

# 2013 Activities Plan

# CITAB

*Compiled by*  
**CITAB Executive  
Committee**

*Edited by*  
**Samantha Jane Hughes  
& Lígia Pinto**

 **Biosystem Engineering - BE**

 **Ecointegrity - EI**

 **Sustainable Agro-food Chains - SAC**

# Index

<b>INDEX</b> .....	<b>2</b>
<b>1 – INTRODUCTION</b> .....	<b>3</b>
<b>2 – MAJOR OBJECTIVES</b> .....	<b>5</b>
<b>3 – ACTIVITIES</b> .....	<b>5</b>
<b>3.1 – SCIENTIFIC DEVELOPMENT FOR 2013</b> .....	<b>5</b>
<b>PROJECT #1 – BIO-BASED MATERIALS</b> .....	<b>5</b>
<b>PROJECT #2 – IMAGE-BASED SYSTEMS</b> .....	<b>8</b>
<b>PROJECT #03 - BIODIVERSITY, ENVIRONMENTAL ASSESSMENT AND BIOTECHNOLOGY</b> .....	<b>10</b>
<b>PROJECT #04 – DISTURBANCE OF FOREST AND AGRO-FORESTED ECOSYSTEMS</b> .....	<b>12</b>
<b>PROJECT #05 – AGRONOMY, CLIMATE CHANGE AND ENVIRONMENTAL STUDIES</b> .....	<b>14</b>
<b>PROJECT #06 – PLANT PRODUCTS AND CO-PRODUCTS (3P's)</b> .....	<b>15</b>
<b>3.2 – DISSEMINATION &amp; IMAGE</b> .....	<b>18</b>
<b>3.3 – COOPERATION</b> .....	<b>20</b>
<b>3.3.1 – INTERNAL</b> .....	<b>20</b>
<b>3.3.2 – NATIONAL</b> .....	<b>20</b>
<b>3.3.3 – INTERNATIONAL</b> .....	<b>22</b>
<b>3.3.4 – STAKEHOLDERS</b> .....	<b>25</b>
<b>4 – HUMAN RESOURCES</b> .....	<b>26</b>
<b>5 – SUMMARY TABLE FOR 2013</b> .....	<b>27</b>
<b>6 – 2013 BUDGET</b> .....	<b>28</b>

# 1 – Introduction

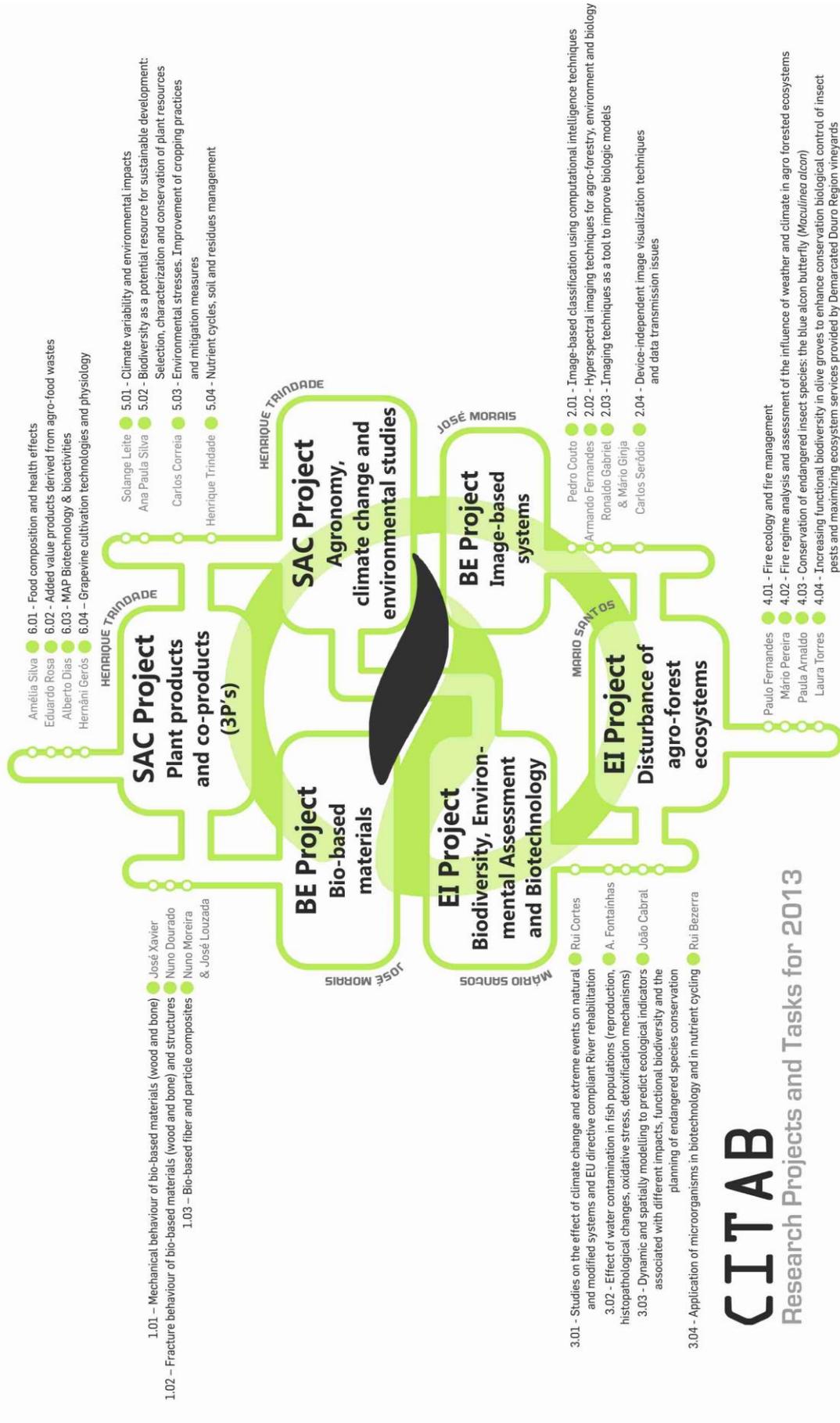
The Activity Plan for 2013 (AP-2013), compiled by the CITAB Executive Committee (ExCo) in collaboration with research line coordinators, outlines key activities and goals and expected results for the coming year for the centre's research units. CITAB implements an ongoing strategy to achieve an FCT classification of "Excellent" and to build sustainable links for developing cohesive, integrated research initiatives with key partners in the public and private sector. CITAB continues to strive to improve critical mass and promote integrated research initiatives both nationally and internationally. Two major initiatives for 2013 will guarantee that these goals are met.

