# 2019
# ACTIVITIES PLAN

CITAB

*Compiled and edited by*

***CITAB Executive Committee and Lígia Pinto***

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

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# INTRODUCTION

Following the recommendation of CITAB's External Advisory Committee in their last report in January 2018, this year sets the reorganization of the Centre focused only in two research Thematic Strands and four Tasks, and no longer around the three Research Groups, which have been incorporated into these strands. By laying down on this strategic structure, it will be possible to improve cohesion among the unit's scientific research strands and reinforce synergies with different strategic partners, either from academia or from the private sector.

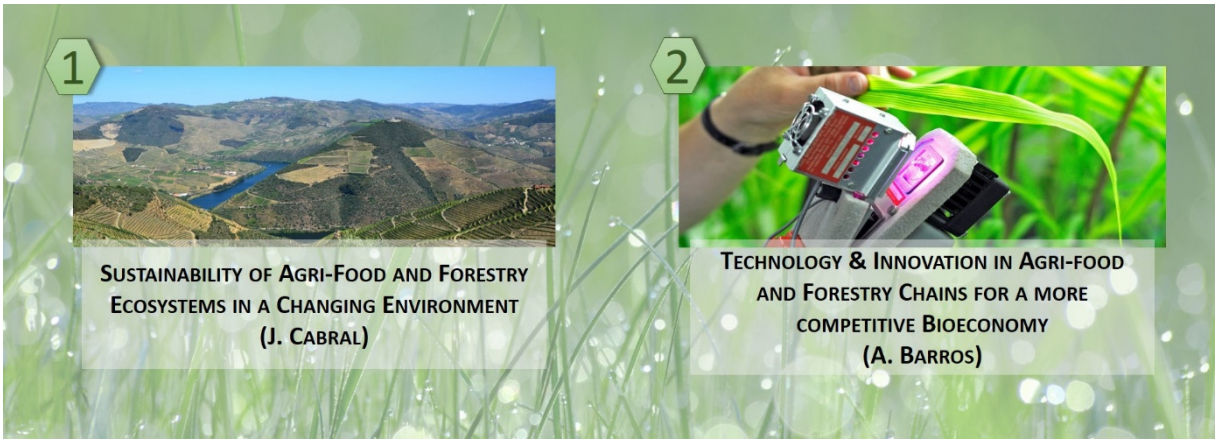
CITAB's Scientific Council approved this structure and it is in agreement with the 2015-2020 strategic programme:

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

- Task 1.1 - Integrated monitoring of climate and environmental impacts
- Task 1.2 – Sustainability in agri-food and forestry ecosystems

***Thematic Strand 2 - Technology & innovation in Agri-food and Forestry chains for a more competitive bio economy***

- Task 2.1 – Innovative technologies and processes
- Task 2.2 – Valorisation of bio-based products and co-products




The objectives of streamlined tasks still focus on stakeholder needs for more competitive and sustainable Agri-food and Forestry chains through scientific and technology innovation.

In 2018 the Centre joined three Collaborative Laboratories, funded by FCT, in the food, forestry and viticulture/wine sectors, which involves the participation of key

stakeholders, associations and other research entities, whose activities will initiate in 2019 involving the close collaboration of CITAB researchers.

CITAB will continue to pursue new national and international partnerships via funded research projects, collaborative protocols with R&D units and associated laboratories, and applied and advanced training. CITAB has shown considerable improvement in internationalisation via funded European projects (Horizon 2020, INTERREG, PRIMA, COST Actions) and will strengthen this strategic pillar to boost critical mass in key areas and increase the success rate of funding and projects coordination.

To carry out these purposes the Centre will benefit the contribution of five new contracted research assistants under the Scientific Employment Stimulus from FCT, starting in 2019.

The Centre will keep on putting a large effort in outreach activities to encourage the local schools and community to become more engaged with the benefits of science and technology, through the “Ciência Viva” activities, visits to local schools and, the new initiative “Cientificamente Provável” of the Portuguese Secretary of Estate of Education and Secretary of State of Science, Technology and Higher Education, where CITAB will actively collaborate with six secondary and professional schools.

