those advances allow the understanding of soil dynamics such to provide management support positively impacting agriculture profits and carbon sequestration. These are key studies to support the use of nature-based solutions in climate change mitigation policies. Road ecology and assessments of habitats connectivity have qualified the understanding of relationships between land uses and the viability of populations (mainly birds, small and meso-mammals). These findings may also elucidate the need for biodiversity-friendly policies for landscape management and the territorial use. The "Biodiversity and Ecosystem Functioning research line" has been also active in assessing the status and quality of habitats in Alentejo, in particular those occurring in Natura 2000 sites, where new inventories are being carried out, following EU demands. One important branch of investigation traversing several research lines in MED (including "Biodiversity

and Ecosystem Functioning") relates to the biotechnology of the cardoon which presents pharmacological and food-related interests, thus offering opportunities for a sustainable socioeconomic exploration inserted in the coherence of functional and dynamic Mediterranean landscapes.



HORTICULTURE

Higher sustainability of the strongly developing horticultural sector in South Portugal.

Coordination: José Teixeira Leitão [jleitao@ualg.pt]

Co-Coordinator: Mário Reis [mreis@ualg.pt]



GOALS: The goals of Thematic line Horticulture were focused on promoting the sustainability and conservation of the biodiversity, while improving the productivity of horticulture through an efficient use of the resources and implementation of biotechnological tools. The achievement of these goals was prosecuted trough the achievement of the following specific objectives:

The increase the bio-protection of horticulture crops against pests and diseases by implementation of agricultural techniques or by metabolomic and biotechnological approaches, including the introgression of genetic resistances, while trying to obtain a deeper knowledge of the plant-pathogen interactions, including at the cellular and molecular level.

The development of technological solutions and sustainability indicators on smart greenhouse production and to improve crop performance under abiotic stress.

The establishment of ex-situ germplasm collections of fruit and other horticultural crops and to promote the production of selected high-value genotypes. Improvement of the sustainability of management of fruit crops, optimizing pruning, fertilization and irrigation. Introduction of new crops adapted to edaphoclimatic conditions of the region with emphasis on resources limitations. The prevention of the introduction of new pests and diseases.

The optimization of the procedures for extraction of bioactive compounds from aromatic plant species using green approaches, and to achieve the chemical and biological characterization of the obtained extracts and to use of novel "green" solvents and developing novel cellulose-based materials.

The improvement of plant tissue culture techniques to produce plant biomass in controlled conditions without compromising the species natural habitats, and to produce clean of virus vegetatively propagated crops via meristem culture.

The development and optimization of new processes to ensure the safety of the food products while improving their nutritional and sensorial value. The study of the effect of alternative and sustainable methods for food preservation. To implement new food packaging using biodegradable plant materials.

The use spectral techniques like FT-NIR for the analysis of fruit quality parameters, and remote sensing using NIR- spectral approaches as potential indicators for rapid identification of crop nutrition status.

RESEARCH STRATEGIES: Regarding the promotion of bio-protection in horticulture, trials were developed to study mycorrhization and the use of organic residues composts and metabolomic and biotechnological approaches, including the introgression of genetic to powdery mildew in peas and Fusarium in tomato), plant-pest with nematode P. penetrans interactions, including at the cellular and molecular level.

Germplasm ex-situ collections of strawberry tree and wild rocket were established. Plant tissue culture techniques were developed to produce plant biomass in controlled conditions without compromising the species natural habitats, and to obtain virus-free material.

Improved management of horticultural production was prosecuted with the test of microalgae and composts as biostimulants.



New crops were introduced considering the predicted climatic changes, as well as the prevention of the introduction of new pests and diseases on the actual crops.

Biotechnological new approaches were tested regarding the extraction and characterization of bioactive compounds from aromatic plants, and to use of novel "green" solvents for extraction and dissolution of polyphenols, developing novel cellulose-based materials.

Fruit quality and safety studies were performed, namely on of the effect of ultraviolet radiation and electrolyzed water, as well as new food packaging using biodegradable plant materials.

The use spectral techniques like FT-NIR for the analysis of polyphenols, anthocyanins and antioxidant activity and remote sensing using NIR- spectral approaches as potential indicators for rapid identification of the crop nutrient status.

New technological solutions and sustainability indicators on smart greenhouse production were tested to improve crop performance under abiotic stress.



RURAL DYNAMICS & GOVERNANCE

Empowered actors, better targeted public policies and enhanced rural sustainability in Mediterranean context.

Coordination: Maria de Belém Costa Freitas [mbfreitas@ualg.pt]

Co-Coordinator: Maria Helena Guimarães [mhguimaraes@uevora.pt]

GOALS: The territorial and socio-ecological perspectives on agriculture and ecosystems are too many

times forgotten or devalued. In this sense, the main goals of this thematic line are tied with these perspectives and the contribution of Mediterranean agriculture, related ecosystems and the involved actors, to rural development in terms of supporting employment, ancillary businesses, and environmental services.

Our main concerns are particularly the governance models, the policy models and the innovation models that exist or can be developed in rural areas and how these impact the production activities and the preservation of the ecosystems.

During 2020, we particularly addressed the questions of governance and policy models, namely in what concerns the typology of small farms in Europe, their role in regional food systems, the role of participatory monitoring and evaluation of regenerative agriculture to enable social learning, adoption, and out-scaling, how economic activities support the territory in beef and sheep Montado systems and the role of the stakeholders' economic health and Common Agriculture Policy coupled and decoupled payments in these systems and finally, how a Result Based Payment (RBP) scheme may be implemented in the Montado system. We also start to address the question of rural fires prevention combining scientific and local knowledge to develop risk reduction strategies built with the community.

RESEARCH STRATEGIES: As research strategies, we have mapped the interests and meeting points of the researchers that converge in this thematic line.

In what concerns policy models, our strategy was to join people from several MED investigation groups to work in a different agricultural policy model. The research on the possible implementation of a RBP for the Montado system joined together people from Animal Bioscience, Applied Ecology and Conservation, Plant Protection, and Landscape Dynamics and Management.

Governance models were particularly addressed with researchers from the Landscape Dynamics and Management group, working with international partners, both in the questions of small farms as in the competitiveness analysis of the Montado beef and sheep systems or the development of a rural fires' mitigation strategy, focusing in how to involve citizens in the rural world to enhance rural development and, at the same time, promote the empowerment of different actors in the rural world? Finally, in what concerns the innovation models, and besides the innovation that is intrinsic to new governance and policy models, our strategy during 2020 was to strengthen this area with one researcher particularly focused on this thematic.



5. MED PEOPLE 2021









6. Associate Laboratory CHANGE

Global change is affecting the natural environment and people's livelihoods around the world. Ongoing environmental, demographic, and socio-political changes are shaping the 'where' and 'how' people will be able to live in the future. Tackling such increasingly interconnected drivers of change requires a rethink on how R&I, societal and political systems can be integrated to develop public policies and trigger private sector initiatives needed to mitigate and adapt to the effects of ongoing changes. The recently approved "European Green Deal" establishes ambitious goals for turning global change challenges into opportunities, essentially by speeding up the transition into a truly sustainable economy while reducing the EU environmental footprint. Tackling these challenges will require that R&I units streamline the development of policies at the national and European levels.

To address this challenge and get along with its strategy to become an acknowledged international leader research institution, that produces knowledge with an effective impact on people's lives and wellbeing, MED joined forces with two other Excellent rated R&D Units, cE3c - Centre for Ecology, Evolution and Environmental Changes CENSE – Center for Environmental and Sustainability, and entailed all efforts in conceiving an application to Associate Laboratories fund promoted by the Portuguese Foundation for Science and Technology, to create CHANGE - Global Change and sustainability Institute – a multidisciplinary R&I Laboratory designed to deliver realistic policy solutions to environmentally-friendly, resource-efficient and competitive economies under current and future global change.

As the first Associate Laboratory fully dedicated to Global Change and Sustainability in Portugal, CHANGE aims to (1) become the go-to R&I hub for developing, evaluating, and operationalizing policies at regional, national, and international levels; (2) attracting, training and retaining top-level international and national researchers tackling Global Change and Sustainability; and (3) achieving financial sustainability grounded on diversified funding from national and international sources, including both the private and public sectors. CHANGE is committed to supporting public policies that (i) safeguard and promote biodiversity and ecosystem services; (ii) ensure sustainable food and biomass systems, from production to consumption; (iii) ensure protection and regeneration of natural resources; (iv) promote a circular and carbon neutral economy; and (v) strengthen territorial cohesion by reducing regional and social disparities. CHANGE will foster cross-disciplinary linkages, ultimately contributing to resilient environments, healthy people and sustainable economies.

To effectively contribute to pressing global change and sustainability issues, CHANGE is organized around five strategic science-policy-oriented objectives:

1) Support policies for safeguarding and promoting biodiversity and ecosystem services CHANGE will inform the development and assessment of policies aimed at the restoration, management of ecosystems, from forests to farmlands; from rural to urban areas; from continental to islands; from Mediterranean to tropical, and their services.

2) Support policies to ensure sustainable food and biomass systems

CHANGE will provide support to policies that promote increased sustainability of biomass and food production value chain as well as food security, while reducing the environmental and climate footprint of the whole food and biomass systems.



3) Support policies to ensure the preservation and regeneration of natural resources CHANGE will contribute to support policies promoting the sustainable management of natural resources, including restoring soil health, promoting sustainable management of water resources and ensuring air quality and genetic diversity. For this purpose, CHANGE will contribute to promote the development and uptake of green technologies, nature-based solutions, improved resources management practices and transformative change towards efficient and environmental safe use of resources.

4) Support policies that promote a circular and carbon neutral economy CHANGE will contribute to the development of policies and mechanisms to support circular economy and energy transition towards a carbon-neutral economy.