Following a series of meetings with key players over 2012, CITAB will be forming a consortium in 2013 with national research units (Centro de Ciência Animal e Veterinária – CECAV - at UTAD and the Centre for Functional Ecology - CEF - at the University of Coimbra), associated laboratories (Centre for Biotechnology and Fine Chemistry - CBQF - Catholic University of Porto) and major stakeholders (Portugal Foods, Douro Region Wine Cluster) based in the centre and north of Portugal. This consortium will apply for FCT funding during 2013 to develop research projects, post graduate training and vocational doctoral programmes. As a result of this merger, CITAB will realise the major objective of becoming part of an associated laboratory.

Members of CITAB research lines will be collaborating with national and international partners to draw up international doctoral programmes for FCT funding over 2013. Two doctoral programmes are under development "Biodiversity and Environmental Sustainability" and "Sustainable Environment and Healthy Lifestyles". The former programme is well underway and a preliminary syllabus will be ready in the first quarter of 2013.

CITAB's newsletter continues to divulge the centre's activities to actual and potential international partners and bids for participation in FP7 and Horizon 2020 projects and consortia will continue in 2013. The 2013 CITAB cycle of conferences will include an international seminar on IV World Seminar on the conservation and management of the endangered Red-billed Chough (*Pyrrhocorax pyrrhocorax*) and a conference on "*Food security, sustainable intensification and the environment: an integrated approach*". The latter event aims to promote the interdisciplinary and integrated nature of CITAB's research.

Outreach activities will be carefully planned and coordinated over 2013 to ensure that CITAB researchers work together to divulge the centre's activities and capture the interest of potential young scientists in the region's secondary schools. CITAB will continue to offer work placements to budding young scientists in the centre's laboratories.



**CITAB**  
 Research Projects and Tasks for 2013

## 2 – Major objectives

The listed objectives for 2013 are based upon foundation planning and activities from previous years:

- ☺ Formal creation of a strategic consortium for northern Portugal, integrating both national FCT funded research centres and associated laboratories and public and private sector stakeholders (Portugal Foods, Douro Wine Cluster).
- ☺ Continued internationalisation efforts by procuring new contacts and strengthening existing international links, in particular with Brazil, China and India.
- ☺ Development of syllabi for international doctoral programmes with national and international research centres, universities and stakeholders.
- ☺ Continued efforts to increase interdisciplinarity within and between CITAB's Groups, especially through the actions described above;
- ☺ Increase the scientific productivity in JCR Journals and in other publications;
- ☺ Continue to offer scholarships at CITAB in key tasks outlined in the projects for each research line.
- ☺ Continued collaboration with key stakeholders
- ☺ Development of planned, strategic outreach activities aimed to capture the interest of young scientists and promote civic responsibility.

## 3 – Activities

CITAB's scientific activities are organized in two projects per research line. Each project comprises four tasks with clear objectives and goals that encourage multidisciplinary between the Working Groups. The scientific scope of the projects and tasks for 2013 is given in the figure below, together with a brief description of scientific activities.

### 3.1 – Scientific development for 2013

#### Project #1 – Bio-based materials

In the light of energy shortage and environmental concerns, there is an increasing interest in agricultural and forestry resources for the production renewable materials for construction, furniture, packaging and automotive industries. A fundamental requirement for efficient and competitive use of these materials is the precise knowledge of their mechanical and physical behaviour.

This project aims to develop a materials science approach to the mechanics of bio-based materials (namely wood and agro-based fiber composites) from the micro to macro levels, which is fundamental for promoting bio-based materials as soundly characterized engineering materials.

### **Task #1.01 - Mechanical behaviour of bio-based materials (wood and bone)**

This task aims the mechanical characterisation of bio-based materials through novel methodologies coupling full-field optical techniques with inverse identification methods. A new data reduction strategy is proposed for characterising wood at the growth ring scale, taking into accounts both orthotropy and heterogeneity.

Mechanical tests are carried out on small ring-oriented specimens for determining local properties of earlywood and latewood, from the strains fields provided by digital image correlation. Suitable inverse identification methods are developed in order to extract local elastic constants along the radial-tangential plane. Quasi-static and dynamic tests are to be performed for determining the dependency of mechanical properties with strain rate. Moreover, quality of maritime pine wood is discussed in terms of spatial variation of elastic properties within and among trees.

A single heterogeneous plate bending test is also proposed for characterising clear wood in the longitudinal-radial plane by the deflectometry technique. Issues to be addressed are gradient properties within the wooden plate.

A complete mechanical characterisation of cortical bone tissues is also aimed by coupling digital image correlation with several test methods. Finally, the integrated toolboxes of white-light optical methods, namely, digital image correlation, grid method/deflectometry and feature-tracking method will be developed. In summary, the following activities are planned:

- Characterisation of stiffness components of wood at the growth ring scale from full-field measurements: quasi-static and dynamic analyses.
- Assessing wood quality by spatial variability of elastic properties within and among trees: multi-scaling modelling and experimental study.
- Mechanical characterisation of wood from heterogeneous plate bending tests.
- Evaluating orthotropic stiffness of clear wood from 3D full-field displacement measurements.
- Identification of mechanical properties of bovine cortical bone from digital image correlation.
- Developing integrated toolbox for digital image correlation, grid method/deflectometry and feature-tracking method.

### **Task #1.02 - Fracture behaviour of bio-based materials (wood and bone) and structures**

The goals of this task are the development of suitable methods to characterize the fracture behaviour of cortical bone tissue subjected to different mode-mixities (I+II), the development of identification methods of cohesive laws in wood bonded joints, the characterization of dowel-joints involving wood and metal pins, the characterization of wood repairs with artificial composite materials, and the study of metal-fixations applied to the fracture repair of long bones. Regarding last planned activity, the definition of a fracture envelop in mode I versus mode II space is foreseen, based on the End Load Shear test, the Single Leg Bending test and the Modified Mode Bending test.

