

2011
Planning
Activities

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CITAB

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1 – Introduction

CITAB's plan for 2011 relies on the consolidation of the new scientific structure resulting from the centre's reorganisation in 2010. Consolidation will require a more active and particularly a more interactive role of members and within each Research Group. Further Group Coordinators (GP) will be expected to work in close cooperation with the members of the Executive Committee (EC) in order to meet this major goal for 2011.

The Activity Plan for 2011, which is expected to be the last, before the new international peer evaluation, is crucial for CITAB. Despite the fact that the centre did not achieve the top classification of "Excellent" in 2007, this goal is still a top priority for the next evaluation.

We accept that current global financial constraints may have a very real influence on the possibility of attaining new sources of finance due to shortage of economic resources, particularly at national level. However, we will strive for funding opportunities and ensure that the current economic climate does not detrimentally affect our scientific activities. We are aware of very competitive opportunities at FCT, FP7, QREN, PRODER and POCTEP. Compared to the prior bids made to some of these Programmes, we will now aim to submit a smaller number of better quality proposals to ensure a far better chance procuring solid financial support. We believe that a direct link between CITAB and its stakeholders is crucial for the financial success of project applications. To that end the Direction of CITAB, reiterates its appeal to the centre's Research Groups to cultivate closer links with SME's and to continue to develop joint research activities.

Regarding dissemination activities, CITAB will soon publish the 2nd issue of its Newsletter which will focus on reporting the activities and main achievements of the centre's projects. This and subsequent newsletters will be directed towards the international scientific community, including CITAB's anchor institutions. More effort will be directed to reinforcing links with these institutions by improving two-way mobility, resulting in a clear benefit to CITAB's scientific development. CITAB already has some strong ongoing links with key anchor institutions; our wish is to expand them. Another 2 major dissemination activities are anticipated for 2011 i) we will start the so called "CITAB cycle of conferences" which will be based on the most mediatic themes of particular interest to the scientific community. We expect a high level of participation of PhD students from UTAD and other external institutions. ii) Outreach activities were quite limited in 2010 but for 2011 we have asked the Research Groups to make a particular effort in developing joint actions with the pedagogic structure of UTAD and secondary school students. Although initiatives were quite successful in 2010, but we aim to improve contact with the media in order to enhance dissemination of our results to society in general.

Another constraint to scientific production, common to other research Units as well as our own, is the amount of time available to our members for developing research activities, since many have teaching duties of around 12 hours a week over the entire academic year. We aim to overcome this constraint by substantially increasing the number of scholarships, in particular PhD students and post-docs. We aim to give special emphasis to

this issue, and the Direction will take decisions that assure an increase in the number of scholarships for 2011. We expect that an increase in our human resources will contribute to an increase of our general scientific productivity as well as individual productivity. This will result in more collaborators will be upgraded, resulting in a 10% increase in integrated members.

Regarding individual productivity, we expect to reach 2 SCI papers per integrated member.

We recognise that 2011 will be hard and recognise that our plan is quite ambitious, even more so than 2010. However, we believe in the capabilities of our members and we expect to grow in most of the activities carried out by each Research Unit. Only the future will show how strong we are and how far we will go, but we have no doubt regarding the quality and willingness of our team.