5) Support policies that strengthen territorial cohesion

CHANGE will contribute to the development of policies to reduce regional and social disparities, by capitalising on the strengths of each territory, better connect territories with equal access to the different services, develop cooperation between countries and regions and particularly between urban and rural areas. Novel governance mechanisms across scales will have to be designed, validated and implemented.

CHANGE' implementation strategy to support the response of public policies to scientific, health, social, environmental and economic challenges spans mainly two strategic domains: (1) research and policy; (2) human resources.

• Domain 1 - Becoming the go-to R&I hub for developing, monitoring, evaluating and operationalizing environment-social-and food related policies tackling Global Change and Sustainability

This domain is set to address key policy areas organized in five independent yet interconnected Thematic Lines (hereafter TL): TL1 - Maintain and restore biodiversity to promote ecosystem services; TL2 - Transform agro-ecological systems to produce sustainable food and biomass; TL3 - Protect natural resources to ensure societal wellbeing; TL4 - Promote circular economy and carbon neutrality towards a safer Planet; and TL5 - Strengthen territorial cohesion to reduce disparities.

TL1 focuses on detecting and projecting biological responses to major environmental and socioeconomic pressures such as habitat loss, overexploitation of resources, climate change pollution, invasive species, and other socioeconomic dynamics including demographic fluxes and urbanization.

TL2 tackles the challenges of increasing yields in agricultural and forestry production systems, while increasing sustainability of the whole system, thus contributing to food security, safety and quality.

TL3 addresses challenges for diagnosing, monitoring and proposing solutions to deal with the effects of global change on the availability and quality of key natural resources (i.e., soil, water, air and genetic resources) for ecosystems structure and function, people's health or food production.

TL4 will focus on promoting the development of policy mechanisms that support a circular economy and energy transition towards achieving a carbon-neutral economy.

TL5 will contribute to support policies that strengthen territorial cohesion with the aim of disparities towards a more balanced and sustainable development while people are able to make the most of the inherent features of the areas in which they live.



• Domain 2 - Attract, train and empower to the next generation of researchers tackling Global Change and Sustainability

CHANGE is committed to the recruitment and development of high-quality students and early-career researchers Here, we outline CHANGE's strategic plan to attract, support and empower a new generation of researchers.





7. NETWORKING

MED aims to be at the forefront of international research while being actively involved in discussions on strategies for research in the field of environmental sustainability, food production and territorial cohesion. The involvement of researchers in many international projects and networks strongly contributes to this. Internationalization is supported by core funding covering participation in international networks, scientific meetings, preparatory meetings for projects submission to competitive funding, and by inviting international colleagues for research stays in MED.

UNIMED AND THE SUB-NETWORK ON FOOD AND WATER



The subnetwork "Food & Water" was created to address challenges of the Mediterranean region with a focus on agricultural systems and their resilience in the context of issues such as

climate change and water management, as well as bio-energy, territorial integration and agroindustrial value chains. Coordinated by MED-University of Évora the subnetwork has partners from all over the Mediterranean basin. The objective of the subnetwork is to bring together research centers, university departments, faculties, academics and researchers that work in this fields, in order to favor scientific cooperation, the exchange of experiences and information, the strengthening of existing partnerships and the establishment of new collaborations.

OTHER INSTITUTIONAL NETWORKS

- EURAGRI: European Agricultural Research Initiative (https://www.euragri.aau.dk/)
- Global Network on Silvopastoral Systems (https://globalsilvopastoralnetwork.org/)
- Rede ECOGRAM (Programa Cyted) Red Iberoameriana para la Mejora Productiva de Sistemas Silvopastorales Mediante la Utilización de Sistemas Ciberfísicos
- FABRE- TP: Farm Animal Breeding and Reproduction Technology Platform (http://www.fabretp.eu)
- Agribenchmark The Beef and Sheep Network (http://www.agribenchmark.org/)
- RIBOLIVA: Red Iberoamericana de Olivar y Aceites de Oliva (http://www.riboliva.com)
- INDEHESA: Instituto Universitario de Investigación de la Dehesa (http://indehesa.unex.es/)
- ESF-EURAPMON
- IENE Infra Eco Network in Europe.



8. TRAINING

In 2021 MED participates, in the following PhD programs:

- Agricultural and Environmental Sciences [course in association]
- Landscape Arts and Techniques
- Biology
- Biochemistry
- Food Sciences [course in association]
- Veterinary Sciences
- Interdisciplinary Landscape Management [course in association]
- Biochemistry
- Agribusiness & Sustainability [course in association]
- Marie-Curie TERRANOVA Phd network and program [International Phd Training Network H2020-MSCA-ITN-2018]



9. SCIENCE & SOCIETY

MED is actively involved in bringing its research and researchers closer to society. This is done through communicating our scientific breakthroughs through media, website, and social networks, organizing outreach activities, such as visits from high schools and universities, and science displays.

MEDIA AND SOCIAL MEDIA

The "Office for Communication, Technology Transfer and Innovation" (UDIT) from MED maintains active communication with the outside world through its website, social media networks, scientific events, and press releases.

MED's website (www.med.uevora.pt) was launched at the end of July 2020, and until the end of the year had a total of 759 visits. In 2021, MED's website increased the number of visits, registering a total of 5555 visits, mainly from Portugal (n=5444), Spain (n=155), and Brasil (n=146). Although the website was launched only in the half of the year 2020, the visits in 2021 were more than triple 2021 for the corresponding months. These results are probably related to an effort of the UDIT to enrich the website with more news about our researchers and their events. In 2021 were produced about 360 news for the website.



Figure 1 – Number of visits to MED's website between 2020 and 2021.



To increase the outreach of MED to the public we also have pages on the social media networks:

Facebook - https://www.facebook.com/MEDUniversidadeEvora/

LinkedIn - https://www.linkedin.com/in/meduevora/

Twitter - https://twitter.com/MED_UEvora

Youtube - https://www.youtube.com/channel/UCC_ggolllbZ1FYUqag2xc8w

In 2021 we made about 300 posts on Facebook and LinkedIn, with a mean of 390 people reached by post. On Twitter, we posted about 200 tweets with a mean of 114 times that each post was visualized.

Throughout this year, about 516 news in online journals, journals, radio and national TV, mentioned MED Researchers or activities hosted by MED.

To keep MED's researchers updated about MED and other important events and calls, in June of 2021, we started the sending of "Divulgação MED". This is a weekly email with the compilation of MED and other events, the opening of calls and funding, and open special issues from our researchers. In 2021 we sent 16 "Divulgação MED" emails.



10. 2021 - A YEAR IN REVIEW

JANUARY

19th – Initiative "Um dia com..." with Elena Ordiales about "O papel da diversidade do cardo na produção de queijos" [MED - CEBAL].

FEBRUARY

2nd – Presentation of the National Technologic Roadshow "Valorização Integrada do Cardo" at Évora [MED – CEBAL & MED-UÉvora].

23rd - Initiative "Um dia com..." with Ana Sofia Santos about "FeedInov CoLab: Inovar em nutrição e alimentação animal" [MED - CEBAL].

27th – National Technologic Roadshow "Valorização Integrada do Cardo" at Serpa [MED – CEBAL & MED-UÉvora].

MARCH

2nd – Participation of CEBAL at the EU Industry Week 2021 with a local event: "Da valorização sustentável de *Cynara cardunculus* à gestão circular de águas residuais de queijaria".

25th/26th - Kickoff meeting of FoSaMed – Enhancing Food Safety in the Mediterranean project (coordinated by Marta Laranjo, a researcher at MED-UÉvora, implemented within the scope of the UNIMED Office of the University of Évora which also coordinates the SubNetwork Food & Water of UNIMED.



6th and 13th – Webinars on veterinary allergy "Alergia em Animais de Companhia" and "Alergia em Cavalos" with Luís Martins, MED researcher, Coordinator of the Interest Group on Comparative and Veterinary Allergology at SPAIC.

9th – Launch of the Startup Europe Accelerathon Spain-Portugal, Euroregion Alentejo-Algarve-Andalucia, for the Innovation and cooperation against Covid-19 and climate change. MED researcher, MED researcher, Nuno Guiomar, is part of the jury of this initiative.

31st – Webinar "Agricultura: do arado aos satélites" organized by Centro Ciência LP with a communication of José Rafael da Silva, researcher at MED-UÉvora.

APRIL

1st – Tertulia "O Impacto das Práticas Agrícolas Sustentáveis na Biodiversidade, Solos e Ciclos da Água" promoted by the initiative "Caravana AgroEcológica" (MITE2 – CE3C/FCUL), with the participation of José Herrera, MED researcher.

6th – Participation of MED researchers, Teresa Pinto Correia and Ricardo Serralheiro, in the public audition "Future of the Common Agricultural Policy (CAP) after 2020" at the Agriculture and Sea Commission, in the Portuguese Republic Assembly.



13th/14th – Seminar "Healthy soils for Europe: sustainable management through knowledge and practice" organized by EIP AGRI with the participation of MED researchers Teresa Pinto Correia, Gottlieb Basch, and Ana Fonseca.

23th - Webinar "Valorização dos Produtos dos Pequenos Ruminantes do Alentejo" organized by CEBAL with the participation of MED researchers.

MAY

3rd to 9th – Participation of Researcher Fátima Duarte, MED-CEBAL, in the European Regions for Smart Communities Summit in Évora.

5th – MED às 4as by Rui Charneca with the presentation "Linha Temática Produção e Saúde Animal do MED" Mitra-UÉvora and online.

12th – 1st public activity related with the Associate Laboratory CHANGE "Encontro com Investigadores: diálogos sobre política científica – Na preparação do CHANGE" at Herdade da Mitra, University of Évora.



19th – MED às 4as by Maria de Belém Costa Freitas, MED-UAlg, with the presentation "Governança em meio rural", Mitra-UÉvora and online.