The determination of cohesive laws in wood bonded joints involves the application of a direct method or an inverse approach, which is associated to an optimization strategy. Through the first planned activity, the determination of the crack opening displacement is required. The digital image technique is envisaged for this purpose. In the second planned activity, a genetic algorithm combined with the finite element method is needed. The characterization of wood-steel dowelled-joints, wood repairs and metal fixations for bone repair will be performed experimentally using the digital image technique. Cohesive models of those structural applications will be calibrated with the generated experimental data. In summary, the following subtasks are to be investigated:

- ② Fracture behaviour of cortical bone under mixed-mode I+II loading.
- ② Numerical and experimental study of cohesive laws in bonded wood joints.
- ② Characterization of steel-wood doweled joints.
- ② Behaviour of wood repair.
- ② Fixation of bone structures by rigid pins.

### **Task #1.03 – Bio-based fibre and particle composites**

Sustainability issues are stimulating the development of renewable materials for structural use. Engineered wood products belong to this broad class of materials, in which particles and fibres are glued together with adhesives to form composite materials. Wood can be replaced in some cases by other agro-based biomass, with significant environmental and economic benefits. These new sort of materials, however, require a complete physical and mechanical characterisation. This task deals with the characterisation of composite materials incorporating agro-fibres and particles. Novel approaches are proposed for a more robust and efficient evaluation.

- ② Characterization of stiffness components of wood products (MDF, OSB) from heterogeneous plate bending tests.

## Project #2 – Image-based systems

This project aims to design and develop computer vision and image processing based systems and solutions in the areas of agro-forestry, environment and biology. Image-based systems can be used in the guidance or control of many agricultural and food processes, providing a cheap, consistent and objective assessment for inspection, evaluation and measurement purposes.

### Task #2.01 Image-based classification using computational intelligence techniques

Artificial intelligence and Soft Computing techniques are developed and incorporated in the computer vision problems under study within the group. Soft Computing techniques are to be applied in image classification problems, for agricultural, forestry, environmental and biological systems, allowing the processes to better deal with the intrinsic ambiguity and complexity usually present in these kind of image based systems. Artificial Intelligence and Soft Computing techniques, namely Fuzzy Sets Theory and its extensions, are also to be applied in image based feature/object tracking in team sports analysis. The complexity involved in these kind of multi-tracking problems is huge and we aim to soften that complexity by coping the processes with the necessary flexibility, while maintaining accuracy, to deal with the uncertainties (occlusions, misdetections, etc.) using the above mentioned techniques.

- ④ Development of novel methodologies for image classification by using soft computing techniques;
- ④ Development of robust methodologies for feature tracking in image sequences using FSs concepts along with feature behavioral characterization methodologies for feature identification and tracking;
- ④ Application of the developed feature tracking methodologies in indoor team sports context to access both player and team dynamics;
- ④ Application of classification methodologies based on FSs concepts and its extensions for meat quality assessment and characterization.

### Task #2.02 Hyperspectral imaging techniques for agro-forestry, environment and biology

Hyperspectral imaging will continue to be used for non-destructive analysis of biological materials. Advanced machine learning algorithms will continue to be developed to extract from hyperspectral information the values of parameters to be measured.

- ④ Further internationalization of Hyperspectral imaging research by procuring new international anchor institutions and participating in European projects.

### **Task #2.03 Imaging techniques as a tool to improve biological models**

This task employs biomechanical and environmental analysis, using computer assisted imaging techniques, to assess the quality and type of the movement in biological models. Different techniques will be used for kinematic and kinetic analysis:

- ② Plantar pressure abnormalities- development of a methodology to determine local (over)loading of the plantar surface.
- ② Biomechanical load over walking trails – development of a methodology to assess the accumulating effects of the external and internal biomechanical loads to which the pedestrian is subjected, in interaction with recreation ecology research on developing new survey methods for assessing formal and informal trails or unsurfaced roads in wilderness and backcountry settings.
- ② Radiographic and ultrasound imaging abnormalities - development of methodologies to improve the imaging diagnosis

### **Task #2.04 - Device-independent image visualization techniques and data transmission**

This task aims to study, model and develop Embedded Systems and WSNs to characterize and perform automatic control over activities (design of devices) related with agro-food environments. This will develop embedded communication protocols and instrumentation (sensor) systems for precision agriculture and food quality evaluation applications:

- ② Modelling and development of Embedded Systems and WSNs to characterize and perform automatic control over activities (design of devices) related with agricultural environments, and apply them to the study of animal behaviour (design of communication and control algorithms).

## **Project #03 - Biodiversity, Environmental Assessment and Biotechnology**

This group studies the effects of large scale environmental change on the sustainability, resilience and diversity of disturbed natural ecosystems and agro-systems. Research aims include:

- ☺ The creation of appropriate tools for capturing, characterising and predicting the spatial and temporal dynamics, structure and function of terrestrial and aquatic ecosystems affected by human disturbance;
- ☺ The development and implementation of typologically appropriate management plans, based on the ecological assessment of different components of the environment, in order to rehabilitate or restore degraded systems.
- ☺ Bioremediation of systems affected by anthropogenic disturbance.
- ☺ Conservation of threatened species of terrestrial and aquatic ecosystems.

EI has drawn up several advanced courses that were approved in 2012 and will be taught in 2013. EI members are also developing an international doctoral programme in “Biodiversity and Environmental Sustainability” with national and international partners for FCT funding. The advanced and doctoral courses draw upon known areas of expertise of members with direct relevance to specific sectors of the employment market, raising the national and international profile of CITAB/UTAD and collaborators. These initiatives attract paying participants with at least degree level qualifications, creating an alternative source of funding.