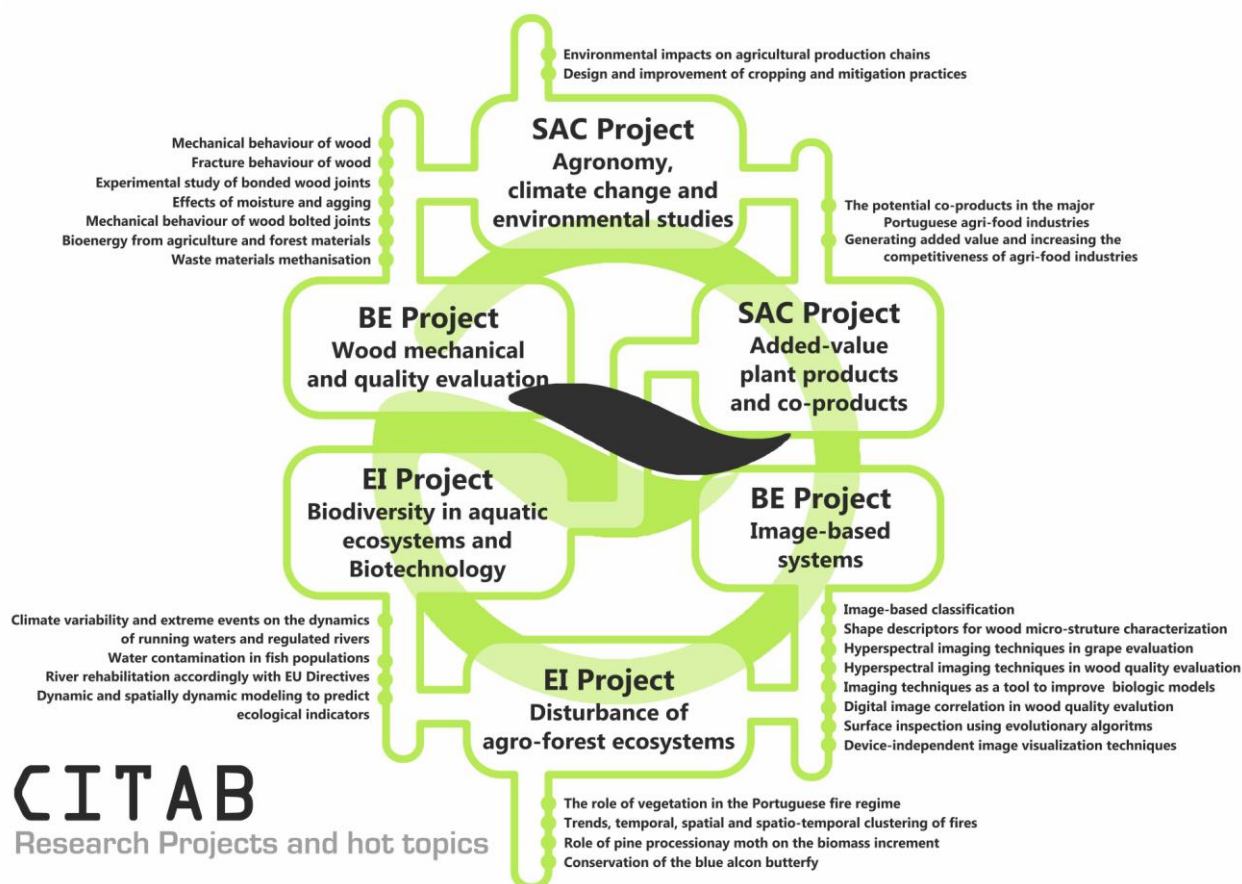
2 – Major objectives

The objectives for 2011 are closely linked to the ones that have been set for 2010, thus following the same driving forces and key actions which are expected to be consolidate during this year, namely:

- Internationalization of the Unit, through a more straight link with our anchor institutions and mobility of our members;
- Increase the interaction within and between CITAB's Groups;
- Increase the scientific productivity in JCR Journals and in other publications;
- Increase the number of members and particularly scholarships, particularly in the projects that clearly have a reduced critical mass;
- Increase collaboration with stakeholders;
- Improve the outreach activities and social responsibilities.

3 – Activities

The scientific activities are organized in projects; for these projects have been defined specific tasks which results are expected to meet the objectives. A straight interaction is envisaged between the Working Groups. In the next figure is shown the scientific scope and this interaction, which is followed by a brief description of all scientific activities.



3.1 – Scientific development

Project #1 – Wood mechanical and quality evaluation

There is an increasing interest in agricultural materials and forest renewable resources for structural applications and as primary energy source. 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 wood mechanics, from the micro to macro levels, which is fundamental for promoting wood as a soundly characterized engineering material. The project also aims to

improve bioenergetic conversion technology of agricultural and forest materials and wastes.

Task #1.01 - Mechanical behaviour of wood

In this task, novel mechanical tests are proposed for the characterisation of mechanical properties of wood species, as well as their spatial variation within the stem, at both macro and meso (growth ring) scales. Using mainly *P. pinaster* we expect to improve the actual understanding of the relationship between the microstructure of wood and its mechanical properties.

"[1] On-axis and off-axis tensile mechanical testing in *P. pinaster* oriented in the RT plane at the meso-scale. Application of the Virtual Fields Method for identification of elastic properties at the growth rings level.

[2] Analysis of experimental results obtained from plate bending tests on MDF plates. Development of the Virtual Fields Method for the identification of MDF elastic properties, coupled with full-field slope measurements provided by the deflectometry optical technique.

[3] Analysis of the effects of equilibrium moisture content on the elastic and viscoelastic properties of *P. pinaster* wood.

[4] Characterisation of elastic properties of bovine cortical bone tissue by tensile, three-point bending and Arcan test methods

Task #1.02 - Fracture behaviour of wood

The overall objectives for this task are: (a) development of suitable identification methods of wood fracture properties under pure mode I, II and III; (b) development of appropriate failure criteria which can contribute to the increase of confidence of the designers in wood structural applications of different sizes. An eventual contribution for a next revision of the Eurocode 5 will be proposed.

[1] Fracture mechanical testing in mode III.

[2] Analysis of the ELS test for fracture mode II. The experimental work is done. Processing of results and discussion.

[3] Fracture mechanical testing in mode I (DCB) at the meso scale.

[4] Fracture mechanical testing in mixed mode I/II (SLB and ELS) in cortical bone.

[5] Study of the scale effects on the strain energy release rate of pine wood, involving SEN-TPB and DCB specimens.

Task #1.03 - Numerical and experimental study of bonded wood joints

Within this task will be performed a comprehensive numerical and experimental investigation about the identification of cohesive laws for adhesively-bonded wood joints, under pure modes I and II and mixed mode I/II loading. Our ambition is to develop a suitable method for complete identification of the cohesive laws, without any a priori choice of its shape. Besides the global mechanical response of specimens (loading-displacement curve), we intend to measure the near crack tip strains with digital image correlation technique and optical fibre Bragg sensors (FBGs).

[1] Fracture mechanical testing in mode I (DCB) and mode II (ENF). Determination of cohesive laws by means of digital image correlation.

[2] Processing results of composite joints Wood/CFRP. The experimental work is done.

Task #1.04 - Study of effects of moisture and physical aging on the mechanical behaviour of thermosetting polymers

For this task have been set three objectives: (1) develop an experimental methodology to characterize the physical effects of moisture sorption on the mechanical behaviour of thermosetting polymers, (2) provide a reliable data base which can be used to check theoretical models, and (3) integrate the moisture effects into the constitutive equations. A special attention will be given to the physical ageing promoted by moisture sorption, a subject that was not addressed by any published work.

[1] Experimental work completed. Analysis of results.

[2] Application of digital image correlation to brittle fracture and ductile fracture of a polymer epoxy. Analysis of the effect of moisture and physical aging.

Task #1.05 - Mechanical behaviour of wood bolted joints

Within this task we envisaged to establish a new design methodology for bolted wood joints based on a materials science approach of wood mechanics and on modern structural mechanical methods. A particular effort will be given to virtual testing of joints using advanced finite element modelling (non-linear constitutive modelling and non-linear fracture mechanics. This work will permit the evaluation of the accuracy of the Eurocode 5 and which eventually will lead to the formulation of a new design procedure for the everyday design practice.