25th/26th – 8th edition of infowine.forum | The Wine Way: More, Better, Greener | CONGRESSO INTERNACIONAL DE VITIVINICULTURA (Hybrid) with the institutional support of MED

28th and 31st - Webinar "A transformação de resíduos de citrinos em bioprodutos. Técnicas, metodologias e tecnologias" [MED-UAlg].

31st – Initiative "Um dia com..." with Bruno Coutinho about "A Ciência e o impacto social" [MED - CEBAL].

20th/25th/29th – Masterclasses about Mediterranean Diet promoted by MED-UAlg



JUNE

2nd – MED às 4as by João Carlos Alves, MED-UÉvora, with the presentation "Osteoartrite em modelo Canis familiaris" and Maria Inês Rouxinol "Caracterização de extratos de uva de castas Vitis vinifera L.", Mitra-UÉvora and online.

5th – Round Table "Um ambiente, vários desafios, muitas mudanças", organized by Associate Laboratory CHANGE objective of promoting the debate on public policies for the environment.

5th – Online public presentation of the Collaborative Network polli.NET, a network for the importance of pollinators and the services they provide. Jose Herrera, MED-UÉvora, joins this network.

15th/29th – Online Science Communication Course "Comunicar Ciência Clara" organized by MED for researchers and the external public interested.

9th – EURAGRI Webinar "Living labs, co-innovation and co-creation as building blocks for soil health and food" organized by MED and EURAGRI.

16th – MED às 4as by Chef Luís Baena and Ana Rita Sanches, MED-UÉvora, with the presentation "INICIATIVA Km0 ALENTEJO – Autenticidade dos produtos locais", Mitra-UÉvora and online.

16th – Seminar "INOVAÇÃO E EMPREENDEDORISMO NO SECTOR AGRO-ALIMENTAR" organized by Newbie project, Herdade da Mitra, UÉvora.

22th - National Technologic Roadshow of Integrated Valuation of Cardo with the theme "DOP Nisa em análise", promoted by CEBAL, Instituto Politécnico de Beja and University of Évora.

29th - National Technologic Roadshow of Integrated Valuation of Cardo with the theme "Portalegre Circular em análise", promoted by CEBAL, Instituto Politécnico de Beja, and the University of Évora.

28th to 30th – Participation of MED at Encontro Ciência 2022 organized by Fundação para a Ciência e a Tecnologia (FCT):

• Communication at Plenary session "Ciência, agricultura e alimentação: desafios para a transição ecológica", by Teresa Pinto Correia;

- Moderation of Thematic session "Produção e Consumo Sustentável I" by Maria João Lança;
- Communication at Thematic session "Florestas e Biodiversidade", by Diogo Alagador;
- Communication at Thematic session "Investigar e Inovar na Europa com o Horizonte Europa Pilar 2: Missões e parcerias", by Teresa Pinto Correia.

28th – Webinar "Gestão simplificada da rega do olival intensivo" promoted by GescertOlive project [MED-UÉvora]

29th – Initiative "Um dia com..." with Ana Gonçalves about "O papel dos Laboratórios Colaborativos na consolidação do Sistema Nacional de Inovação" [MED - CEBAL]



JULY

 $1^{st}/2^{nd} - 1^{st}$ Congress of the Network of Higher Education Institutions to the Mediterranean Diet Safeguard. MED was represented at this event through the researchers Elsa Lamy, Scientific Committee and Organizing Committee, and Ana Sanches with a presentation.

1st - Webinar of the Wild Resources Competence Center "A Fileira dos Cogumelos: o presente e o futuro" with the participation of Celeste Silva [MED-UÉvora]

2nd – Tertúlias do Montado | Visit to Herdade do Forno de Vidro, Coruche

5th – Seminar "Pagamentos agroambientais baseados em resultados – uma nova visão em termos de política agrícola para Portugal?" organized by Portuguese Association of Agricultural Economists (APDEA), with presentations of Maria de Belém Costa Freitas, MED-UAlg, and Isabel Ferraz de Oliveira, MED -UÉvora.

7th – MED às 4as by Amélia Delgado, MED-UAlg, with the presentation "Ação climática, PMEs, Alimentos, Saúde e Lucro: ligando os pontos", Mitra-UÉvora and online.

21th – Initiative "UM DIA COM..." with Bruno Medronho about "Ciência ao Sul: descobrindo o MED-UAlg" [MED-CEBAL].

21th – MED às 4as by José Munõz Rojas, MED-UÉvora, with the presentation "Melhorando a sustentabilidade dos olivais do Mediterrâneo: discernindo a realidade dos discursos", Mitra-UÉvora and online.

19th to 23th – Course "MultiOmics for para Iniciantes: Explorar Big Data" course taught by MED researchers at UÉvora Summer School.





AUGUST

8th – Open day of the Operating Group "PROTECESTENFILIO", demo action of the machine for removing fruits from the ground in orchards by António Bento Dias, MED-UÉvora.

SEPTEMBER

15th – MED às 4as by José Andrade, MED-UÉvora, with the presentation "Otimização da germinação de sete culturas mediterrâneas" & Ana Alexandre, MED-UÉvora, with the presentation "Bactérias benéficas do solo: parceiras fundamentais das leguminosas" | Mitra-UÉvora and online.

16th - Webinar "PROGRAMA LEITE DE VACAS FELIZES – Estratégia de Promoção e Valorização dos Lacticínios dos Açores" promoted by the project "Val+Alentejo – Valorização dos Produtos dos Pequenos Ruminantes do Alentejo", MED-CEBAL in collaboration with INIAV, I.P.

17th and 18th – The KmO Alentejo Initiative [MED] was a local partner of the International Conference "A World for Travel". KmO Alentejo provided, together with the Social Action Services of the University of Évora, the Lunch Boxes for the participants (~300).

24th – MED researchers participated in the European Researchers Night in Évora (activities) and Lisbon (in a debate).

27th/28th - Together with EURAGRI, MED organized the online event: EURAGRI Conference – Bringing Science to Society through Co-innovation and Co-Creation – the "Soil-Health and Food Mission".

OCTOBER

6th – MED às 4as by Marta Laranjo (MED-UÉvora) and Sónia Bombico (CIDEHUS & MED-UÉvora) with the presentation "Building Euro-Mediterranean collaboration networks: the UNIMED Subnetwork on Food and Water and the FoSaMed project" | Mitra-UÉvora and online.

6th – Local event within the scope of the FOOD SYSTEMS SUMMIT 2021 – INDEPENDENT DIALOGUES | "Revalorizar os Sistemas Alimentares Mediterrânicos: A promoção dos produtos locais como estratégia para um consumo sustentável" organized by the UNIMED Subnetwork on Food and Water

in partnership with MED-UÉvora and CITAB – Centro de Investigação e Tecnologias Agroambientais e Biológicas da Universidade de Trás-os-Montes e Alto Douro.

6th - National Technologic Roadshow "Valorização Integrada do Cardo" int he region of DOP Serra da Estrela [MED – CEBAL & MED-UÉvora]

7th/9th - MED researchers participated on the 42th Annual Edition of SPAIC – Sociedade Portuguesa de Alergologia e Imunologia Clínica, with the theme "Desafios e oportunidades".

16th – As part of World Food Day, which is celebrated on October 16th, the Évora City Council organized, in partnership with other entities, various activities in the City of Évora between the 16th and 31st of October. MED researchers of the Animal Physiology Laboratory participated in this action with the activity: "A que sabe a Dieta Mediterrânica".

20th – MED às 4as by Maria João Cabrita with the presentation "Linha Temática Viticultura e Enologia do MED" & Mariana Patanita with the presentation "Doenças do Lenho da Videira" | Mitra-UÉvora and online.

24th - Tertúlias do Montado "Descortiçamento – práticas atuais, boas práticas, novas tecnologias e comercialização".

28th – Initiative "UM DIA COM…" with Carlos Bettencourt, Diretor do Centro de Experimentação do Baixo Alentejo da Direção Regional de Agricultura e Pesca do Alentejo (DRAP Alentejo), with the presentation "Centro de Experimentação do Baixo Alentejo – A Herdade da Abóbada".

29th/30th/31st - Activity "Noite das Criaturas das Trevas", organized by Project LIFE LINES.

NOVEMBER

3rd – MED às 4as by Carla Varanda, MED – UÉvora, with the presentation "Laboratórios de Virologia Vegetal e Micologia: Da investigação à prática" and Patrick Materatski, MED-UÉvora, "Novos vírus em oliveira: de inimigos a aliados extraordinários" Mitra-UÉvora and online.

2nd/4th/9th/11th/16th – Webinar series of the project S4agro – Soluções Sustentáveis para o Setor Agroindustrial (MED researchers on the organization).

8th - WEBINAR CITRINOS, MED-UAlg.

 $8^{th}/11^{th}/16^{th}/18^{th}/22^{th}$ and 16^{th} December – Training workshops about the sanity of Montado – 3^{rd} edition organized by MED-UÉvora.

3rd – MED às 4as by Paola Hernández, MED – UÉvora, with the presentation "Consumo local de alimentos por residentes de zonas rurais" and Francesco Valerio, MED-UÉvora, "Conectividade funcional da paisagem e movimento animal" Mitra-UÉvora and online.





DECEMBER

6th – Environmental awareness activity "O meu caderno de campo" at Herdade da Mitra organized by MED Researchers in a collaboration with ONG Ambios Portugal and Évora City Council, for young students (3rd and 4th grade).

15th – MED às 4as by Jesús Ruiz Goméz (Keyline) & Alfredo Sendim (Herdade do Freixo do Meio) with the presentation "O Projeto Ecomontado XXI: keyline e Agroecologia" followed by an event about the results of the Project Ecomontado XXI by Ana Fonseca, MED-UÉvora Researcher.