### **Task #3.01 – Studies on the effect of climate change and extreme events on natural and modified systems and EU directive compliant River rehabilitation**

The aims of this task will continue the works initiated in 2012 and are associated to rivers, reservoirs and effects of land uses/cover on water quality and systems integrity. The principal planned activities include:

- ☺ Multivariate analysis of land use, landscape metrics and pressure parameters as predictors and drivers of ecological quality across different river typologies using integrated biological quality elements.
- ☺ Development of predictive models for extrapolating ecological status in surface water bodies and climate changes effects on ecological status.
- ☺ Continued ecological assessment of restoration and requalification programmes for aquatic ecosystems and threatened aquatic species.
- ☺ Publication of 4 papers in JCR journals.

### **Task #3.02 - Effect of water contamination in fish populations (reproduction, histopathological changes, oxidative stress, detoxification mechanisms)**

This task investigates the use of biomarkers as an “early warning system” of environmental contamination linked to sub-organism level processes. Biomarkers permit quick and predictable associations to be established between results and particular stressor agents, providing valuable information on the effect of different sources of water contamination.

- ☺ Publication of 6 papers in JCR journals.
- ☺ Establish new national and international collaboration to increase our scientific dimension and internationalization.

### **Task #3.03 - - Dynamic and spatially dynamic modelling to predict ecological indicators associated with different impacts, functional biodiversity and planning of endangered species conservation measures**

The innovative Stochastic Dynamic Methodology (StDM) and the spatially explicit StDM framework developed by CITAB researchers are becoming more and more accepted by international scientists. The methodologies integrate Multi-Model approaches under a common framework that relate ecological trends to changes in the surrounding habitats and environmental conditions at local and regional levels. Activities for 2013 include:

- ☺ To test the applicability of a novel spatially explicit modelling framework in predicting ecological indicators responses to realistic scenarios of environmental changes at local and regional levels.
- ☺ Emphasis on the use of these integrative modelling frameworks, scenarios and projections developed to improve the use of management models for measuring and monitoring ecological integrity.
- ☺ Publication of 2-3 ISI articles.
- ☺ Start of the FCT funded project “*IND\_CHANGE - modelling tools based on indicators to predict changes in the landscape and promote the application of research on socio-ecological adaptive management planning*” PTDC/AAG-MAA/4539/2012.

### **Task #3.04 - Application of microorganisms in biotechnology and in nutrient cycling**

- ☺ Continue research on the role of autochthonous bacteria, yeasts and fungi in bioremediation and as functional indicators of ecological quality of degraded ecosystems.

- 🌱 Promote the use of microorganisms and their enzymatic extracts in sewage treatment processes and the bioconversion of lignocellulose in products of added value.

## **Project #04 – Disturbance of forest and agro-forested ecosystems**

This project includes studies on abiotic and biotic disturbance that act on forests, woodlands, agricultural agro-forestry systems. Research aims:

- 🌱 To characterize spatial and temporal patterns of abiotic disturbance regimes and to develop management guidelines for disturbance mitigation and adaptation measures.
- 🌱 The ecology of endangered arthropods and their role in the functioning of ecosystems.
- 🌱 Integration of ecosystem services in agriculture to decrease the use of pesticides and associated costs.

### **Task #4.01 - Fire Ecology and Management**

- 🌱 To establish links between fire environment, fire behaviour and fire effects in eucalyptus plantations
- 🌱 To understand how fire policy options affect the effectiveness of fire management in Portugal

### **Task #4.02 - Fire regime analysis and assessment of the influence of weather and climate in agro forested ecosystems**

- 🌱 Assessment of climate change impacts on the occurrence and burnt areas by forest fires.
- 🌱 To develop, select and apply new methodologies for analyzing the fire regime.
- 🌱 Assessment of climate changes in European the regions of chestnut production.
- 🌱 Assessment of weather/climate influences on cork productivity.

### **Task #4.03 - Conservation of endangered insect species: the blue alcon butterfly (*Maculinea alcon*)**

Work will continue on the conservation of the blue alcon butterfly (*Maculinea alcon*) in the Alvão Natural Park. This project is the only national initiative aimed at the

conservation of this species in Portugal, which represents the peripheral distribution range of *M. alcon*. Tasks for 2013 include:

- ☺ The study of several ecological issues of this insect life cycle aimed his conservation: determinations of *P. alcon* flight period and oviposition preferences and determination and identification of its host ant species.
- ☺ Identification of new populations.
- ☺ Development of strategies for green corridors construction between identified populations.
- ☺ Genetics characterization of these populations.

#### **Task #4.04- Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests and maximizing ecosystem services provided by Demarcated Douro Region vineyards**

This highly innovative task aims to maximise ecosystem services provided by agro-ecosystems in highly varied terrain near water bodies such as Alto Douro landscape using pheromone based mating disruption against key-pests.

Planned activities for increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests include:

- ☺ Phenological model to simulate olive moth, *Prays oleae* (Bernard), population dynamics in different scenarios: agricultural implications, developed;
- ☺ Syrphid community associated with the olive grove from northeastern Portugal identified;
- ☺ Food resources required to maximize conservation biological control exerted by *Episyrphus balteatus* (De Geer) (Diptera: Syrphidae) identified

Planned activities for maximizing ecosystem services provided by Porto Wine Region (PWR) vineyards include

- ☺ Development of spatial analysis methodology to support activities to establish an ecological infrastructure network at the project's farms and the application of "friendly" mating disruption technique to control *Lobesia botrana*, that maintains or promotes farm biodiversity;
- ☺ Plant species to be used in the establishment of the ecological infra-structure network aimed at maximizing conservation biological control against *L. botrana* identified.

## Project #05 – Agronomy, climate change and environmental studies

Tasks within this project aim to develop suitable adaptation and mitigation measures for environmental and climate change in the agricultural sector, based on plant studies, numerical atmospheric modelling, studies on environmental impacts on Mediterranean agricultural production chains and the design and improvement of cropping practices. –The planned activities for the tasks for 2013 are:

### Task 5.01 Climate variability and environmental impacts

- ☺ Regionalization of the atmospheric electrical activity over the Iberian Peninsula, modelling/prediction of lightning activity and identification of its major forcing factors. Impacts on the power distribution networks.
- ☺ Viticultural climatic zoning over Europe and Portugal with very high spatial resolution. Assessment of climate change impacts on the winemaking sector and development of adaptation/mitigation measures.
- ☺ Paleoclimatic reconstructions over Portugal and validation of reconstructed time series.

