

# 2021 ACTIVITIES PLAN



*Together for Excellent Science*

**This Activity Plan is in strict agreement with  
the 2015-2020 Strategic Programme**

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**PRODUCTIVITY METRICS*****Expected scientific production for 2021:***

<i>ITEM</i>	<b>2021</b>
<b><i>Publications</i></b>	
<i>Books/Book Chapters</i>	<b>3</b>
<i>ISI Publications</i>	<b>190</b>
<i>Publications in national journals</i>	<b>5</b>
<b><i>Communications</i></b>	
<i>Oral communications in international conferences</i>	<b>70</b>
<i>Oral communications in national conferences</i>	<b>10</b>
<b><i>Reports</i></b>	<b>0</b>
<i>Organization of seminars and conferences</i>	<b>0</b>
<b><i>Advanced training</i></b>	
<i>Doctoral thesis</i>	<b>12</b>
<i>Master thesis</i>	<b>35</b>
<b><i>Patents</i></b>	

## ACTIVITIES

### ***Thematic Strand 1- Sustainability of Agri-Food and Forestry Ecosystems in a changing environment***

Thematic Strand 1 aims to deliver integrated frameworks to anticipate, detect and tackle ecological changes in agricultural, forestry and natural ecosystems and landscapes. Thematic Strand 1 integrates natural and social sciences concepts to develop and integrate novel analytical frameworks and tools that contribute to progress in fundamental and applied fields of environmental research (Task 1.1) and ecological sustainability in agri-food and forestry ecosystems (Task 1.2).

#### ***Task 1.1 - Integrated monitoring of climate and environmental impacts: adaptation and mitigation strategies***

Task 1.1 is highly interdisciplinary, using field, laboratory and computational techniques, advanced analysis, scaling and modelling tools and testing novel potential indicators of change. This task aims to (i) develop and apply new analytical technologies to (ii) understand climatic and environmental forcing on target ecosystems under current conditions; (iii) assess future scenarios of climate and environmental change to develop, test and implement suitable mitigation and adaptation measures, such as intercrop agriculture, riparian restoration (e.g. to assess ecosystem service provisioning of green infrastructures) or bioclimatic cultivar adaptation (e.g. crop zonation).

In brief, Task 1.1 aims to:

- 🕒 Produce projections of potential impacts on the environment, water resources, forestry and agricultural systems, associated with changing weather/climate conditions and extreme events;
- 🕒 Develop seasonal predictions for grapevine yield and wine production using spatial modelling techniques;
- 🕒 Develop a grapevine-model calibration platform to facilitate applications in decision support systems for the major European wine regions;
- 🕒 Test several stress mitigation strategies in grapevine and other crops (eg hazelnut trees), such as deficit irrigation and foliar kaolin application, and their impacts on the metabolomics of photosynthetically active tissues. Cytogenetic and molecular studies will allow the selection of the best biostimulant to improve the almond tree's ability to fight environmental stressors;
- 🕒 Develop biomarkers of anthropogenic activity effects in trees, such as changes in wood anatomy and increased levels of some toxic chemical elements;
- 🕒 Evaluate groundwater resources and their sustainability using models for the allocation of rainwater harvesting systems on agroforestry applications, evaluating the risk of aquifer contamination;

- 👁️ Evaluate the toxicological effects of microplastics and waterborne copper, alone or combined, in fish species providing novel insights regarding the environmental impacts of microplastics in freshwater and marine biota. Also, the effects of glyphosate-based herbicides and antilipidemic pharmaceuticals will be assessed in aquatic species.

### ***Task 1.2 – Sustainability in agri-food and forestry ecosystems***

Task 1.2 research encompasses multivariate analysis and modelling of habitat and land-use change impacts on terrestrial and aquatic environments, and ecosystem services as well as characterization of agri-food and forestry systems. Multidisciplinary research, relevant to stakeholders, will develop and apply techniques for species and biodiversity conservation, and pest control. Following this line, the compatibilization of agriculture intensification with biodiversity conservation will be tested. Modern methods (i.e. innovative hyperspectral imaging, computational intelligence techniques, and decision spatial support systems) will be developed and implemented as part of the CITAB's strategy to test innovative technologies to increase efficiency and system resilience, as well as facilitate the interaction between service providers and consumers to protect and enhance ecosystem services (water and soil quality, soil biodiversity and temperature regulation). Therefore, research to develop, test, and apply spatiotemporal dynamic predictive analytical tools will be directed towards understanding how natural (e.g. seasonality, precipitation, energy flow) and anthropogenic (e.g. fertilizer application in agricultural systems, discharge of effluents, variations in crop type) changes affect ecosystem integrity.

In specific, Task 1.2 aims to:

- 👁️ Develop of integrative landscape management approaches to support biodiversity conservation, assuring the provision of critical ecosystem service (ES) and sustainable development for the Atlantic region. The development of this new participatory approach will allow a better characterization and harmonization of biodiversity and ES assessment methods across terrestrial and aquatic Atlantic landscapes;
- 👁️ Conduct antimicrobial resistance (AMR) studies in aquatic environments using a holistic approach, based on the One Health concept;
- 👁️ Evaluate and genotyping of different crops to identify the most drought-tolerant genotypes to cope with climate change;
- 👁️ Develop a dynamic modelling framework as an instructive tool to support decision-making aimed at the effective management of invasive alien plants.