15th - Olivum Talks promoted by Olivum – Associação de Olivicultores e Lagares do Sul with the participation of MED Researchers.

15th – Open Day of Operational Group TECOLIVE – "Técnicas e tecnologia para Valorização de subprodutos em Olivicultura" promoted by MED Researchers.





11. ONGOING PROJECTS 2021

In 2021, MED had 84 projects - 28 International Projects in progress and 56 National Projects. The funding of international projects was mainly from Interreg, Horizon 2020, LIFE, and ERASMUS+. Of the national projects, 16 were with FCT funding, and the remainder were mainly funded by the operational groups – PDR2020.

During the year 2021 the MED, using its funds to support 9 exploratory projects for some of its researchers. The main objective of these projects was to develop preliminary activities that allow the development of new lines of research.

PROJECTS FUNDED BY EUROPEAN COMMISSION

	Title.	Start	End	Respons.	Programme	Total	MED Management Institution BUDGET	Coordinator
1	MONTADO & CLIMATE; A NEED TO ADAPT	2016/09/ 01	2021/09/0 1	Outra Inst.	LIFE Program	2 051 538,00 €	72 544,00 €	Nuno Manuel Cabral de Almeida Ribeiro
2	SolACE - Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use	2017/05/ 01	2022/04/3 0	Outra Inst.	H2020 Program	1 253 354,00 €	91 018,75 €	Gottlieb Basch
3	LIVESEED - Improve performance of organic agriculture by boosting organic seed and plant breeding efforts across Europe	2017/05/ 31	2021/05/3 0	Outra Inst.	H2020 Program	7 454 839,50€	121 100,00 €	Hélia Cristina Guerra Cardoso
4	LIFE RELICT - Preserving Continental Laurissilva Relics	2017/10/ 01	2022/09/3 0	Outra Inst.	LIFE Program	732 734,00 €	732 734,00€	Carlos José Pinto Gomes
5	Sustainable Farming- SFARM	2017/10/ 15	2021/07/1 4	Outra Inst.	ERASMUS +	100 000,00 €	100 000,00 €	Fátima de Jesus Folgôa Baptista
6	Developing knowledge, policy recommendations and strengthening capacities on Water Management and Ecological security in the frame of the China Europe Water Platform	2018/01/ 01	2021/12/3 1	Outra Inst.	H2020 Program	1 940 000,00 €	599 278,00 €	Ana Isabel da Silva Mendes
7	Horizontal Activities Program under the PI-Supported China Europe Water Platform (CEWP) Lot 5	2018/01/ 01	2021/12/3 1	Outra Inst.	H2020 Program	1 580 000,00 €	437 225,00€	Ana Isabel da Silva Mendes
8	NEWBIE - New Entrant netWork: Business models for Innovation, entrepreneurship and resilience in European agriculture	2018/01/ 01	2021/12/3 1	UÉvora	H2020 Program	1 999 038,00 €	156 332,00 €	Maria Teresa Amado Pinto Correia
9	Prospecion en ambientes subterraneos de compuestos bioactivos microbianos con uso potencial para la medicina, agricultura y medio ambiente.	2018/01/ 01	2021/12/3 1	Outra Inst.	РОСТЕР	480 679,08 €	93 333,33€	Ana Teresa Fialho Caeiro Caldeira



	Title.	Start	End	Respons.	Programme	Total	MED Management Institution BUDGET	Coordinator
10	Better Rural Innovation: Linking Actors, Instruments and Policies through Networks	2018/05/ 01	2022/04/3 0	UÉvora	H2020 Program	5 000 000,00 €	220 156,25 €	Maria Teresa Amado Pinto Correia
11	The European Landscape Learning Initiative: Past and Future Environments and Energy Regimes shaping Policy Tools	2019/04/ 01	2023/03/3 1	Outra Inst.	H2020 Program	4 082 398,20 €	0	Maria Teresa Amado Pinto Correia
12	BIOTRANS - Gestón Integrada de la Biodiversidad en el Área Transfornteteriza	2019/04/ 01	2021/12/3 1	UÉvora	ΡΟϹΤΕΡ	2 259 020,51 €	100 000,00 €	Nuno Manuel Cabral de Almeida Ribeiro
13	SUSTAINOLIVE: Novel approaches to promote the SUSTAInability of OLIVE cultivation in the Mediterranean	2019/06/ 01	2023/05/3 1	Outra Inst.	PRIMA	2 000 000,00 €	237 966,37 €	Maria Teresa Amado Pinto Correia
14	Critical Thinking for Successful Jobs	2020/09/ 01	2023/08/3 1	UÉvora	ERASMUS +	390 438,00 €	50 060,00 €	Rita Maria Payan Martins Pinto Carreira
15	MOVING: Moutanin Valorization through Interconnectedness and Green Growth	2020/09/ 01	2024/08/3 1	Outra Inst.	H2020 Program	5 996 748,75 €	377 062,50 €	Maria Teresa Amado Pinto Correia
16	Removal of As from water using innovative BIO-adsorbents produced from by products of the agro-industrial sector	2020/09/ 01	2023/08/3 1	Outra Inst.	LIFE Program	1 800 452,00 €	266 440,00 €	Paulo Alexandre Mira Mourão
17	Tackling skills gap in the wildlife conservation sector	2020/10/ 01	2023/03/3 1	Outra Inst.	ERASMUS +	295 790,00 €	55 620,00 €	João Eduardo Morais Gomes Rabaça
18	Pan-European Network for Climate Adaptative Forest Restauration and Reforestation	2020/10/ 08	2024/10/0 7	Outra Inst.	COST Action	2 000,00 €	2 000,00 €	Ana Cristina Andrade Gonçalves
19	Next Generation Training on Intelligent Greenhouses	2020/11/ 01	2023/10/3 1	Outra Inst.	ERASMUS +	980 348,00 €	59 354,00 €	Fátima de Jesus Folgôa Baptista
20	SHOWCASing synergies between agriculture, biodiversity and Ecosystem services to help farmers capitalisng on native biodiversity	2020/11/ 01	2025/10/3 1	Outra Inst.	H2020 Program	7 999 771,25 €	168 150,00 €	José Manuel Herrera Vega
21	Strengthening social capital in rural communities for rural development	2020/12/ 31	2022/12/3 0	Outra Inst.	ERASMUS +	197 913,00 €	30 004,00 €	Maria Teresa Amado Pinto Correia
22	Enhancing Food Safety in the Mediterranean	2021/01/ 15	2024/01/1 4	UÉvora	ERASMUS +	871 487,00 €	190 271,00 €	Marta Sofia Serrano Valente Casimiro Ferreira Laranjo
23	ERBF - European Raptor Biomonitoring Facility	2017/10/ 17	2022/04/2 022	UÉvora	COST Action	1 000 000,00 €	5 000,00 €	Rui Lourenço
24	LIFE ScrubsNet - Revitalizing semi-arid extensive farming habitats through the sustainable management of their associated scrubs areas	2021/12/ 01	2026/08/3 1	UÉvora	LIFE	2 329 866, 00 €	1 397 919,00 €	Teresa Pinto Correia; Isabel Oliveira
25	Catlantic - Climate Change and Biodiversity in both sides of the North Atlantic	2021/11/ 01	2022/09/3 0	UÉvora	U.S. Embassy & Consulate in Portugal	10 000,00 €	10 000,00 €	Catarina Meireles



	Title.	Start	End	Respons.	Programme	Total	MED Management Institution BUDGET	Coordinator
26	LIFE Olivares Vivos + Increasing the impact of Olivares Vivos in the EU	2021/09/ 01	2026/30/0 9	Sociedad Española de Ornitología	LIFE	7,031,291		Rui Fragoso
27	ENOVAT European Network for Optimization of Veterinary Antimicrobial Treatment	2019/11/ 15	2023/11/0 14	Outra Inst.	COST Action	2 000,00 €	2 000,00 €	Elsa Duarte
28	SOUND CONTROL-Standardizing output-based surveillance to control non-regulated diseases of cattle in the EU.	2018/10/ 29	2022/10/0 28	Outra Inst.	COST Action	2 000,00 €	2 000,00 €	Elsa Duarte

PROJECTS FUNDED BY NATIONAL PROGRAMS

	Title.	Start	End	Respons.	Programme	Total	Univ. Evora	Coordinator
29	Estudo da qualidade da carne de bovinos da raça Cachena	2016/11/2 9	2021/12/31	UÉvora	PDR 2020	450 000,00 €	166 290,49 €	Miguel Nuno Geraldo Viegas Santos Elias
30	GESTÃO INTEGRADA DA COBRILHA DA CORTIÇA (UnderCork)	2017/01/0 1	2021/12/31	Outra Inst.	PDR 2020	86 787,64 €	86 787,64 €	João Eduardo Morais Gomes Rabaça
31	GO SOLO: Promoção de práticas agrícolas conservadoras do solo através da demonstração, expedita e a baixo custo, do seu impacto na matéria orgânica	2017/01/0 1	2021/12/31	Outra Inst.	PDR 2020	41 572,50€	41 572,50€	João Manuel Pereira Ramalho Serrano
32	ProtecEstenfilio	2017/01/0 1	2021/12/31	Outra Inst.	PDR 2020	469 999,00 €	27 696,81€	António Fernando Bento Dias
33	Segurança & Qualidade dos Produtos Cárneos Transformados	2017/01/0 1	2021/12/31	Outra Inst.	PDR 2020	67 484,39 €	67 484,39€	Miguel Nuno Geraldo Viegas Santos Elias
34	Go BovMais - Melhoria da produtividade da fileira dos bovinos de carne	2017/11/3 0	2021/12/31	UÉvora	PDR 2020	51 725,65€	51 725,65€	Maria Elvira Lourido Sales Baptista
35	Viabilização de pastagens semeadas biodiversas através da otimização da fertilização fosfatada	2017/12/0 1	2021/12/31	Outra Inst.	PDR 2020	67 848,67 €	67 848,67 €	João Manuel Pereira Ramalho Serrano
36	A Agroecologia aplicada ao design do Montado Novo	2018/01/0 1	2021/12/31	Outra Inst.	PDR 2020	153 317,69€	153 317,69€	Ana Margarida Pinto da Fonseca
37	Programa de conservação e melhoramento genético da videira	2018/01/0 1	2021/12/31	Outra Inst.	PDR 2020	316 306,50 €	80 000,00 €	Augusto António Vieira Peixe
38	iCheese -Cynara Innovation for best Cheese	2018/01/0 2	2021/11/29	Outra Inst.	PDR 2020	4 816,67 €	4 816,67 €	Cristina Maria dos Santos Conceição
39	Nutrição e fertilização do pinheiro manso em sequeiro e regadio - FERTIPINEA	2018/01/0 2	2021/12/23	Outra Inst.	PDR 2020	455 000,00 €	46 088,55 €	Ana Cristina Andrade Gonçalves