### Task 5.02 Biodiversity as a potential sustainable development resource: Selection, characterization and conservation of plant resources

- ☺ Selection of organically produced blueberry cultivars best adapted to the soil and climate of northern Portugal.
- ☺ Characterization of berries produced in Portugal. Analysis of the effects of harvest time and shelf life period on the quality of blueberries, raspberries and blackberries (project submitted to the FCT).
- ☺ Exploitation of traditional fruits from the island of Madeira: sustainability, nutritional data and health impact (project submitted to the FCT).
- ☺ Continue studies initiated in 2011 on the implementation of dual axis conduction system on apple trees. PRODER project Medida 4.1/2010.
- ☺ Continue studies on hazelnuts.

### Task 5.03 Environmental stress. Improving cropping practices and mitigation measures

- ☺ Amelioration of physiological responses of *Vitis vinifera* L. and *Olea europaea* L. using reflective antitranspirants.

- ☺ Improvement of water use and productivity of rainfed olive orchards by cover crops.
- ☺ Early detection and management of drought stress in *O. europaea* L.; Elucidation of the physiological mechanisms of salicylic acid application in drought tolerance of *O. europaea* L.
- ☺ Morpho-physiological characterization of Portuguese varieties of *Sambucus nigra* L. and their responses to abiotic stress.
- ☺ Genotypic variation in tolerance to long-term high RH in cut roses (*Rosa hybrida* L.).

#### **Task 5.04 Nutrient cycles, soil and residues management**

- ☺ Assessment of chemical and biological treatment methods to reduce gas emission measurements from stored animal slurries
- ☺ Assessment of gas emission kinetics under winter and summer temperature scenarios.
- ☺ Investigate the effects of soil amendment with composts rich in phytochemical compounds on organic N and C mineralization kinetics and greenhouse gases emissions.
- ☺ Assessment of ammonia and greenhouse gas emissions from rice paddies amended with distinct mineral fertilizers under Mediterranean conditions
- ☺ Evaluation of N, P and C nutrient cycling effects, carbon sequestration and greenhouse gases emissions in vineyards under different soil management practices.

### **Project #06 – Plant products and co-products (3P's)**

This project provides effective and sustainable solutions for “greening the food chain” and optimizing both human and animal health. Emphasis is given to Mediterranean crops, medicinal and aromatic plants (MAP) but also to other economically-important plants. The planned activities for the tasks for 2013 are:

#### **Task 6.01 Food composition and health effects**

- ☺ Investigate the composition of essential oils from *Thymus vulgaris* L. and *Thymus mastichina* L. (the second is native to Portugal and Spain).
- ☺ Investigate the main components of the water and ethanolic extracts obtained from *Thymus vulgaris* L., *Thymus mastichina* L. and *Geranium robertianum*.

- ☺ Investigate the anti-oxidant properties of these extracts and their potential role in modulating several biological mechanisms by using *in vitro* assays in selected cell lines.
- ☺ Results will serve for scientific production and valorization of regional crops such as *Thymus mastichina* L.
- ☺ Obtain information on the anti-proliferative effect of various salads leaf extracts by using two different cell lines.
- ☺ Chemical characterization and antioxidant activity of *Coriandrum sativum* extracts, biochemical protection against *t*-BHP toxicity using HepG2 cells.
- ☺ Hepatoprotective effect of coffee lees oil against carbon tetrachloride on rat wistar model.
- ☺ Evaluation of parabens (food preservatives) toxicity and relevance on the reproductive capacity in male animals.

#### **Task 6.02 Added value products derived from agro-food wastes**

- ☺ Differentiate the biological role of different vegetables and aromatic and medicinal plants as natural source of bioactive compounds with antioxidant and antimicrobial activities.
- ☺ Evaluation of the potential of development of new food- products with antioxidant and antimicrobial potential against relevant pathogenic bacteria.
- ☺ Evaluation of the potential of co-products development from agro-food wastes residues (Chestnut industrial residues and olive leaves) with biological added value; Anti-cancer and anti- inflammatory activities; Identification of quorum-sensing (QS) inhibitors and formation of biofilms including studies of synergism/potentiating effects with sanitizers and antibacterial and antibiotic agents.
- ☺ Development of new extraction methods for compounds with biological added value.
- ☺ Implement new analytical procedures for evaluation of biological role of different compounds.
- ☺ Development of patents concerning new bioactive compounds extractions procedure.

#### **Task 6.03 MAP Biotechnology & bioactivities**

- ☺ Study of results on solute (sugars/acids/phenolics) transport/metabolism in grapevine, under the effect of heat and drought.

- Evaluation of the utilization of biological control agents and biopesticides against esca e vineyards is underway and is expected to produce results in 2012.
- Study the effect of plant polyphenols on intestinal SGLT1 glucose transporters, insulin secretion from beta-cells, mechanisms of colon anti-cancer effects.
- Study the use of plant extracts for obtaining functional foods with antioxidant and neuroprotective activities.
- Study of nanoencapsulation of plant extracts and selected compounds with the aim of brain targeting.