**Thematic Strand 2 – Technology in Agro-food and Forestry chains for a more competitive bioeconomy**

Aligned with RIS3 policy, this Thematic Strand explores innovative approaches to develop and update processes and technologies to crop and food products, biological materials and agri-food residues. The Thematic Strand 2 will bring added value to agri-forestry ecosystems, agri-food and forestry products and co-products, boosting regional and national economic growth. This Strand directly involves sector stakeholders throughout the 2 vertically structured tasks applying multidisciplinary research.

**Task 2.1 – Innovative technologies and processes**

Task 2.1 focuses on a major unit objective – optimization and development of innovative technology for more competitive agri-food and forestry production chains. This task optimizes solutions for current and future stakeholders, boosting competitiveness and income by improving food and forestry crop productivity, reducing management costs and increasing profit. To meet these objectives this task research will focus on (i) the development of physiological and best management tools; (ii) the production of novel technological applications, including predictive management software and spectral imaging applied to crop and forestry parameters (e.g. maturation stages, growth rates, harvest periods, water and cycle nutrients, fertilizer management, disease); (iii) identification of key intervention points to optimize production and identify suitable species, varieties and rootstocks; (iv) characterization of vegetation and quality to optimize physiological responses to climate conditions. This will contribute to sustainable economic income for regional stakeholders, but findings extend to the national level.

Therefore, Task 2.1 aims to:






- 👁️ Develop in vitro assay new formulations for the administration of natural products with anti-diabetes (*sucupira* oil, green tea) and anti-tumoral (perillaldehyde 1,2-epoxide) activities.
- 👁️ Develop of methodology for vegetal oil fluorescence components to be used in fingerprinting identification.
- 👁️ Cytogenomic approaches, are to be applied for the first time in *Pinus nigra* and *Vitis vinifera* varieties allowing to identify more tolerant genotypes to drought and copper exposure.

**Task 2.2. Biological validation of by-products and natural compounds**

High added value of sustainable bio-based products in the food supply chains in order to fulfil European policies targeting zero waste policies, circular economy and the green

deal, a strategic approach to integrate sustainable food production systems with the consumption of safe food products and the existing links to healthy people and healthy societies is a priority to CITAB. The consumers should envisage the selection of food towards healthier and sustainable choices, taking into account sustainable local and regional food systems and the development of environmentally friendly agriculture practices. This Task aims to address these challenges throughout the isolation, identification and characterization of natural compounds and their by-products, followed by their validation in biological systems (in vitro and in vivo approaches). Reduction of wastes in animal and agricultural production systems and in the food supply chains, as well as approaches to enhance the re-utilization of such products are addressed to promote sustainable food consumption and facilitate the shift to healthy and sustainable diets.

In brief, Task 2.2 aims to:

-  Develop animal models to study the impact of colorectal cancer and the effect of flower extracts on hormonally and chemically induced prostate cancer.
-  Evaluate phytochemical and antioxidant analysis of medicinal and food plants towards bioactive food, cosmetic and pharmaceutical resources.
-  Study the impact of salt consumption on human nutrition issues.
-  Evaluate the potential of based nutrition education programs on nutrition knowledge and behaviour patterns of consumers.
-  Evaluate nutritional valorisation of agro-industry by-products in animal nutrition.

## COOPERATION

### ***National***

Strengthening the link between CITAB research and the stakeholder's needs, CITAB will initiate participation in two national mobiliser projects, "cLABEL+: Innovative natural, nutritious and consumer-oriented 'clean label' foods" and "rePLANT: Implementation of collaborative strategies for integrated forest and fire management", which joined together a total of 40 national entities (22 industrial partners, two technological interface centres and 16 research units).

In 2021 the Centre will strengthen its position as a research provider for private and public stakeholders, with the establishment of several contracts with CITAB's Laboratories of Applied Ecology (LEA) and Fluvial Ecology (LEF). Moreover, the mobiliser projects with the industry and the Operational Group projects, funded by the Rural Development Programme, will be a source of funding for the Centre.

### ***International***

The Centre projects the approval of one or two international projects.



## DISSEMINATION

In 2021, CITAB will continue to promote conferences, seminars and workshops with themes that capture the range of CITAB's areas of expertise. Like in past years, target audiences will include the academic community, actual and potential key stakeholders from the public and private sectors. Contributions and keynote talks will be given by CITAB and consortium members and invited experts. CITAB researchers will give communications at several national and international conferences.

### Organization of conferences

All funded projects will apply Open Science principles, covering the organisation of stakeholder-relevant themed workshops, seminars and conferences (e.g., to present project findings and deliverables to different target audiences), researcher participation in conferences, open access publishing, creation of dedicated websites and use of social media to rapidly disseminate news to a broader audience.

### Outreach activities

As in the past, CITAB will increase the number of outreach activities for junior and high schools. In this context, several initiatives are planned to be taken in 2021, despite the restrictions affecting outreach and outdoor activities. CITAB will promote dissemination events oriented mainly devoted to high school and university students, either in person or by remote communication tools. The most relevant and impact initiatives will be the summer courses "Verão com Ciência", the "OCJ-Scientific Occupation of Young People on Vacation", and the "Science, and Technology Week".