,	Title.	Start	End	Respons.	Programme	Total	Univ. Evora	Coordinator
40	A Multifuncionalidade da Floresta - Potencialidade e Valorização dos Ecossistemas Florestais em Portugal	2018/03/2 3	2021/12/06	Outra Inst.	PDR 2020	5 671,72 €	5 671,72 €	Celeste Maria Martins Santos e Silva
41	Olive fly management through symbiosis-based strategies: looking for Trojan horse candidates	2018/09/0 1	2021/08/31	UÉvora	SAICT	238 344,00 €	238 344,25 €	Tânia Mesquita Nobre
42	Rega de precisão de sobreiros em modo de produção intensiva de cortiça	2018/09/0 1	2021/12/30	UÉvora	PDR 2020	336 231,09 €	238 142,83€	Nuno Manuel Cabral de Almeida Ribeiro
43	TRUST - Social innovation sTRategies for sUSTainability transitions	2018/09/0 1	2021/08/31	Outra Inst.	SAICT	233 641,00 €	18 587,00 €	Maria Teresa Amado Pinto Correia
44	Early-life exposure to MYCOtoxins and its impact on health	2018/10/0 1	2021/09/30	Outra Inst.	SAICT	239 937,00 €	22 812,50 €	Elsa Maria Leclerc Duarte
45	Edible bait vaccine for rabbit haemorrhagic disease virus 2 (RHDV2) control in wild rabbits	2018/10/0 1	2021/09/30	Outra Inst.	SAICT	239 980,00 €	15 110,00 €	Elsa Maria Leclerc Duarte
46	Pine host chemistry and environmental factors driving the epidemiology of the pinewood nematode	2018/10/0 1	2021/09/30	Outra Inst.	SAICT	239 792,00 €	54 446,00 €	Manuel Galvão de Melo e Mota
47	Sustainable use of soil and water for improving crops productivity in irrigated areas (SOIL4EVER)	2018/10/0 1	2021/09/30	Outra Inst.	SAICT	67 484,39€	67 484,39 €	Carlos Alberto de Jesus Alexandre
48	Control of olive anthracnose through gene silencing and gene expression using a plant	2018/10/1 5	2021/10/14	UÉvora	Alentejo 2020	235 904,00 €	227 779,00€	Patrick José de Queiroz Materatski
49	Development of a new virus- based vector to control TSWV in tomato plants	2018/10/1 5	2021/10/14	UÉvora	Alentejo 2020	232 154,00 €	223 404,00 €	Carla Marisa Reis Varanda
50	Pine ENEMY - Exploring the NEmatode-MYcobiota interactions in PineWilt Disease	2018/10/1 5	2021/10/14	Outra Inst.	SAICT	230 234,00 €	27 875,00€	Manuel Galvão de Melo e Mota
51	TECOLIVE: Técnicas e tecnologia para valorização de subprodutos em olivicultura	2019/01/0 9	2021/12/31	UÉvora	PDR 2020	250 369,93 €	182 224,83 €	José Manuel Nobre de Oliveira Peça
52	Poda mecanizada e colheita em contínuo de olivais de variedades portuguesas	2019/01/1 0	2021/12/31	UÉvora	PDR 2020	116 411,75 €	116 411,75 €	António Fernando Bento Dias
53	Centro de Interpretação e Portas de Entrada do Parque Natural da Serra de S. Mamede	2019/10/0 1	2021/09/30	Outra Inst.	Alentejo 2020	291 227,10€	65 952,60 €	Celeste Maria Martins Santos e Silva
54	Conhecimento, Organização e Linhas Estratégicas	2019/10/0 1	2022/01/18	Outra Inst.	PDR 2020	42 763,52 €	14 074,00 €	Maria Teresa Amado Pinto Correia
55	Metabolómica, ambiente e agricultura de regadio	2020/01/0 9	2022/01/08	UÉvora	Alentejo 2020	411 840,00 €	411 840,00€	Gottlieb Basch
56	S4Agro - Soluções sustentáveis para o setor agroindustrial	2020/04/0 1	2022/04/01	Outra Inst.	COMPETE	937 331,30€	184 668,59€	Miguel Nuno Geraldo Viegas Santos Elias
57	Transferência de TeCnologia para Valorização do Cardo	2020/09/0 1	2022/08/31	Outra Inst.	Alentejo 2020	257 211,02 €	91 781,69€	Cristina Maria dos Santos Conceição
58	Melhor produção equina	2020/09/2 3	2022/09/22	UÉvora	Alentejo 2020	704 230,81 €	704 230,81 €	Elisa Maria Varela Bettencourt
59	Apoio à gestão de olivais e à certificação de material vegetativo de variedades de oliveira nacionais	2020/09/2 8	2022/09/27	UÉvora	Alentejo 2020	277 705,90€	208 061,18€	Augusto António Vieira Peixe



	Title.	Start	End	Respons.	Programme	Total	Univ. Evora	Coordinator
60	Transferência e Divulgação dos Estudos Técnico-Científicos da Rega de Sobreiros	2020/10/0 1	2022/09/30	UÉvora	Alentejo 2020	199 316,06 €	199 313,06 €	Nuno Manuel Cabral de Almeida Ribeiro
61	Utilização da espectroscopia NIR para a análise rápida da qualidade em frutos secos	2020/10/1 6	2022/10/15	UÉvora	Alentejo 2020	120 606,85 €	120 606,85 €	Ana Elisa de Mendonça Rato Barroso
62	Bioprotecção de Tomateiro Contra a Fusariose- Impacto das práticas agronómicas	2020/10/2 8	2022/10/27	UÉvora	Alentejo 2020	155 109,79 €	155 109,79€	Isabel Maria Oliveira Brito
63	És(cola)Ciência - Estratégia Educativa Complementar Baseada Pensamento Científico	2020/5/01	2022/09/31	CEBAL	POISE PT2020	102.191,58€	102.191,58€	Rita Martins
64	CynaraTeC - Transferência de TeCnologia para Valorização do Cardo	2020/9/01	2022/08/31	CEBAL	Alentejo 2020	257 211,02 €	257 211,02 €	Fátima Duarte
65	LactoMTeC - Tecnologia de Membranas na valorização sustentável de efluentes do sector dos Lacticínios	2020/11/0 1	2022/10/31	CEBAL	Alentejo 2020	68 643,29€	68 643,29€	Rita Martins
66	Inov-Amendo-AL - Microenxertia in vitro de amendoeiras selecionadas para a promoção do amendoal no Alentejo	2020/9/01	2022/08/31	CEBAL	Alentejo 2020	137 726,60 €	137 726,60 €	Liliana Marum
67	MedCynaraBioTec - Seleção de Genótipos de Cynara cardunculus Para Novas Aplicações Biotecnológicas: potenciar a cadeia de valor do cardo, uma cultura mediterrânica bem adaptada	2019/4/01	2022/03/31	CEBAL	Alentejo 2020	287 663,89€	287 663,89€	Fátima Duarte
68	Val+Alentejo – Valorização dos produtos dos pequenos ruminantes do Alentejo	2020/9/01	2022/08/31	CEBAL	Alentejo 2020	174 361,88 €	174 361,88 €	Eliana Jerónimo

PROJECTS FUNDED BY FCT

	Title,	Start	End	Respons,	Programme	Total	Univ, Evora	Coordinator
69	A sustainable landSCAPE plannig model for rural FIREs prevention	2019/03/0 1	2022/02/28	Outra Inst.	Projetos de Investigação Científica e Desenvolvimento Tecnológico no Âmbito da Prevenção e Combate a Incêndios Florestais - 2017	38 044,00 €	16 352,00 €	Nuno Manuel Cabral de Almeida Ribeiro
70	Monitoring of Olive infecing viruses in Tunisia and Portugal: Identification and characterization of new isolates	2019/03/0 7	2021/03/06	UÉvora	Cooperação Internacional FCT/Tunísia concurso 2019/2020	3 000,00 €	3 000,00 €	Carla Marisa Reis Varanda
71	MED: Financiamento base 2020-2023	2020/01/0 1	2023/12/31	UÉvora	Financiamento Plurianual de Unidades de I&D 2020- 2023	2 720 900,00 €	2 176 720,00 €	Maria Teresa Amado Pinto Correia