#### **Task 6.04 Grapevine cultivation technologies and physiology**

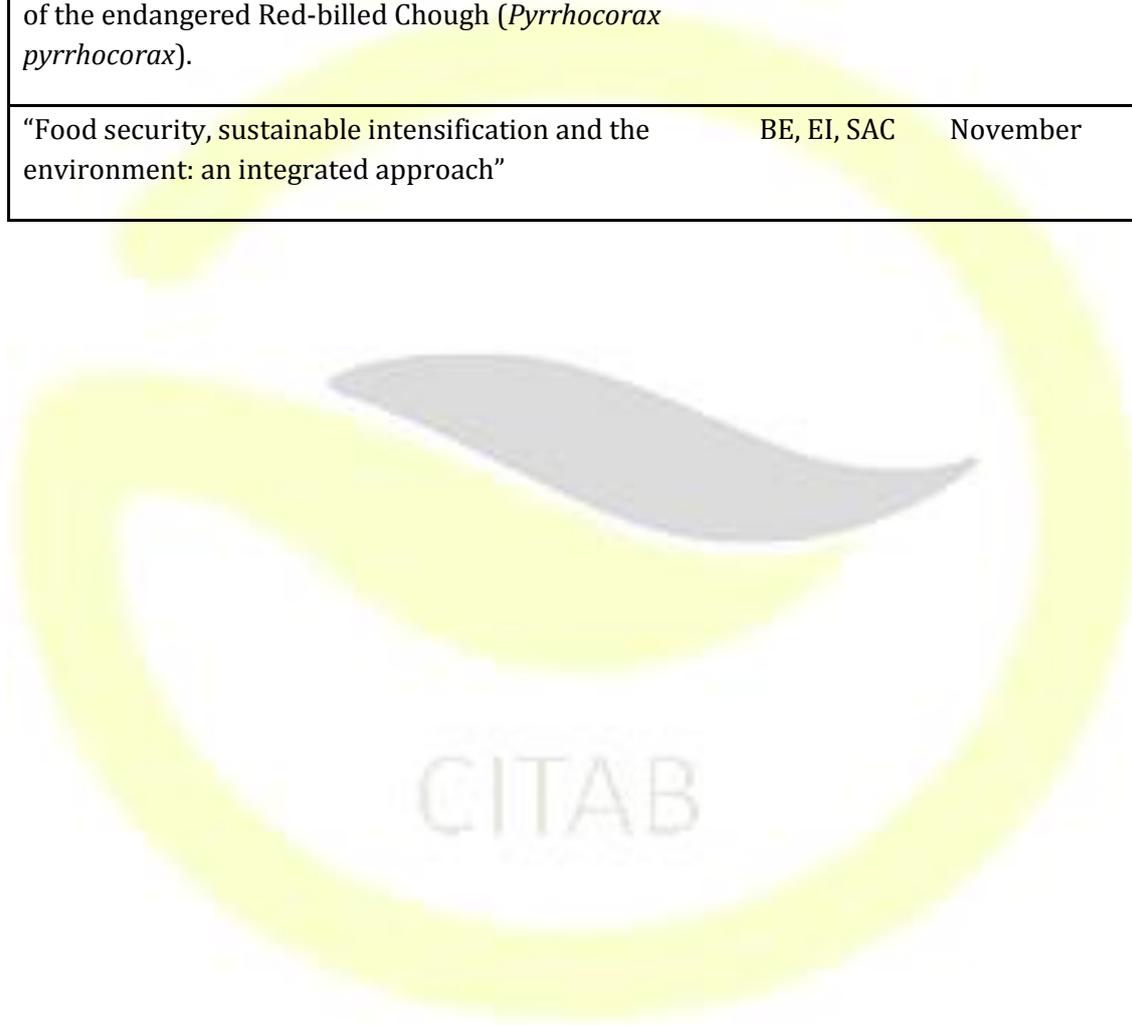
- Subcellular localization of copper transporters (VvCTrs) in *Vitis vinifera*.
- VvCTr expression during berry development by qPCR.
- Effect of Bordeaux mixture application in grape berry metabolome.
- Elucidation of the functional role of the polyol transporter VvMAT1.
- General role of polyol metabolism in grapevine defense against drought.
- Response of different Portuguese cultivars of *V. vinifera* (Alvarinho, Arinto and Padeiro de Basto) to edaphoclimatic conditions (EVAG – Viana do Castelo and INIA – Dois Portos) – a metabolomic and a biochemical analysis.
- Characterization of water transport through VvSIP1 aquaporin.
- Cloning and functional role of the grapevine tonoplast dicarboxylate transporter VvtDT.
- Elucidation of grape berry photosynthesis in the fruit carbon balance.

### 3.2 – Dissemination & Image

CITAB will continue to promote its Cycle of Conferences on transversal themes under development within both CITAB's and consortium members' areas of expertise. Target audiences will include the academic community, actual and potential key stakeholders and the private sector. Contributions and keynote talks will be given by CITAB and consortium members and invited experts.

Seminars/Conferences/Workshops Proposed themes	Work Groups	Date
Workshop " <i>Technologies applied to Agro-Industry</i> "	BE	February
II Seminar in <i>Biomechanics, Health and Sustainable Environment</i>	BE	May
Seminar " <i>Boas Práticas no Cultivo de Arroz por Alagamento, em Portugal</i> " (with the collaborations of INIAV, Cotarroz, FFCT/UNL and ISA/CEER)	SAC	May
Seminar " <i>El arco encamonado de madera: Modelos de analisis estructural para el laminado vertical y union mecánica</i> " (Prof. José Fernandez Cabo, Universidad Politécnica de Madrid)	BE	June
Advanced Workshop " <i>Oxidative Stress and Oxidants</i> "	SAC - UMinho	June
International Training Course " <i>Gaseous emissions from animal manure and bio wastes – processes and measurement</i> " (integrated in the Marie Curie International Initial Training Network project "ReUseWaste-Recovery and Use of Nutrients, Energy and Organic Matter from Animal Waste" FP7)	SAC	June/July
Intensive course " <i>The Virtual Fields Method - Extracting Constitutive Mechanical Parameters from Full-field Deformation Measurements</i> "	BE	July
Workshop " <i>Bio-based material characterisation from full-field measurements</i> "	BE	July

Seminars/Conferences/Workshops Proposed themes	Work Groups	Date
Agro-food residues and co-products with added biological value. Suggested themes: - Recent advances on agro-food and co-products analysis - Potential and prospects - Biotechnology for agro-industrial residues and utilization of Agro-Residues for Bioprocesses.	SAC	September
IV World Seminar on the conservation and management of the endangered Red-billed Chough ( <i>Pyrrhocorax pyrrhocorax</i> ).	EI	October
"Food security, sustainable intensification and the environment: an integrated approach"	BE, EI, SAC	November



## 3.3 – Cooperation

### 3.3.1 – Internal

CITAB continues to promote internal cooperation with ExCo members meeting and encouraging dialogue with CITAB researchers who make suggestions on actual and potential activities which are transmitted to the Board. This dialogue helps to define adequate policies for the centre.