## Major Objectives

CITAB researchers will focus their efforts within the two approved Thematic Strands addressing societal challenges within the European Union, and apply Open Science principles to guarantee the centre's mission of continued transparency in the effective transfer of scientific, technological and innovative knowledge to existing and new partners in academia, agri-food, forestry, industrial, public and private sectors.

CITAB will meet the following specific objectives in 2019:

- Cooperate in the implementation of three Collaborative Laboratories (CoLAB) that aim to stimulate the creation of qualified employment, to generate knowledge and economic value and to become examples of key innovation infrastructures for the national development:

  - CoLAB **"*Vines & Wines*"** aims to increase the volume and value of Port wine in the world market, as well as the search for efficient responses from economic agents to the process of climate change. The headquarters will be in UTAD;


  - CoLAB "***ForestWISE – Collaborative Laboratory for Forest and Fire Integrated Management***" aims to drive forward all agents of the forest sector in order to preserve the sustainability of the forest resources, to minimize the risks of the wildland fires and to optimize the benefits of the forest to society. The headquarters will be also in UTAD;


  - CoLAb "***4FOOD – Collaborative Laboratory for Innovation in the Food Industry***" aims to promote a paradigm change in the collaboration framework between stakeholders from the food sector.

- Organization of international congresses in straight collaboration with the research centres CIIMAR (Interdisciplinary Centre of Marine and Environmental Research) and INESC TEC (Institute of Systems Engineering and Computers, Technology and Science) in the thematic of “Ecosystems services in interface environments” and “Digital technologies applied to agro-food and forestry chains”, respectively.

- Start of the 5th edition of the FCT funded international doctoral programme “AgriChains – Agricultural Production Chains - from fork to farm” and continuation of the 4th edition of “Do*Mar - Marine Science, Technology & Management” doctoral programme.

- Participate in Horizon 2020, PRIMA – Partnership for Research and Innovation in the Mediterranean area, COST, Portugal2020, North2020 and PDR2020 proposals, aligned with CITAB’s strategic programme.

- Increase the number of Open Access publications in high impact factor journals.

- Develop outreach activities under the ‘Ciência Viva’ and ‘Cientificamente Provável’ programmes for secondary students.

- Efficiently execute the current ongoing funded projects

# ACTIVITIES

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

Thematic Strand 1 aims to deliver integrated analytical and modelling frameworks to detect agricultural, forestry and ecological changes in rural 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 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:

- Assess the effects of climate variability on Mediterranean agricultural crops and develop strategies for adaptation to climate change;
- Study the responses of hydrological systems to natural and human pressures, developing strategies for conservation and recovery;
- Promote water reuse for a circular economy;
- Use distinct levels of biological organization (biomarkers and bioindicators) to assess the environmental quality of water resources and investigate cause-effect relationships along multiple disturbance gradients;
- Establish the relationship of aquatic communities with land use, landscape metrics and pressure parameters, using integrated elements of biological quality;
- Study forest fires in Portugal, their relationship with human and environmental factors, and determine estimates of incidence, hazard and risk for future climate scenarios.

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

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

In summary, Task 1.2 aims to:

- Continue the cutting edge research associated with understanding the functioning and improvement of ecosystem management, taking into account the current challenges related to regional and global changes;
- Use green and blue structures to increase the sustainability of farms and their ecosystem services in pest and disease control in relevant agricultural and forestry crops at the scale of the landscape;
- Use new modelling tools to predict the impact of several functional changes of the landscape on the dynamics of the landscape and ecosystems, relevant for the definition of adaptation and mitigation strategies.

## *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 in (i) development of physiological and best management tools; (ii) 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 national level.

Therefore, Task 2.1 aims to:

- Promote the optimization and development of innovative technology for agri-food and forestry production chains;
- Increase the competitiveness of the agro-industrial sector, involving its main stakeholders, improving food productivity and yield of crops and forest resources, reducing management costs and increasing your profit;
- Develop new technological applications for management, forecasting and evaluation;
- Identify the main points of intervention to optimize production;
- Characterize the vegetation and its quality to optimize its physiological responses to climatic conditions;
- Optimize waste management and co-products of the wine industry.