	Title,	Start	End	Respons,	Programme	Total	Univ, Evora	Coordinator
72	MED: Financiamento programático 2020-2023	2020/01/0 1	2023/12/31	UÉvora	Financiamento Plurianual de Unidades de I&D 2020- 2023	645 000,00 €	645 000,00 €	Maria Teresa Amado Pinto Correia
73	From Molecularly Imprinted Polymers to MIP-based optical sensors: A "light-up" tool for the analysis of pesticide residues in olive oil	2020/03/0 2	2023/03/01	UÉvora	SAICT	236 373,80 €	174 588,30€	Raquel Marta Neves dos Santos Garcia
74	Avaliação do risco de erosão pós-incêndio usando marcadores moleculares	2020/04/0 1	2023/03/31	UÉvora	Projectos de Investigação Científica e Desenvolvimento Tecnológico no âmbito da Prevenção e Combate de Incêndios Florestais - 2018	299 820,00 €	255 980,00 €	Nicásio Tomás Jiménez Morrillo
75	BlOma - Soluções integradas de BlOeconomia para a Mobilização da cadeia Agroalimentar	2020/07/0 1	2023/06/30	Outra Inst.	SI - Sistema de Incentivos à Investigação e Desenvolvimento Tecnológico(SI I&DT)	5 374 333,67 €	129 742,35 €	Fátima de Jesus Folgôa Baptista
76	Desenvolvimento de uma mistura alimentar inovadora para acabamento de machos de raças de suínos autóctones, ao ar livre, com beneficio para a qualidade da carne e para a sustentabilidade do sistema	2020/12/3 1	2023/06/30	Outra Inst.	SI - Sistema de Incentivos à Investigação e Desenvolvimento Tecnológico(SI I&DT)	760 610,06 €	288 934,13€	José Manuel Mota Ruivo Martins
77	A Climate-Smart Pest Management Strategy for Resilient and Sustainable Olive Growing	2021/01/0 1	2023/12/31	UÉvora	Projetos de IC&DT em todos os Domínios Científicos - 2020	249 789,66 €	229 649,03€	José Manuel Herrera Vega
78	Sistema Integrado de Produção Sustentável de Carne	2021/01/0 1	2022/12/31	UÉvora	SI - Sistema de Incentivos à Investigação e Desenvolvimento Tecnológico(SI I&DT)	158 769,62 €	158 769,62€	Alfredo Manuel Franco Pereira
79	Investigação em carnes alentejanas de porco preto	2021/02/0 1	2023/06/30	UÉvora	SI - Sistema de Incentivos à Investigação e Desenvolvimento Tecnológico(SI I&DT)	523 649,52 €	160 636,74€	Miguel Nuno Geraldo Viegas Santos Elias
80	Plant metabolomics for the control of the root-lesion nematode Pratylenchus penetrans	2021/03/0 1	2024/02/29	Outra Inst.	Projetos de IC&DT em todos os Domínios Científicos - 2020	249 936,90 €	85 020,00 €	Claudia Sofia Leite Vicente
81	O papel da saliva nas escolhas alimentares	2021/07/1 2	2021/07/23	UÉvora	Ciência Viva no Laboratório - Criar futuro 2021	871,20€	871,20€	Elsa Cristina Carona de Sousa Lamy
82	Desvendar quimicamente a rotulagem de azeites: um olhar sobre os parâmetros químicos da qualidade	2021/07/1 9	2021/07/24	UÉvora	Ciência Viva no Laboratório - Criar futuro 2021	485,25€	485,25€	Raquel Marta Neves dos Santos Garcia
83	O papel dos genes e das proteínas na resposta das plantas aos stresses ambientais	2021/07/2 6	2021/07/30	UÉvora	Ciência Viva no Laboratório - Criar futuro 2021	647,25€	647,25€	Lénia Isabel Alfaiate Rodrigues
84	Estarão as plantas sozinhas? Na descoberta dos microorganismos que as habitam	2021/08/3 0	2021/09/03	UÉvora	Ciência Viva no Laboratório - Criar futuro 2021	647,25€	647,25€	Hélia Cristina Guerra Cardoso



EXPLORATORY PROJECTS SUPPORTED BY MED

	Title	Thematic Line	Pincipal Researcher
1	Assessing emerging zoonotic disease as threats in ecosystems: the case of Montado and Hepatitis E	Agro-Silvo-Pastoral Systems; Animal Production and Health; Biodiversity and Ecosystem Functioning; Rural Dynamics and Governance,	João Tiago Marques
2	Molecular basis of resistance/susceptibility of Vitis vinifera L. to wood infection by fungal trunk pathogens in Alentejo region	Vineyards and Wine	Maria Doroteia Campos
3	Estimating macronutrients status in walnut tree based on FT- NIR spectroscopy and remote sensing data	Horticulture; Irrigated agriculture	Ana Elisa Rato
4	Development of an environmentally safe tool to control olive knot disease	Olive Groves and Olive Oil	Maria do Rosário Félix
5	Unraveling olive somatic embryogenesis signaling – a focus on the extracellular bioactive molecules	olival e azeite	Hélia Cardoso
6	Aiding cork oak: a soil-plant-microbe approach	Montad; Biodiversity and moderately Rural dynamic and governance	Celeste Santos e Silva
7	SCREAM-R: Screening Antimicrobial Resistance	Animal Production and Health	Marta Laranjo
8	Citizen science as a tool to assess the impact of exotic bird species in agroecosystems	Biodiversity and Ecosystem Functioning; Olive Groves & Olive Oil and Viticulture & Enology	Pedro F. Pereira
9	Using municipal solid waste compost, biochar, and cork residues as components of substrates and its effects on yield and quality of the leafy vegetables.	Horticulture; Animal Production and Health; Soil water and climate and animal biosciences	Rui Almeida Machado



12. FUNDING

During the year 2021 MED received a total funding of around 5 million euros, shared between FCT, National and International sources and Pluriannual Funding from FCT by 12,4%, 50,38%, 22,23% and 14,97%, respectively.

Through project funding and the base amount made available by the FCT, MED had available a total amount of EUR **4 810 299,45**.

Receive Funding MED 2021		Var. p 2020
International Project Funding	1 069 669,89 €	354 012,62 €
National Project Funding	2 423 606,93 €	1 084 321,54 €
FCT Project Funding	596 583,48 €	3 860,52 €
R&D Unit Pluriannual funding 2020	720 439,15 €	268 736,97 €
TOTAL	4 810 299,45 €	1 710 931,65 €


13. PUBLICATIONS 2021



DESCRIPTION

Indexed Papers	Books and Books
(ISI e Scopus)	Chapters with referee
224	24



14. **FULL LIST OF PUBLISHED PAPERS 2021**

ARTICLES INDEXED IN WEB OF SCIENCE/SCOPUS

- Albuquerque A, Óvilo C, Núñez Y, Benítez R, López-Garcia A, García F, Félix M, Laranjo M, Charneca R, Martins JM. 2021. Transcriptomic Profiling of Skeletal Muscle Reveals Candidate Genes Influencing Muscle Growth and Associated Lipid Composition in Portuguese Local Pig Breeds. Animals 11:1423. 10.3390/ani11051423
- Alegria C, Roque N, Albuquerque T, Fernandez P, Ribeiro M. 2021. Modelling Maritime Pine (Pinus pinaster Aiton) Spatial Distribution and Productivity in Portugal: Tools for Forest Management. Forests 12:368. 10.3390/f12030368
- **3.** Alves J, Jorge P, Santos A. 2021. Comparison of two mesotherapy protocols in the management of back pain in police working dogs: a retrospective study. Topics in Companion Animal Medicine100519. 10.1016/j.tcam.2021.100519
- Alves J, Santos A, Jorge P, Lavrador C, Carreira L. 2021. Comparison of clinical and radiographic signs of hip osteoarthritis in contralateral hip joints of fifty working dogs. PLOS ONE 16:e0248767. 10.1371/journal.pone.0248767
- **5.** Alves J, Santos A, Jorge P, Lavrador C, Carreira L. 2021. Evaluation of digital thermography imaging to assess and monitor treatment of police working dogs with naturally occurring hip osteoarthritis. BMC Veterinary Research 17. 10.1186/s12917-021-02876-z
- **6.** Alves J, Santos A, Jorge P, Lavrador C, Carreira LM. 2021. Effect of a single intra-articular high molecular weight hyaluronan in a naturally occurring canine osteoarthritis model: a randomized controlled trial. Journal of Orthopaedic Surgery and Research 16. 10.1186/s13018-021-02423-4
- Alves J, Santos A, Jorge P, Lavrador C, Carreira LM. 2021. Intra-articular Injections With Either Triamcinolone Hexacetonide, Stanozolol, Hylan G-F 20, or a Platelet Concentrate Improve Clinical Signs in Police Working Dogs With Bilateral Hip Osteoarthritis. Frontiers in Veterinary Science 7. 10.3389/fvets.2020.609889
- Alves J, Santos A, Jorge P, Pitães A. 2021. The use of soluble fibre for the management of chronic idiopathic large-bowel diarrhoea in police working dogs. BMC Veterinary Research 17. 10.1186/s12917-021-02809-w
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- 10. Alves JC, Jorge P, Santos A. 2021. The effect of photobiomodulation therapy on the management of chronic idiopathic large-bowel diarrhea in dogs. Lasers in Medical Science. 10.1007/s10103-021-03469-w
- **11.** Alves JC, Santos A, Jorge P, Lavrador C, Carreira LM. 2021. Intraarticular triamcinolone hexacetonide, stanozolol, Hylan G-F 20 and platelet concentrate in a naturally occurring canine osteoarthritis model. Scientific Reports 11. 10.1038/s41598-021-82795-z
- **12.** Alves JC, Santos A, Jorge P, Lavrador C, Carreira LM. 2021. orrection: The intra-articular administration of triamcinolone hexacetonide in the treatment of osteoarthritis. Its effects in



a naturally occurring canine osteoarthritis model. PLOS ONE 16:e0248082. 10.1371/journal.pone.0248082