The “*Science at lunchtime*” initiative, launched in January 2011, will continue throughout 2013. CITAB researchers are invited to give presentations on “hot topics” in their area of research. The “*Science at Lunchtime*” is open to all, aiming to improve dissemination within the centre and encourage dialogue between CITAB members in order to develop ideas for future collaboration. Attendance at these talks has become quite low with many CITAB members stating they are not available during the lunch hour time slot. The “*Science at Lunchtime*” initiative is informal and flexible, so talks will be held at different times, suggested by members, over the coming year to try and satisfy those interested in attending. Organization of these talks will be passed to a different member of the EI group.

Regular meetings (4 times a year) between working group coordinators and ExCo members will continue to discuss research, outreach and dissemination activities, solve problems and promote integration.

The development and teaching of advanced courses and the international Doctoral programs during 2013 will also promote greater internal cohesion as CITAB members work together to develop syllabi based on areas with high levels of expertise and critical mass.

### 3.3.2 – National

The formation of the national consortium during 2013 and the development of doctoral programmes will be major steps towards strengthening national cooperative actions and gaining critical mass.

CITAB continues to aim for increasing cooperation with national research centres via joint applications for funding, MSc and PhD thesis supervision. In an effort to improve interaction and better divulge national collaborative actions, CITAB will implement a new regulation that will oblige visiting national scientists to give a public talk on their research while working at or visiting CITAB.

CITAB will be collaborating with the following key national institutions in 2013:

<b>Biosystems Engineering</b>
University Hospital - Coimbra, E.P.E (HUC/UC):
University of Porto <ul style="list-style-type: none"> <li>• Laboratório de Óptica e Mecânica Experimental (LOME), do Instituto de Engenharia Mecânica e Gestão Industrial (INEGI)</li> </ul>
University of Trás-os-Montes e Alto Douro <ul style="list-style-type: none"> <li>• Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD)</li> <li>• Animal and Veterinary Science Research Centre(CECAV)</li> </ul>
University of Aveiro
<b>Ecointegrity</b>
University of the Algarve
Instituto Dom Luiz (Associated Laboratory)
University of Aveiro
University of Coimbra <ul style="list-style-type: none"> <li>• Centre for Functional Ecology (CEF)</li> </ul>
University of Évora
University of Lisbon <ul style="list-style-type: none"> <li>• Fundação da Faculdade de Ciências (FFC/FC/UL)</li> </ul>
University of Porto: <ul style="list-style-type: none"> <li>• Interdisciplinary Centre of Marine and Environmental Research (CIIMAR)</li> <li>• Research Centre in Biodiversity and Genetic Resources (CIBIO)</li> <li>• Department of Botany</li> <li>• Abel Salazar Institute of Biomedical Sciences (ICBAS)</li> <li>• Instituto de Ciências e Tecnologias Agrárias e Agro-Alimentares (ICETA)</li> </ul>
Instituto Politécnico de Viana de Castelo Escola Agrária,
Escola Superior Agrária/Polytechnique Institute of Bragança <ul style="list-style-type: none"> <li>• Mountain Study Research Centre</li> </ul>
University of Minho

<b>Sustainable Agro-food Chains</b>
University of Aveiro <ul style="list-style-type: none"> <li>• Centro de Estudos do Ambiente e do Mar (CESAM)</li> </ul>
University of Coimbra
Instituto de Tecnologia Química e Biológica (ITQB) - Lisboa
Catholic University of Porto <ul style="list-style-type: none"> <li>• Centro de Biotecnologia e Química Fina (CBQF)</li> </ul>
Instituto Dom Luiz (Associated Laboratory)
Technical University of Lisbon <ul style="list-style-type: none"> <li>• Instituto Superior de Agronomia</li> </ul>

### 3.3.3 – International

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

CITAB will continue to expand cooperative research work initiatives, through funding initiatives such as the Horizon 20/20 programme (topics such as Excellent Science, societal challenges, Food Security, Sustainable Agriculture and the Bio-economy challenge, Climate action and INTERREG (see table). CITAB will be drawing up at least 3 international doctoral programmes over the coming year. These programmes are based on strong areas of expertise in CITAB and invited national and international research centres and universities. Themes for programmes include “Biodiversity and Environmental Sustainability” and “Sustainable Environment and Healthy Lifestyles”. The former programme is well underway and a preliminary syllabus will be ready in the first quarter of 2013. A third programme on “Gaseous emissions from animal manures and biowastes – processes and measurement” will be developed by SAC during 2013

In an effort to improve interaction between the research community and better divulge international collaborative actions, CITAB will implement a new regulation that will oblige visiting international scientists to give a public talk on their research while working at or visiting CITAB.

<b>Biosystems Engineering</b>
Cooperative Wine Institute (ICV), France
Department of Biokinetics, Sport and Leisure Sciences, University of Pretoria, Pretoria, South Africa
Institut de Mécanique et d'Ingénierie de Bordeaux, France
Instituto de Ciencias de la Vid y del Vino, Spain
Istituto Dalle Molle di Studi sull'Intelligenza Artificiale University of Manno, Switzerland (IDSIA)
Polytechnic University of Madrid (UPM), Spain
SOING, Italy
Technical University of Madrid
Technical University of Munich, Germany
Universidad de La Rioja (Spain)
University of Exeter – United Kingdom
University of Navarra (UPNA), Spain
<b>Ecointegrity</b>
Botany Department, University of Salamanca, Spain
Center for Genome Regulation, Universidad de Chile, Chile
Center for Macroecology, Evolution and Climate Department of Biology, University of Copenhagen, Denmark
Centro Ibérico de Restauración Fluvial (CIREF), Spain.
Department of Biology and Botanical Garden, Fribourg, Switzerland
Department of Geography, University of Loughborough, United Kingdom
Euskal Herriko Unibertsitatea Universidad del País Vasco, Bilbao, Spain
Institute of Ecosystem Study, National Research Council, Verbania Pallanz, Italy
Lehrstuhl für Aquatische Systembiologie, Technische Universität München, Germany
Universidad Complutense de Madrid, Spain