***Task 2.2 - Valorisation of bio-based products and co-products***

Task 2.2 studies the potential of agri-food and forestry residues (AFFR), native flora and aromatic and medicinal plants (AMP) to develop new high bio-based value products. This task researcher will develop processes to create products with biological and innovative industrial value. AFFR and AMP application studies will be supported by the extraction, purification and isolation of highly bioactive compounds using updated and case-to-case protocols to assess biochemical and biological activity and toxicologically and phytotherapeutically properties will be evaluated. Finally, the safety of extracts/fractions and validate pharmacological/nutraceutical properties will be assessed.

In brief, Task 2.2 aims to:

- Characterize the structural and physical-chemical properties of AFFR for producing new raw materials with industrial application, via transformation;
- Extract, purify and isolate bioactive compounds and evaluate their toxicity, therapeutic and nutraceutical potential (eg. antibacterial activity; anti-aging, anti-inflammatory, anti-cancer, anti-ischemic and neuroprotective);
- Reinforce the components of valorisation of different types of co-products produced by the agro-industrial sector, involving the main stakeholders in the definition of strategic lines for the development of value added products, both in the area human health and cosmetics in the area of animal science, veterinary and animal production.

# COOPERATION

***National***

CITAB continues to aim for increasing cooperation with national research centres via joint applications for funding, MSc and PhD thesis supervision. FCT-sponsored projects are a good opportunity to establish contacts with other organizations. CITAB will also be involved in the calls of the SAICT (FCT), Portugal2020, Norte2020, PDR2020 as well as in the specialized services for the national community.

Collaboration Protocols with INESC-TEC (Institute for Systems and Computer Engineering, Technology and Science) and CIIMAR (Interdisciplinary Centre of Marine and Environmental Research) are in place in scientific activities recognized as being capable of integrating the research areas of the two research units.

Research activities within CITAB will continue via close cooperation with universities, technical schools, research centres and micro, small or medium-sized enterprises, cooperatives or other forms of associations, among other stakeholders from different sectors of the agro-food and forestry industries. Links with stakeholders include joint participation in projects, transfer of know-how, dissemination of results, development of new products and developing technological solutions.

***International***

CITAB will expand cooperative research work initiatives, through funding initiatives such as the Horizon 2020 programme. At the international level these projects are also a good possibility to establish contacts with other international research centres.

CITAB researchers will continue to actively participate in international conferences, management and scientific meetings and technical visits to develop contact with relevant foreign researchers and acquire expertise through visits abroad (mobility).

The development and teaching of advanced courses and the international Doctoral Program AgriChains and Do*Mar encourage CITAB members to work together to develop syllabi based in areas with high levels of expertise and critical mass.

CITAB will continue to receive incoming researchers for PhD and Post-doc (short / medium-term stays).

# DISSEMINATION

In 2019, 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 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