- **13.** Alves JC, Santos A, Jorge P. 2021. Platelet-rich plasma therapy in dogs with bilateral hip osteoarthritis. BMC Veterinary Research 17. 10.1186/s12917-021-02913-x
- Alves JCA, Santos AMMP dos, Jorge PIF, Lavrador CFTVB, Carreira LMA. 2021. Management of Osteoarthritis Using 1 Intra-articular Platelet Concentrate Administration in a Canine Osteoarthritis Model. The American Journal of Sports Medicine. January 2021. 10.1177/0363546520981558
- **15.** Alves L, Medronho B, Filipe A, Romano A, Rasteiro M, Lindman B, Topgaard D, Davidovich I, Talmon Y. 2021. Revisiting the dissolution of cellulose in H3PO4(aq) through cryo-TEM, PTssNMR and DWS. Carbohydrate Polymers 252:117122. 10.1016/j.carbpol.2020.117122
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- **30.** Baquero RA, Barbosa AM, Ayllón D, Guerra C, Sánchez E, Araújo MB, Nicola GG. 2021. Potential distributions of invasive vertebrates in the Iberian Peninsula under projected changes in climate extreme events. Diversity and Distributions 27:2262-2276. 10.1111/ddi.13401
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- **36.** Beltrão P, Godinho C, Lourenço R, Pereira P. 2021. Behavioural repeatability in Sardinian warblers (Sylvia melanocephala): larger individuals are more aggressive. acta ethol (2021). 10.1007/s10211-020-00358-3
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- **48.** Campos MD, Félix MDR, Patanita M, Materatski P, Varanda C. 2021. High throughput sequencing unravels tomato-pathogen interactions towards a sustainable plant breeding. Horticulture Research 8. 10.1038/s41438-021-00607-x
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- **50.** Cano-Ortiz A, Musarella CM, Piñar FJ, Quinto CR, Pinto GC, Spampinato G, Ighbareyeh JMH, Del RS, Cano E. 2021. Forest and Arborescent Scrub Habitats of Special Interest for SCIs in Central Spain. Land 10:183. 10.3390/land10020183



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15. MED Members 2021

MEMBERS FROM THE GROUP ANIMAL BIOSCIENCES

INTEGRATED MEMBERS		
NAME	ACADEMIC	PROFESSIONAL
	DEGREE	CATEGORY
Alfredo Manuel Franco Pereira	PhD	Assistant Professor
Amadeu António Gomes Borges de Freitas	PhD	Assistant Professor
Ana Carina Alves Pereira de Mira Geraldo	PhD	Other
Ana Isabel Usié Chimenos	PhD	Researcher
Angela da Conceição Relvas Guerra	PhD	Research fellow
António Marcos Costa do Amaral Ramos	PhD	Other
Cristina Maria dos Santos Conceição	PhD	Assistant Professor
Célia Cristina Fialho Leão	PhD	Researcher
David Orlando Alves Ferreira	PhD	Assistant Professor
Eliana Alexandra Sousa Jerónimo Alves	PhD	Researcher
Elisa Maria Varela Bettencourt	PhD	Assistant Professor
Elsa Cristina Carona de Sousa Lamy	PhD	Researcher
Elsa Maria Leclerc Duarte	PhD	Assistant Professor
Elsa Rute Guerra Caeiro	PhD	Researcher
Fernando Manuel Salvado Capela e Silva	PhD	Assistant Professor
Helder Carola Espiguinha Cortes	PhD	Invited Assistant Professor
Isabel Maria Simão Alves Pereira Ferreira	PhD	Assistant Professor
José Luís Tirapicos Nunes	PhD	Assistant Professor
Ludovina Rodrigues Galego	PhD	Assistant Professor
Luís Miguel Lourenço Martins	PhD	Assistant Professor
Manuel D'Orey Cancela D'Abreu	PhD	Professor, Retired
Margarida Pires Simões	PhD	Assistant Professor
Maria Cristina Calhau Queiroga	PhD	Assistant Professor
Maria Elvira Lourido Sales Baptista	PhD	Assistant Professor
Maria Isabel Soares de Albergaria Ferraz de Oliveira Mendonça Rato	PhD	Assistant Professor
Maria João Martins Vila-Viçosa	PhD	Technician
		Assistant Professor
Maria Manuela Clemente Vilhena	PhD	with Habilitation
Maria Teresa Carvalho Oliveira de Sousa Alves	PhD	Invited Assistant Professor
Maria de Fátima Pereira Duarte Ricardo	PhD	Other
Nuno Miguel Lourenço Alexandre	PhD	Assistant Professor
Olinda Rosa Fragoso das Neves Guerreiro	PhD	Researcher
Orlando da Silva Lopes	PhD	Assistant Professor
Ricardo Jorge da Costa Trindade Palmeiro Romão	PhD	Assistant Professor
Rita Maria Payan Martins Pinto Carreira	PhD	Full Professor
Rui Manuel Alves Ferreira	PhD	Assistant Professor

INTEGRATED MEMBERS		
NAME	ACADEMIC	PROFESSIONAL
	DEGREE	CATEGORY
Rui Miguel Carracha Charneca	PhD	Assistant Professor
Sandra Maria da Silva Branco	PhD	Assistant Professor
Susana Oliveira Serrano Monteiro	PhD	Assistant Professor
Sónia Félix Vilas Boas de Lucena	PhD	Invited Assistant Professor

STUDENT MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Raquel Carrilho Paixão	Master	Senior Official
Ana Sofia Coelho Ramos	Master	Other
António Eduardo Mira Cruz Mendes Pinto	Master	Other
Emanuel Ruben dos Santos Carreira	Master	Other
João Carlos Agostinho Alves	Master	Other
Luiza da Costa Corrêa Oliveira	Master	Other
Maria do Carmo Mateus da Silva Feliciano	Master	Other
Mónica Alexandra Freire Cardoso de Mira	Degree	Other
Nara Patricia Cavalcanti Andrade	Master	Other
Pedro Miguel Cunha Caetano	Master	Other
Sílvia Alexandra Macedo Arantes	PhD	Other
Tarcísio Guerra Guimarães	Master	Research fellow
Teresa de Jesus Farinha Marques Louro	Master	Other

MEMBERS FROM THE GROUP MEMBERS FROM THE GROUP FOOD SCIENCE AND TECHNOLOGY

INTEGRATED MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Amélia Maria Sousa Martins Muralha Delgado	PhD	Other
Ana Cristina Pinto Agulheiro Santos	PhD	Assistant Professor
Ana Elisa de Mendonça Rato Barroso	PhD	Assistant Professor
Ana Maria Ferreira da Silva da Costa Freitas	PhD	Full Professor
Angela da Conceição Relvas Guerra	PhD	Research fellow
Custódia Maria Luís Gago	PhD	Researcher
Célia Maria Brito Quintas	PhD	Assistant Professor
Elsa Cristina Carona de Sousa Lamy	PhD	Researcher
Igor Alexandre da Silva Dias	PhD	Assistant Professor
Ilda Maria Justino Caldeira	PhD	Researcher
Isabel Maria Marques Saraiva de Carvalho	PhD	Assistant Professor
Jessie Mara Donaire Bosisio de Melo	PhD	Assistant Professor
José Manuel Mota Ruivo Martins	PhD	Assistant Professor

INTECHATED WILWIDEN.

ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY	
Maria Dulce Carlos Antunes	PhD	Assistant Professor	
Maria Eduarda Marques Madeira Silva Potes	PhD	Assistant Professor	
Maria João Marinho Lança Silva Almeida	PhD	Assistant Professor with Habilitation	
Maria João Pires de Bastos Cabrita	PhD	Assistant Professor	
Maria Margarida Cortez Vieira	PhD	Full Professor	
Maria da Graça Costa Miguel	PhD	Assistant Professor	
Maria de Fátima Pereira Duarte Ricardo	PhD	Other	
Marta Sofia Serrano Valente Casimiro Ferreira Laranjo	PhD	Researcher	
Miguel Nuno Geraldo Viegas Santos Elias	PhD	Assistant Professor	
Nicásio Tomás Jiménez Morrillo	PhD	Researcher	
Raquel Marta Neves dos Santos Garcia	PhD	Assistant Professor	
Rui Mariano Sousa da Cruz	PhD	Assistant Professor	
Sara Maria de Almeida Lopes Canas	PhD	Researcher	

STUDENT MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
André Filipe Barreto Albuquerque	Master	Research fellow
Carlos Alexandre Ribeiro Lima	Master	Research fellow
Catarina Correia da Cruz Pereira Mendes	Master	Other
Elyane Cristina Borges Dias	Master	Other
Maria Inês Silva Caçador Pereira Rouxinol	Master	Research fellow
Miguel Duarte Ferro	Master	Research fellow
Nathana Lazzarotto Cristofoli	Master	Research fellow
Sara Isabel Ricardo Rodrigues	Master	Research fellow
Sara Margarida Prates da Conceição	Master	Research fellow

MEMBERS FROM THE GROUP PLANT PROTECTION

INTEGRATED MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Isabel Pereira Alexandre	PhD	Researcher
Ana Paula Honrado Pinto	PhD	Assistant Professor
Carla Marisa Reis Varanda	PhD	Researcher
Carlos Gutiérrez Gutiérrez	PhD	Researcher
Clarisse Cordeiro Brígido	PhD	Researcher
Cláudia Sofia Leite Vicente	PhD	Researcher
Esther Menéndez Gutiérrez	PhD	Researcher

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Fernando Manuel de Campos Trindade Rei	PhD	Assistant Professor
Isabel Maria de Oliveira Brito	PhD	Assistant Professor
Jorge Miguel Silva Faria	PhD	Other
José Rodrigo da Silva	PhD	Research fellow
Luís Manuel Cardoso Vieira Alho	PhD	Assistant Professor
Luís Miguel Mascarenhas Neto	PhD	Invited Assistant Professor
Manuel Galvão de Melo e Mota	PhD	Assistant Professor
Maria Ivone Esteves da Clara	PhD	Professor, Retired
Maria Margarida Saial Santos Guiomar Espada	PhD	Researcher
Maria do Rosário Fernandes Félix	PhD	Assistant Professor
Maribela Fátima Oliveira Pestana Correia	PhD	Assistant Professor
Mário José Gouveia Pinto Rodrigues Carvalho	PhD	Full Professor
Patrick José de Queiroz Materatski	PhD	Researcher
Pedro José Realinho Gonçalves Correia	PhD	Assistant Professor