Universidade de Castilla la Mancha, Toledo, Spain
Universidade Estadual de Paraíba, (UEPB), Brasil
Universidade Federal de Minas Gerais (UFMG), Brasil
University of Dronten, ALMERE Holland
University of Santiago de Compostela, Spain
University of Wageningen, Holland
<b>Sustainable Agro-food Chains</b>
Biotechnical Faculty of University of Slovenia
Indian Institute of Technology, India
Institute for Geophysics and Meteorology, Uni of Cologne, Germany
ISVV, Bordeaux, France
Laboratory of Plant Raw Materials Processing and Agricultural Storage, University of Szczecin, Poland
University of Wageningen, Netherlands
Polytechnic University of Valencia, Spain
University of California, Davis, USA
University of Copenhagen, (UCPH), Faculty of Science, Denmark
University of Crete, Greece
University of Reading, United Kingdom
University of Verona, Italy

### 3.3.4 – Stakeholders

#### Biosystems Engineering

Stakeholders listed for BE 2013 research activities include Iberia HealthCare Systems, Instituto de Ciencias de la Vid y del Vino (Spain), O Instituto dos Vinhos do Douro e do Porto, I P (IVDP, IP) and the Douro Alliance.

#### Ecointegrity

EU researchers continue to develop and build on strong ties with key public stakeholders such as Energias de Portugal (EDP), the National Forest Authority (AFN), the National Civil Protection Authority, the Agência Portuguesa do Ambiente (APA) and North Region Water Authority, Vila Real Municipal Council, Mira Municipality Council, Figueira da Foz Municipal Council. Associação para o Desenvolvimento da Viticultura Duriense (ADVID), Associação de Agricultores para Produção Integrada de Frutos de Montanha (AAPIM)

Private stakeholders include Águas do Algarve S.A., forestry industry end users (Grupo Portucel, Soporcel), and SME's (Gestão Integrada de Fogos Florestais, S.A.) and organizations dealing with environmental impact assessment and ecosystem rehabilitation and renewable energy sources (PROFICO Ambiente, Proistemas, Ecosfera, Energia Verde and Energiekontor – Parques Eólicos Unipessoal, Lda). Sogevinus Quintas S.A, Companhia Geral da Agricultura das Vinhas do Alto Douro, S.A. (Real Companhia Velha).

#### Sustainable Agro-food Chains

Research activities within this group will continue via close cooperation with stakeholders from different sectors of the agro-food industry. Links with stakeholders include joint participation in projects, transfer of know-how transfer, dissemination of results, development of new products and developing technological solutions. SAC members will collaborate in joint experiments to test new products for animal slurry treatment developed by Biosystems Europe company (UK) as part of the FP7 project Reuse Waste and intend to contact new potential stakeholders from the pharmaceutical sector to develop methods for extracting biologically valuable compounds from plants and exchange data, information and impressions on present and future work packages.

Listed stakeholders for 2013 are: The “Amândio Galhano” Vinicultural Station EVAG of the Comissão de Viticultura da Região dos Vinhos Verdes (CVRVV), Associação para o Desenvolvimento da Viticultura Duriense (ADVID), Associação dos Olivicultores de Trás-os-Montes e Alto Douro (AOTAD), BioBaga – Estarreja, Mirtilusa - Sociedade de Produtores Horto-Frutícolas - Sever do Vouga, Regiefrutas, Sogrape, Unidade de Investigação e Desenvolvimento - Departamento de Alimentação e Nutrição - Instituto Nacional de Saúde Doutor Ricardo Jorge.

## 4 – Human resources

CITAB will maintain the number of MSc, PhD and postdoctoral students carrying out their studies at the centre. However, with our drive and ambition to attain “excellence” we aim to increase the number of graduate and post graduate students. One strategy will be to actively encourage foreign students and researchers, in particular from Brazil, China and India, to carry out their studies at the centre.

BE initiatives in image based research include 2 FCT funded doctoral theses in Motion Analysis in Indoor Sports and Team Sport Analysis with Video Sequences.

EI project 3.01 researchers will be supervising 5 Masters theses over 2013, many of which are based on results from the FCT funded project “PTDC/BIA-ECS/114859/2009 “*Combination of biomarkers, bioindicators and functions to assess environmental changes in river systems*” and the 2012 project “SeivaCorgo”. Doutor Renato Farias do Valle Junior (Federal University of Minas Gerais, Brasil) will be carrying out postdoctoral studies in collaboration with EI researchers aspects of aquatic resource management and environmental planning in the Sordo river catchment over 2013.

At present, CITAB is advertising a full-time postdoctoral research position within the SAC work group. The successful candidate will identify and develop added-value co-products from selected Portuguese plants and residues derived from major food plants. This position will provide an opportunity to develop novel, economically valuable research within national and international networks. SAC is committed increasing the number of students and fellowships via new projects and submission proposals for national and international funding.

CITAB  
CENTRE FOR RESEARCH AND TECHNOLOGY OF AGRO-ENVIRONMENTAL AND BIOLOGICAL SCIENCES

## 5 – Summary table for 2013

The expected benchmarks for 2013 are listed below:

<b>Item</b>	<b>BE</b>	<b>EI</b>	<b>SAC</b>	<b>TOTAL</b>
JCR Publications	20	30	50	100
Publications: Books and Chapters	2	1	5	8
Publications: Proceedings	20	2	24	46
Projects: QREN			1	1
Projects: FCT	2	1	2	5
Projects: EU Programmes	3		1	4
Projects: Other Programmes		1	3	4
Master Thesis	14	5	7	26
PhD Thesis	3	1	2	6



## 6 – 2013 Budget

<b>CITAB Budget Funds</b>	<b>2013</b>
Projeto Estratégico FCT	108.329,50€
Incentivo	12.019,00€
<b>Total</b>	<b>120.348,50€</b>
<b>Board Budget</b>	
Research scholarships	13.227,12€
Administrative and computer equipment	2.000,00€
Web site	450,00€
Newsletter	600,00€
Cycle of Conferences	794,90€
Consultants	300,00€
Other expenses	1.000,00€
<b>TOTAL</b>	<b>18.372,02€</b>