[1] The experimental work is completed. Numerical simulations will be performed.

Task #1.06 - Bioenergy from agriculture and forest materials

It will be developed work towards the definition of conversion technologies which will offer the maximum yield ratio of forest and agriculture material. Specific objectives are (1) to specify available agricultural materials; (2) to specify available forestry materials; (3) to

identify the best conversion technologies based upon forestry and agricultural material characteristics.

[1] Create a specification of the available agriculture materials

[2] Create a specification of the available forest materials

[3] Identifying the most favourable technologies for conversion depending on the forest and agriculture material characteristics

Task #1.07 - Waste materials methanisation

It will be studied the entire methanisation process (digestion, gasification, cleaning and purification systems) and establish the principles for the development of a biomethane market in Portugal, since there is no market for biomethane in Portugal or any legislation regulating its introduction into the same network as natural gas or its price. We will be focused on:

[1] Create technological skills for installation and operation of the production of biomethane for injection into natural gas network in order to determine the technical, energy and environmental measures;

[2] Research and development on methanisation technologies more appropriate to available resources, with the aim of creating the specification of technologies

[3] Create a specification for the biomethane to be injected in the NG network

[4] Set a price recovery for the biomethane produced according to the resource and technology used

[5] Research and development on the technologies more appropriate to the use of the biomethane in vehicles

Project #2 – Image-based systems

The need for sustainable development and improved quality of life have direct implications for agriculture and forestry, leading to the improved use of natural resources and more objective, accurate production and assessment methodologies.

Image-based systems have been used increasingly in the agricultural industry for inspection, evaluation and measurement purposes as they provide economic, consistent and objective assessment. They have long been recognized as a potential technique for the guidance or control of agricultural and food processes with manifold applications.

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.

Task #2.01 – Improved methodologies for image based classification using computational intelligence techniques

This task will incorporate and develop the use of computational intelligence in computer vision and existing image processing classification methodologies, for agricultural, forestry, environmental and biological systems, developing approaches that take advantage of the flexibility provided by soft computing to deal with the complex problems present in image based systems.

- [1] Improved methodology for classification using multi thresholding
- [2] Methodology for feature tracking in image sequences
- [3] Application of classification methodologies for meat quality assessment

Task #2.02 – Development of image based methods for characterising bio-material micro-structure and finding a shape descriptor (through image based parameterization) of wood micro-structure

The overall objectives of this task are to obtain cell shape descriptors through image-based methodologies and to apply it to micro-structure characterization. With the help of classification pre-processing algorithms, the estimation of the cell shape description (as well of the estimation of the general micro-structure morphological characteristics) will provide valuable information allowing significant progress in wood mechanical characterization studies.

- [1] A cell shape descriptor using image-based methodologies
- [2] Application of this process to micro-structure characterization

Task #2.03 - Application of local hyperspectral imaging techniques for non invasive grape analysis and evaluation: assessment of grape maturity using pH, sugar content and anthocyanin content

The main objective of this task is non-destructive measurement of pH, sugar content and anthocyanin content for precision maturation control. The models that transform spectral measurements into chemical parameter values are based on neural networks. Hyperspectral imaging will significantly reduce analysis time compared to conventional laboratory analysis. Thus, we will:

- [1] Establish a single calibration scheme for several grape types.
- [2] Apply the recently developed neural network based algorithms to handle this non-linear problem.

Task #2.04 - Local hyperspectral imaging techniques and wood quality evaluation

Hyperspectral imaging techniques will be applied to the measurement of wood properties such as density and moisture content. The work will focus on wood from a Mediterranean species of pine tree, *Pinus Pinaster*.

[1] Creation of a new calibration scheme that will provide wood density from hyperspectral imaging.

Task #2.05 - Development of computer assisted imaging techniques, based on kinematic and kinetic data capture on biological models:

Through biomechanical and environmental analysis, using computer assisted imaging techniques, we intend to assess the quality of the movement in biological models. Different techniques will be used for kinematic and kinetic analysis.

The Estrela Mountain Dog is used as research model, due to the high incidence of the hip dysplasia in the breed. Retro-reflective infra-red markers are placed on the dogs' skin over their backquarters joints and data of plantar pressure will be collected with the RsScan footscan 2D system. Two major activities will be conducted:

[1] Functional dog evaluation and application on canine hip dysplasia diagnosis and characterization.

[2] Functional human evaluation and application to the prevention and quantification of the muscle-skeletal injury risk during outdoor based recreational activities land use.

Task #2.06 - Application of digital image correlation (DIC) techniques to wood quality evaluation, using computational intelligence

This task will study the most advanced DIC techniques and, based on state-of-the-art knowledge, will attempt to make improvements to DIC, focusing on the development of methods with subpixel precision that do not require the creation of artificial random speckle patterns to work. Two major activities are expected for 2011:

[1] Customisation of already available software and algorithm to the work conducted in CITAB in the area of mechanical behaviour of materials.

[2] DIC algorithms will be tested in samples without the speckle pattern.

Task #2.07 - Development of device-independent image visualization techniques and data transmission issues

It will be studied the image adaptation that is necessary in order to get a reliable transmission of digital images over a transmission channel with low bandwidth (when compared with the amount of information to be sent). This adaptation must be done considering the final application.

[1] Study of the vegetation influence on the propagation of wireless communications based on low data-rate technologies.

[2] Modelling of the transmission channel in vegetative environments.

Project #03 - Biodiversity in aquatic ecosystems 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. The aim is: (i) to create appropriate tools for capturing and predicting the dynamics, structure and function of terrestrial and aquatic ecosystems affected by human disturbance over different spatial and temporal scales. (ii) To develop and promote appropriate management plans, based on the ecological assessment of different components of the natural community, in order to rehabilitate or restore degraded systems.