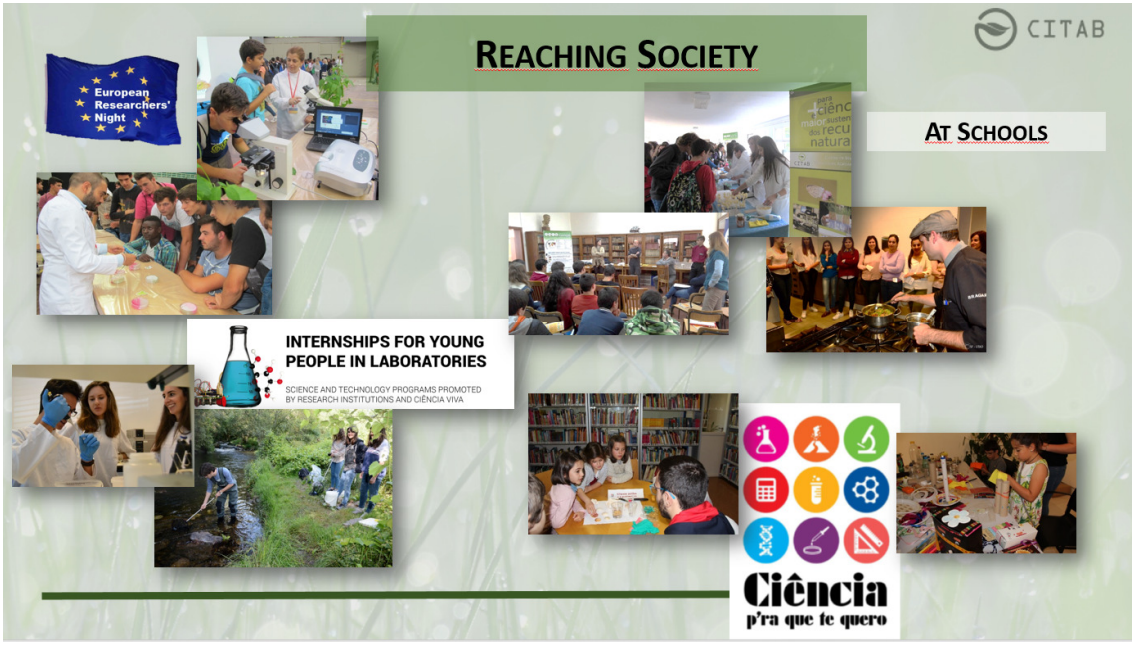
Under the recent established protocols, with CIIMAR and INESC TEC, two international conferences will be organized in collaboration with this two institutions focusing common research themes within the scope of CITAB Thematic Strands. On TS1, the workshop *Ecosystem Services in Interface Environments: Towards Social-Ecological Resilience, Health and Wellbeing from the Stream to the Coast* with CIIMAR will occur in October and will pay special attention to the demonstrative relevance of freshwaters, estuarine and coastal ecosystem services (provisioning, regulating/maintenance/support and cultural services), by promoting the participation of different stakeholders and policy decision-makers, since they influence and are influenced by decisions on land uses and management. This will illustrate how biodiversity and ecosystem services valuation can be incorporated into integrated landscape social-ecological management and socioeconomic planning involving stakeholders in natural resources protection. On TS2, the conference *Digital Agro-food and Foresty (r)evolution*, co-organized with INESC TEC, will be a forum open to national and international researchers, stakeholders and students, staking on the link between research and innovation, using new technologies in agro-food and forestry value chains. This congress, to be held in December, will present a diversified program, designed to promote the interaction between the different participants, creating discussion forums on the most relevant topics in the Agro-food and Forestry areas, including the Internet of Things and Big Data, Artificial Intelligence, Robotics and Remote Sensing.

## 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 2019 under the programme "Cientificamente Provável", namely with "Agrupamento de Escolas de Mêda - Viseu", "Escola Profissional de Fermil-Celorico de Basto", "Agrupamento de Escolas Dr. Júlio Martins – Chaves", "Escola Básica e Secundária de Murça-Murça",

"Escola Básica e Secundária D. Sancho II de Alijó-Alijó", "Agrupamento de Escolas de Mirandela-Mirandela, "Agrupamento de Escolas Professor António da Natividade de Mesão Frio". This is a joint initiative of CITAB, National Secretariat of Education and National Secretariat for Science and Technology, aiming the promotion of scientific knowledge and the enrichment of the educational path of young students. This program is designed to stimulate in young students scientific literacy and skills, motivating them to deepen their knowledge and pursue higher education in their areas of interest (http://www.rbe.min-edu.pt/np4/2164.html).

Besides this, other initiatives will be performed in CITAB, which have a dedicated Management Structure that supports and promotes the Unit and its researchers' activities on different levels and for different target audiences (e.g. the general public, partners and institutions to stakeholders and industry). CITAB expects an increasing level of awareness of its activities and how they affect society. CITAB will engage more and more different sectors of the scientific community, students and the general population.



## PRODUCTIVITY METRICS

Expected scientific production for 2019:

| Item | 2019 |
|---|---|
| Books/Book Chapters | 6 |
| ISI Publications | 170 |
| Publications in national journals | 15 |
| Oral communications in international conferences | 150 |
| Oral communications in national conferences | 80 |
| Reports | 10 |
| Organization of seminars and conferences | 10 |
| Doctoral theses | 10 |
| Masters theses | 20 |
| Patents | 2 |

# BUDGET

FCT Pluriannual funding

| ITEM | % | 2019 |
|---|---|---|
| Human Resources | 19,4 | 38.750,00€ |
| Missions | 20,2 | 40.500,00€ |
| Acquisition of Goods & Services | 40,4 | 80.750,00€ |
| Dissemination | | |
| Overheads | 20 | 40.000,00€ |
| Equipment | | |
| **Total** | **100** | **200.000€** |