STUDENT MEMBERS			
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY	
Daniela Filipa Firmino Rosa	Master	Research fellow	
Jordana Pia Cardoso Branco	Master	Research fellow	
Luísa Isabel Guerreiro David Coelho	Master	Other	
Maria João Santiago Militão Camacho	Master	Research fellow	
Mariana Cardoso Patanita	Master	Research fellow	
Pedro Miguel de Sousa Barbosa	Degree	Research fellow	
Taiana de Araújo Conceição	Master	Other	

MEMBERS FROM THE GROUP PLANT GENETICS AND BIOTECHNOLOGY

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Alfredo Jaime Morais Cravador	PhD	Professor, Retired
Ana Isabel Mimoso Tomás Coelho	PhD	Other
Ana Rita Pereira da Costa	PhD	Researcher

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Anabela Maria Lopes Romano	PhD	Full Professor
Augusto António Vieira Peixe	PhD	Assistant Professor with Habilitation
Bruno Filipe Figueiras Medronho	PhD	Researcher
Hélia Cristina Guerra Cardoso	PhD	Researcher
Isabel de Jesus Pereira Godinho Velada	PhD	Other
José Manuel Godinho Calado	PhD	Other
José Manuel Peixoto Teixeira Leitão	PhD	Full Professor
João Manuel Mota Barroso	PhD	Assistant Professor
Liliana Maria Bota Marum	PhD	Researcher
Lénia Isabel Alfaiate Rodrigues	PhD	Research fellow
Maria Catarina Murteira Rico dos Santos Campos	PhD	Researcher
Maria Doroteia Murteira Rico da Costa Campos	PhD	Researcher
Natacha Rodrigues Coelho	PhD	Research fellow
Raja Rathinam	PhD	Researcher
Raquel Rodríguez Solana	PhD	Researcher
Sandra Marisa Gomes Gonçalves	PhD	Researcher
Susana Anahi Dandlen	PhD	Researcher
Tânia Mesquita Nobre	PhD	Researcher

STUDENT MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Inês Filipa Paixão Mansinhos	Master	Research fellow
Rita Nobre Pires	Master	Research fellow

MEMBERS FROM THE GROUP APPLIED ECOLOGY AND CONSERVATION

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Amália Maria Marques Espiridião de Oliveira	PhD	Other
Anabela Dias Ferreira Belo	PhD	Assistant Professor
António Paulo Pereira Mira	PhD	Assistant Professor with Habilitation
António Pedro de Avelar Gonçalves Santos	PhD	Assistant Professor
Carla Sofia Borges Pinto da Cruz Ferreira	PhD	Assistant Professor
Carlos António Marques Pereira Godinho	PhD	Researcher
Carlos José Pinto Gomes	PhD	Assistant Professor

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Catarina Isabel Rodrigues Meireles	PhD	Researcher
Celeste Maria Martins Santos e Silva	PhD	Assistant Professor
Inês Margarida Ferreira Roque	PhD	Research fellow
João Eduardo Morais Gomes Rabaça	PhD	Assistant Professor with Habilitation
João Tiago Sabino Lino Marques	PhD	Researcher
Luiz Carlos Gazarini	PhD	Assistant Professor
Maria Antónia Pacheco Ilhéu	PhD	Assistant Professor
Nuno Miguel Peres Sampaio Pedroso	PhD	Researcher
Paula Rute Pereira Matono Alves	PhD	Research fellow
Pedro Miguel Filipe Pereira	PhD	Research fellow
Ricardo Miguel Miguéns Cardoso Cadete Pita	PhD	Researcher
Rui Nascimento Fazenda Lourenço	PhD	Researcher
Sara Maria Lopes Santos	PhD	Researcher

STUDENT MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Cristina Pereira da Cruz Galantinho	Master	Other
Bárbara Afonso Pires	Master	Other
Eduardo Miguel Ramos Ferreira	Master	Research fellow
Francesco Valerio	Master	Research fellow
Mauro André Mauricio Raposo	Master	Research fellow
Tiago Filipe Crispim Mendes	Master	Research fellow

MEMBERS FROM THE GROUP SOIL, WATER AND CLIMATE

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Lúcia Pena Barão	PhD	Research fellow
Ana Rita da Silva Prazeres	PhD	Other
Elsa Paula Figueira Ferreira Morgado de Sampaio	PhD	Assistant Professor
Francisco Lúcio Reis Borges Brito dos Santos	PhD	Full Professor
Gottlieb Basch	PhD	Assistant Professor
José Alexandre Varanda Andrade	PhD	Assistant Professor
Manuel Rijo	PhD	Assistant Professor
Maria Madalena Vitório Moreira Vasconcelos	PhD	Assistant Professor
Paulo Alexandre Justo Fernandez	PhD	Assistant Professor
Ricardo Paulo Serralheiro	PhD	Professor, Retired
Rui Manuel de Almeida Machado	PhD	Assistant Professor

INTEGRATED MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Sandra de Jesus Martins Mourato	PhD	Assistant Professor
Shakib Shahidian	PhD	Assistant Professor

STUDENT MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Felipe da Rocha Soares	Master	Other
Fernanda Alexandra Firmino Fiúza	Master	Other
Fernando José de Barros Teixeira	Master	Researcher Assistant
Silvana Guerreiro da Luz	Master	Research fellow

MEMBERS FROM THE GROUP FARMING TECHNOLOGY AND ENERGY EFFICIENCY

INTEGRATED MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Adélia Maria Oliveira Sousa	PhD	Assistant Professor
Amílcar Manuel Marreiros Duarte	PhD	Assistant Professor
Anacleto Cipriano Pinheiro	PhD	Assistant Professor
António Fernando Bento Dias	PhD	Assistant Professor
Fátima de Jesus Folgôa Baptista	PhD	Assistant Professor
José Eduardo dos Santos Félix Castanheiro	PhD	Assistant Professor
José Manuel Nobre de Oliveira Peça	PhD	Assistant Professor
José Pedro Pestana Fragoso de Almeida	PhD	Assistant Professor
José Rafael Marques da Silva	PhD	Assistant Professor
João Manuel Pereira Ramalho Serrano	PhD	Assistant Professor with Habilitation
Luís Alcino Pinto Monteiro da Conceição	PhD	Assistant Professor
Luís Leopoldo de Sousa e Silva	PhD	Assistant Professor
Maria da Conceição Fernandes	PhD	Assistant Professor
Paulo Alexandre Mira Mourão	PhD	Researcher
Vasco Manuel Fitas da Cruz	PhD	Assistant Professor

STUDENT MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
José Carlos Silva Rico	Degree	Research fellow
Teresa da Silva Morgado	Master	Other

MEMBERS FROM THE GROUP LANDSCAPE DYNAMICS AND MANAGEMENT

INTEGRATED MEMBERS		
ΝΑΜΕ	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Cristina Andrade Gonçalves	PhD	Assistant Professor
Ana Margarida Pinto da Fonseca	PhD	Research fellow
Carlos Alberto Falcão Marques	PhD	Full Professor
Cati Oliveira Dinis	PhD	Other
Constança de Sampaio e Paiva de Camilo Alves	PhD	Researcher
Diana Surova	PhD	Research fellow
Emilie Françoise Caline Smith	PhD	Invited Assistant Professor
José Rafael Muñoz-Rojas Morenés	PhD	Researcher
João Paulo Tavares Almeida Fernandes	PhD	Assistant Professor
Maria Helena Marques Enes Guimarães	PhD	Researcher
Maria Rivera Mendez	PhD	Researcher
Maria Teresa Amado Pinto Correia	PhD	Full Professor
Maria Teresa Folgôa Batista	PhD	Researcher
Maria de Belém Ferreira da Silva da Costa Freitas	PhD	Assistant Professor
Patrícia Miguel Rocha Lourenço	PhD	Other
Pedro Damião de Sousa Henriques	PhD	Assistant Professor

STUDENT MEMBERS		
NAME	ACADEMIC DEGREE	PROFESSIONAL CATEGORY
Ana Patrícia Cebola Poeiras	Master	Other
Carla Maria Gomes Azeda	Master	Other
Nuno Ricardo Gracinhas Nunes Guiomar	Master	Researcher
Paola Andrea Hernandez	Master	Research fellow
Rui Daniel Parreira Machado	Master	Research fellow

MEMBERS FROM THE GROUP BIODIVERSITY AND CLIMATE CHANGE

INTEGRATED MEMBERS		
NAME	ACADEMIC	PROFESSIONAL CATEGORY
Diogo André Alves Salgado Alagador	PhD	Research fellow
Frederico Manuel Vaz Pontes Vitorino Mestre	PhD	Research fellow
José Manuel Herrera Vega	PhD	Researcher
Margarida Maria de Almeida Vaz	PhD	Assistant Professor
Miguel Bastos Araújo	PhD	Full Professor
Miguel Nunes da Costa da Graça Matias	PhD	Researcher
Pamela González del Pliego Castañeda	PhD	Research fellow
Sónia Cristina Cobra Cardoso	PhD	Researcher Assistant
Zeynep Ersoy Ferhat	PhD	Researcher



STUDENT MEMBERS		
ΝΑΜΕ	ACADEMIC	PROFESSIONAL
	DEGREE	CATEGORY
Bruno Miguel Santos Antunes Silva	Master	Research fellow







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