Task #3.01 – Studies on climate variability and extreme events on the dynamics of running waters and regulated rivers, including the interaction with human impacts

This task will study the effect of climate change on aquatic systems. We aim to

[1] Continue to add to large scale spatiotemporal data sets

[2] Assess combinations of biological indicators of catchment condition, landscape change and climate change on freshwater systems (natural and artificial).

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

The overall aim of this task is the use of biomarkers as an “early warning system” linked to sub-organism level processes, allowing quick and predictable associations to be established between obtained results and particular stressor agents. This will provide valuable information on the effect of different sources of water contamination.

[1] Evaluate and validate multiple biochemical markers of exposure in lotic and estuarine fish populations.

[2] Initiate field studies (biomarkers) contributing to the development of integrated bioassessment methods in heavily polluted streams and rivers.

Task #3.03 – EU directive compliant River rehabilitation

This task is multidisciplinary, taking into account broad temporal and spatial dimensions and the use of bioindicators, physicochemical and hydromorphological elements to characterise and restore aquatic habitats and riparian ecotones. The following 5 actions are envisaged:

[1] Research and development: sampling programmes for assessing the use of bioindicators in the integrated bioassessment of environmentally degraded streams and rivers in Northern Portugal.

[2] Research and development: monitoring and compensatory/restoration/requalification measures for aquatic ecosystems and organisms affected by the construction of large dams.

[3] Contribute to the WFD oriented planning, development and execution of regional freshwater monitoring and management and planning of aquatic resources.

[4] Assess the use land-use and pressure parameters as predictors of ecological quality across different river typologies.

[5] Development and implementation of river restoration and requalification programmes.

Task #3.04 - Dynamic and spatially dynamic modelling to predict ecological indicators associated with different impacts, functional biodiversity and the planning of endangered species conservation

Stochastic Dynamic Methodology (StDM) is a sequential modelling process that predicts the ecological status of altered ecosystems. StDM can be complemented by agent-based modelling approaches (ABM), for predicting the response of ecological indicators to anthropogenically induced change.

[1] Initiate studies on the use of long term monitoring data and dynamic modelling for predicting regional ecological diversity.

[2] Initiate studies on the effect of climate change and anthropogenic factors on ecological processes in reservoirs.

Task #3.05 - Application of microorganisms in biotechnology and in nutrient cycling

This task studies autochthonous bacteria, yeasts and fungi in bioremediation, agro-food and forestry by product processes and as functional indicators of ecological quality. Agro-industry generates several sub-products, such as residual waters with high polluting potential from olive oil processing industries and wine production.

- [1] Contribute to the sustainable management of olive orchards
- [2] Study of the integrated use of industrial by-products of agro-food and forestry companies in the production of biodiesel and animal feed
- [3] Assess the role of ecological function (fungal decomposition) in river bioassessment methods.
- [4] Contribute to studies in the optimization of ecosystem services in the demarcated Douro region.

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

This project focuses on ecological abiotic (mainly fire) and biotic disturbance that act on forests, woodlands and agro-forestry systems. The aim is to characterize spatial and temporal patterns, regimes of disturbance and develop management-oriented guidelines towards mitigation and adaptation to disturbance.

The tasks within this project will be revised very soon to better accommodate regional, national and international studies in ecological monitoring, environmental impacts and biodiversity preservation in terrestrial forest and agro-forested ecosystems that will take place over 2011.

Task #4.01 - The role of vegetation (fuel) in the Portuguese fire regime

This task is dedicated to the analysis of the Portuguese fire regime, using the Forest Service atlas of fire perimeters and GIS tools to describe and quantify how fuel age controls the fire regime. Analyses will focus on fire frequency, burn probability, burnt surface and integrate the influence of weather conditions and human pressure..

- [1] Study of the application of fire – land – atmosphere Interrelationships: to predict wildfire regimes
- [2] Assessment of forest fires under climate, social and economical changes
- [3] Study of factors affecting post-fire regeneration variability in *Pinus pinaster* and *Eucalyptus globulus*: implications for biodiversity and post-fire management.

Task #4.02 - Trends, temporal, spatial and spatiotemporal clustering of fires in Portugal

This task analyzes temporal (trends and spatial correlation of variables relating forest fire events in the Portuguese Forest Service fire database using geostatistical methods to detect spatiotemporal clustering of point-database for past fire events and to foresee the continuity of current and the development of new clusters in the future.

[1] Collaboration in development and implementation of forest fire management systems and the role of local agents in forestry politics in areas affected by fire.

[2] Collaboration in post-fire forest management systems in Southern Europe.

Task #4.03 - The role of the pine processionary moth (*Thaumetopoea pityocampa* Den & Schiff) on the biomass increment of pine trees

Two articles on the results of this task were published in 2010. This task will no longer continue in 2011.

Task #4.04 - Conservation of the blue alcon butterfly (*Maculinea alcon*) in the Alvão Natural Park

This very specific task is on the ecology of the blue alcon butterfly *Maculinea alcon*, the only representative of its genus and a rare resident butterfly in Portugal. Studies have carried out on the availability of host plant and host-ant species and the quality of potential habitats. These studies will continue under newly delineated tasks on terrestrial biodiversity for 2011.

Project #05 – Agronomy, climate change & environmental studies (ACES)

The main objective of ACES is the development of suitable adaptation and mitigation measures in the agricultural sector in relation to environmental and climate changes, based on plant studies and numerical atmospheric modelling. ACES will also evaluate and reduce environmental impacts resulting from cultural production and other human activities related to farmland.

Task #5.01 - Climate variability mechanisms

The non-linearity and multiplicity of the interactions among the different components of the Climate System make the study of climate variability extremely complex. The isolation of underlying mechanisms is fundamental in environmental research. The study of these mechanisms frequently implies an analysis on a global scale, or at least over a large geographical area and across several vertical levels.

It will be studied the precipitation and temperature variability, their corresponding extremes and also their relationship with large-scale atmospheric patterns and particularly the dynamical mechanisms underlying the occurrence of precipitation and temperature extremes in Portugal and in Europe (e.g. identification of dynamical precursors) and their associated hydrological impacts will be the most important goals of this task.

Task #5.02 - Atmospheric modelling and environmental impacts

Atmospheric modelling is a key tool for assessing environmental impacts due to climate variability and likely future changes. Physical, mathematical, statistical and empirical models can be developed in order to relate a set of climate variables with an almost unlimited number of environmental, social and economical variables. This research area will be conducted by multidisciplinary teams to integrate the different scientific expertises relevant to the different model parameters. A successful model yields obvious applications with great practical usefulness and enables the assessment of future scenarios.

A more detailed viticultural zoning in Europe will be undertaken using state-of-the-art observational datasets. Furthermore, the inter-annual variability of a number of bioclimatic indices relevant to viticultural zoning will be assessed in greater detail (by applying multivariate statistical approaches) and related to the atmospheric large-scale circulation;

Task #5.03 – Biodiversity as a potential resource for sustainable development: Selection, characterization and conservation of plant resources

The recovery and valorisation of locally endangered germplasm, in traditional productive areas of the Mediterranean basin, to create a core collection of crop species is essential. In order to share and spread information on these genetic resources, the final aim is to set up a web based inventory linked with the major thematic international databases. The data will also be used to promote a wider application of traditional knowledge and agricultural practices and raise stakeholder awareness on the values of conserving biodiversity from the biological, economic and socio-cultural perspectives e.g. improving sustainable nut production in Portugal and assessment of the variability in chestnuts and other nut landraces for their industrial uses.

Thus, chestnut fruit polispermic tendency will be scrutinized by controlled pollinations using different *C. sativa* pollinators, a germ bank to preserve different genotypes from Côta variety will be prepared and a screening of their genotypes by molecular markers will be developed; Studies on metabolite composition of chestnut upon cooking will be continuing; Proximate analysis, fibre, organic acids and phenolics compounds will be determined on wild blueberries (*Vaccinium corymbosum*).

Task #5.04 - Increasing functional biodiversity in olive groves and vineyards

Olive groves and vineyards are agro-ecosystems with high ecological potential and are very promising candidates for improving associations between agriculture and environment. The aim of this task is to evaluate the possibilities for practical improvements to protect against natural enemies in olive and vineyard agro-ecosystems via conservation biological control methods. In 2011 we intend:

[1] Studies aiming to evaluate nectar accessibility for the insects and native plants pre-selected during 2010 will be extended to the other pre-selected species;

[2] phytochemicals and sugars in the pollen and nectar as well as in *Sternorrhynchae* honeydews will be extracted and analysed, and their suitability for the natural enemies will be investigated by comparing their effects on the longevity, nutrient levels and egg loads on those insects;

[3] volatiles released from different plant species infested by theoretical alternative hosts for the natural enemies (e.g. *Foeniculum vulgare* under *Hyadaphis foeniculi* attacks) will be screened for potential natural enemies attractant, by electrophysiological and behavioural studies;

[4] an ecological infrastructure network will be designed for selected pilot Porto Wine Region farms, by using new methods of spatial analysis of landscapes for pest management, and measurement of biodiversity and ecological services, relevant for use in mixed landscapes on variable terrain, under an OECD's Fellowship conferred to Dr. Howard Thistlewood, Research Scientist 3 at Pacific Agri-Food Research Centre, Summerland, B.C.

Task #5.05 - Environmental impact effects on plant composition

This task is focused on plant ecophysiology, particularly the effect of different abiotic stresses such as water, light and elevated CO₂ levels on economically-important crops e.g. cherry, chestnut, hazelnut, olive, grapes and medicinal and aromatic plants. Abiotic stresses can increase the biosynthetic secondary metabolites such as phenolics, with beneficial effects in human health. We intend to continue studies in this subject, particularly: to analyse the antioxidant activity of aqueous or methanolic extracts of aromatic and medicinal plants; antioxidant activities of chestnut fruits of *Castanea sativa* (var. Judia) from different ecotypes.

Task #5.06 - Trace gas emissions from agricultural systems under climate change scenarios

This task is focused on the evaluation of greenhouse gases emitted from crops under ambient and elevated temperature and CO₂ concentrations, providing data on CH₄, N₂O, NO_x and NH₃ emissions from rice paddies in Mediterranean conditions and establishing associations between gas emissions and cropping practices, soil type, climatic parameters, and N cycle key-processes, like nitrification.

Task #5.07 - Design and improvement of cropping practices and mitigation measures

This task aims to increase yield, quality and sustainability of selected crops (namely cherry, chestnut, grapevine, olive and medicinal and aromatic plants) in Mediterranean environment by improving adequate plant responses to environmental factors (water, light, heat, salinity, heavy metals stresses and viral and fungal diseases). We also intend to study new adaptation/mitigation cultural strategies in the context of climate change scenarios. The work plan for 2011 is:

[1] related with the FCT project “Short-term climate change mitigation strategies for Mediterranean vineyards”, the establishment and maintenance of the grapevine potted trials will be done in order to investigate the physiological effects of the leaf adaxial particles films;

[2] Related with the FCT project “Cover cropping - the decisive strategy for the sustainable management of the rainfed olive orchards”, one Master dissertation will be presented and one manuscript will be submitted to JCR; sharing of knowledge in the subject “Abiotic stress in olive: early detection and management” between CITAB and Tunisian Olive Tree Institut research groups;

[3] included in work program to achieve a new hybrid chestnut population ink disease resistant, first progenies will be studied under field conditions;

[4] study of the effective capability of *Bacillus velezensis* to promote the chestnut growth under orchard conditions;

[5] study of the zeolites capability to promote root system development in a rootstock chestnut mother-plant field;

[6] long-term adaptations due to origin climatic conditions in the photosynthetic productivity and metabolites of *Castanea sativa* (var. Judia): physiological and biochemical study of grafted from the mother-trees from different ecotypes.

Task #5.08 - Mitigation of animal manure and agro-food wastes impacts- Cycles of nutrients; residues processing and reuse

We will assess the crop nutrient and soil quality value of new manure treatment products and bio-fertilizers.

It will be conducted studies about the environmental consequences associated with the addition of phytochemical-rich plant materials to soils and subsequent effects of “green manures”. Gaseous emission measurements over the storage period of animal slurries will be performed after treatment of the effluent by chemical and biological methods; the kinetics of gaseous emissions will be assessed under two temperature scenarios corresponding to winter and summer conditions; Effects of Phytochemical (PCH) compounds on the composting process and on the degradation pattern of compounds during composting will be investigated.

Project #06 – Added-value plant products & co-products (APPC)

APPC aims to find pragmatic, effective and sustainable solutions for “greening the food chain” and optimizing human and animal health with emphasis on Mediterranean crops, medicinal and aromatic plants (MAP), and other economically-important plants. APPC will

develop strategies for using agro-food/forestry wastes and application of plant cell cultures to generate added-value products and co-products e.g. biopesticides, functional food ingredients and animal feeds. APPC will disseminate research in high quality peer-reviewed publications, national and international conferences and national and international food fairs.

Task #6.01 – Composition and Health Effects Studies of Portuguese and International Foods

Fundamental composition data is important for use as markers of stress, quality and eventually the potential health effects of the foods being investigated e.g. optimization of nutrients and phytochemicals in animal and human foods.

We foresee the major activities: Continued analytical support for researchers in SAC/CITAB and other Researchers/Research Centers in UTAD – specifically further development of the valuable collaborations with CECAV (microbiologists and animal nutritionists); It will be necessary to increase critical mass in the cell models area: this is a key research area for studying health effects of dietary phytochemicals (derived from foods and co-products e.g. functional food ingredients) and will in part be developed through an approved FCT post-Doctoral bolsa starting in May 2011, at least one post-Doctoral contract if the AgriCoProd project is successful, and additional bolsa and project proposals in 2011; In parallel with the Co-products area (6.01) there will further development of fundamental nutrient and compositional studies: via (Inter)national project proposals involving Anchor Institutes, Stakeholders (Ceres) and International Collaborators; Continued submission of high quality research papers and reviews to peer-reviewed journals for promotion of the APPC/SAC and CITAB.

Task #6.02 - Added Value Co-Products Derived from Portuguese Agro-Food Wastes

This rapidly developing research area is an important and major focus for APPC that will involve researchers from ACES and APPC, with direct application of solutions for stakeholders. Currently we have three projects funded in this area for the period 2010-2013 (Vale I&DT, QREN-Copromoção and FCT) involving active collaborations with stakeholders. There are more proposals in development for the period 2010-2011; specifically the EU FP7 Capacities Network 2010/2011.

Task #6.03 Bioproducts & Biotechnology

MAP -Tech & MAP-Products

The core of this research focuses on three axes: phytochemistry, bioactivities and biotechnology of medicinal and aromatic plants (MAP) e.g. the study of essential oils and phenolic compounds of plant species from the Lamiaceae and Guttiferae families, namely those from *Salvia* and *Hypericum* genus. Currently, MAP species from other families are

under study for their potential as sources of immunomodulators, galactagogues, biopesticides and biofuel.

Plant Functional Metabolites and Plant Genetic Engineering

We aim to identify and determine the role of bioactive metabolites in plants related with biotic stress and to study their biosynthesis and production. The potential human health benefits of plant secondary metabolites produced in response to plant-pathogen interactions and abiotic stresses, such as phenolic and lipidic compounds with potential antioxidant, neuroprotective, anticancer and antidiabetic activities, is also currently being studied. Also, we intend to genetically manipulate plants to produce pharmaceutically useful compounds.

Plant Cultures Physiology and Biochemistry

The aim is to study and characterize in vitro plant cultures of economically-important species at the developmental, physiological and biochemical levels. Changes associated with dynamic processes, such as growth and differentiation, and responses to stress conditions are also under investigation. This will allow the development of in vitro-based bioplatfroms to evaluate biological effects of extracts and specific compounds on plant development and physiology, and to develop in vitro strategies for acclimation to ex vitro conditions and to produce compounds of interest.

3.2 – Dissemination & Image

CITAB will be launching a **Cycle of Conferences** that will cover transversal themes under development, targeted both for academic and business audience, including contributions from CITAB members and external invited experts.

Cycle of Conferences proposed themes		
Viticulture	Olive Culture	Ecology and Environment
Viticulture and climate changes		
Vine physiology		
Geographic information system		
Remote sensing		
Biodiversity and biological control		

Research Group Coordinators will be responsible for organizing each conference.

The Executive Committee will be organising a hike for CITAB members during spring 2011 which apart from being a social activity, will include information on the ecology of the area, on outdoor activities and health.

CITAB will be organizing and hosting the f COST FP0802 Workshop on "Mixed numerical and experimental methods applied to the mechanical characterization of bio-materials" which will take place in Vila Real, Portugal, April 27-28, 2011. CITAB will also be organizing the EUROFUSE 2011 European conference on "Fuzzy Methods for Knowledge-Based Systems" which will take place in Régua, Portugal, September 21-23, 2011. CITAB will be co-organizer of the special session "Fuzzy Logic and Image Processing" in the International conference EUSFLAT-LFA 2011, which will take place in Aix-les-Bains, France. July 18-22. 2011.

EI members will be participating in at least 14 international and national meetings, where results from the subthemes of the group's two projects will be presented, largely as oral presentations.

In some cases, several members from a particular research area will be making a series of presentations at the same conference. EI members will continue to contribute to the CITAB newsletter in 2011. EI has also has launched an initiative for 2011 called "Science at Lunchtime", which will be explained in greater detail in the "Cooperation" section.

3.3 – Cooperation

3.3.1 – Internal

One of the chief objectives of 2011 is to improve the level of interaction between members. Several FCT funded projects, due to commence during the coming year, will partly meet this objective, though we will continue to strive to develop initiatives that promote internal interaction. The ExCo contacted EI members in late 2010, asking for information and suggestions for promoting integration and requesting predicted activities for 2011. The information sent by EI members is already being used to redefine subthemes relevant for 2011 activities, in particular within the "*Disturbance of forest and agroforested ecosystems*" project. The ExCo will continue to divulge events, papers and opportunities for funding to all EI members (in fact, all CITAB members). Monthly meetings with key groups of EI members, the ExCo and the EI coordinator will be held throughout 2011 to address issues related to key topics that will encourage greater levels or interaction, scientific production and pave the way for interdisciplinary project development.

In response to suggestions made by group members to the ExCo, EI launched another initiative in January 2011 named "*Science at lunchtime*". "*Science at lunchtime*" comprises an informal presentation or debate given by an invited EI member (although other CITAB members may be invited during 2011) on "hot topics" in their area of research. "*Science at Lunchtime*" is open to all CITAB members and any other member of UTAD's scientific

community who may wish to participate. After the proffered presentation or debate, members who wish to continue to discuss the theme can have lunch together or arrange to meet and develop ideas. The aim of this initiative is to improve dissemination within the centre and encourage dialogue between EI and CITAB members, hopefully giving rise to ideas for future collaborations and interdisciplinary projects. The first presentation, given by the EI coordinator Professor Rui Cortes on the 12th January 2011 was entitled “*The dramatic consequences of dams on fluvial erosion processes: is requalification possible?*”

Regular meetings (4 times a year) will be promoted between the coordinators of the WG and the respective members of the Executive Committee, to discuss ongoing research activities and to promote a higher integration of all members. To achieve this aim and to join the efforts of the team around the same research topic, the SUSTAINABLE AGRO-FOOD CHAINS group is setting up a joint working plan centered on vineyards and grape production key-issues which envisage the involvement of a large number of the researchers from the group.

3.3.2 – National

The main objective continues to be increased cooperation with other research centres via joint applications for funding and MSc and PhD supervision. From national collaborations we could stress the following key institutions:

Biosystems Engineering
CECAV-UTAD: conclusion of the research project “Fracture behaviour of cortical bone tissue”.
INEGI: conclusion of the research projects: “Fracture behaviour of cortical bone tissue”, “Repair of wood structures using artificial composites” and “Experimental assessment of moisture effects on aging and durability of thermosetting polymers”
EGF&D, ACE: progress of the project “Biogn”
SONORGAS: progress of the project “Dourobiogás”
UBI: collaboration within the local hyperspectral imaging technique development and application task
UAveiro: progress of the project “Hip femoral prosthesis for in-vivo loosening data acquisition”
Ecointegrity
Instituto Dom Luiz (IDL – an Associated Laboratory)
Fundação da Faculdade de Ciências (FFC/FC/UL) of the University of Lisbon
University of Aveiro
University of Porto (CIIMAR, the Department of Botany and the Instituto de Ciências Biomédicas Abel Salazar - ICBAS)
Fundação da Faculdade de Ciências (FFC/FC/UL) of the University of Lisbon
Escola Superior Agrária/Polytechnique Institute of Bragança (particularly the Research Center of Mountain Studies)
Sustainable Agro-food Chains
Agronomy, climate change & environmental studies
Aristotle Unv. of Thessaloniki (Greece) (Prof. Filippos Aravanopoulos); FP7 consortium
Biocentrum - Technical University of Denmark: join research (consultant) and publications; Active FCT Project (2010-2012; 1 submitted project in 2009)
Consejo Superior de Investigaciones Científicas (CSIC) Estación Experimental del Zaidín (Spain); Dr ^a Mercedes Campos Aranda is co-adviser of a FCT funded PhD thesis
CRA, Consiglio per la Ricerca e la Sperimentazione in Agricoltura, Italy, (Dr. Damiano Avanzato): Join social ecological actions, divulgation book

CRAB, Consorzio di Ricerche Applicate alla Biotecnologia, Italy, (Dr. Daniela Spera): Samples Analyses , and join EC project
ENEA, Ente per le Nuove Tecnologie, l'Energia e l'Ambiente, Italy, (Dr. L. Bacchetta): Active AGRI GEN RES (EC) project (2007-2010), join research and communications in International Congress
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (Spain) Subdirección General de Investigación y Tecnología; "Red ibérica de evaluación de eficacia y efectos secundarios de tratamientos para el control de plagas en el olivar (Proyecto/Acción nº AC2009-00045-00-00)
IRTA, Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Spain (Dr. Mercè Rovira): Join research and communications in International Congress, join EC project.
Lundbeck Pharmaceuticals: join research (consultant) and publications; Active FCT Project (2010-2012; 1 submitted project in 2009)
NAGREF - National Agricultural Research Foundation (Greece): (Prof Setefanos Diamandis), submitted FCT Project (2009); (Dr Pavolina Drogoudi and Dr. Metzidakis, Institute of Olive Trees and Subtropical Plants), Samples Analyses
Plant Research International B.V. Wageningen, NL (Doctor Rene van der Vlugt): Join research and join publications
Univ. Santiago Compostela: (Prof Santiago Pereira Lorenzo), FP7 consortium, book chapter and collaborations in INTERREG projects; (Prof. Cristina Cabaleiro), Join supervision of PhD student and join publications
UNiv. Torino (Italy); Prof Roberto Botta; FP7 consortium ;
University of Zagreb (Prof. Mirna Curkovic-Perica) FP7 consortium
Added-value plant products & co-products
Faculdade de Ciências da UL, Lisbon (Prof. Lia Ascensão): Active FCT Project (2007- 2010)
Instituto Superior de Agronomia, Lisbon (Prof. Carla Pimentel): Active FCT Project (2010-2012)
ISEL, Lisbon (Prof. Amin Karmali): Joint Research, 2 Submitted Projects (2009), New Projects in 2010
Universidade de Évora (Prof. Manuel Mota): Active FCT Project (2007-2010)
CBMA (Uni. Minho): Share of the Department of Biology, School of Sciences Building, Laboratories and equipment (Sandra Paiva): study of VvHt1 trafficking and turnover induced by glucose catabolic repression; (Prof. Cristina Pereira-Wilson): Active FCT Project (2010-2013); Joint Research & Papers; (M ^a João Sousa; M ^a Teresa Almeida): Active FCT Project (PTDC/AGR-AAM/70418/2006)
CEB-EENG-UM (Miguel Gama; Fernando Dourado): Collaboration in the Ph.D work programmes FCT Grants SFRH/BD/42513/2007 SFRH(BD/66041/2009 and SFRH(BD/63468/2009
CNC (Uni. Coimbra): active FCT project PTDC/AGR-ALI/105169/2008; several colaborations with PhD students
ESB (Uni. Católica Portuguesa): active FCT project PTDC/AGR-ALI/105169/2008
FCUL (Univ. de Lisboa, Jorge Marques da Silva): plant physiological (PAM, IRGA, water relations) analyses; joint supervision of post-graduation students & Joint Papers

ICBAS (Uni. Porto): active FCT project PTDC/AGR-ALI/105169/2008
ICVS (Uni. Minho) (Jorge Pedrosa): Collaboration in the Ph.D work programmes FCT Grants SFRH/BD/42513/2007
ITQB (Univ. Nova de Lisboa, Manuela Chaves): mannitol in grape berry development and ripening: evaluation of its potential role in plant defense against drought; co-supervision of a PhD thesis and joint papers.
Univ. Açores (Elisabete Lima, José Baptista, José Silvino Rosa, M ^a do Carmo Felgueiras): Active FCT Project (PTDC/AGR-AAM/70418/2006) and Colaboration in Ph.D work programme, FCT Grant SFRH(BD/66041/2009
UPMM-IHMT-UNL (M ^a Amélia Grácio; António Grácio): Colaboration in Ph.D work programme, FCT Grant SFRH(BD/66041/2009

3.3.3 – International

We look to increase the participation in the more relevant international conferences, management and scientific meetings to be in contact with the most important researchers in the different fields. To continue and expand the current cooperative research work, to promote cooperation in future research projects and increase the number of joint publications.

Biosystems Engineering
Unité Sciences du Bois et des Biopolymères, Université Bordeaux 1(France): conjoint publications about size effects on fracture behaviour of wood
Universidade Politécnica de Madrid (Spain): conjoint publications about size effects on fracture behaviour of wood
Laboratoire de Mécanique et Procédés de Fabrication, Arts e Métiers, Paris Tech (France): conjoint publications about the identification of wood properties using the Virtual Fields Method
Institute of Polymer Mechanics, Riga University (Latvia): viscoelastic behaviour and ageing effects on polymers
Universidad Publica de Navarra: conjoint work and publications about image segmentation and image based classification methods using Soft Computing
Ghent University: conjoint work and publications about the shape descriptor of wood micro-structure
Universidad de Cartagena: conjoint work and publications about the smart data acquisition devices
Ecointegrity
Disturbances on forest ecosystems
UNIVERSIDAD DE CASTILLA LA MANCHA, Toledo, Spain
the University of Santiago de Compostela, Spain

Botany Department of the University of Salamanca (Salamanca, Spain)
the Department of Biology and Botanical Garden, Fribourg (Switzerland).
Aquatic ecosystems
Centro Ibérico de Restauración Fluvial (CIREF, Madrid Spain),
Departamento de Botánica, Universidad de Salamanca, Salamanca, Spain
Department of Biology and Botanical Garden, Fribourg (Suíça)
Sustainable Agro-food Chains
Agronomy, climate change & environmental studies
Aristotle Univ. of Thessaloniki (Greece) (Prof. Filippos Aravanopoulos); FP7 consortium
Biocentrum - Technical University of Denmark: join research (consultant) and publications; Active FCT Project (2010-2012; 1 submitted project in 2009)
Consejo Superior de Investigaciones Científicas (CSIC) Estación Experimental del Zaidín (Spain); Dr ^a Mercedes Campos Aranda is co-adviser of a FCT funded PhD thesis
CRA, Consiglio per la Ricerca e la Sperimentazione in Agricoltura, Italy, (Dr. Damiano Avanzato): Join social ecological actions, divulgation book
CRAB, Consorzio di Ricerche Applicate alla Biotecnologia, Italy, (Dr. Daniela Spera): Samples Analyses , and join EC Project
ENEA, Ente per le Nuove Tecnologie, l'Energia e l'Ambiente, Italy, (Dr. L. Bacchetta): Active AGRI GEN RES (EC) project (2007-2010), join research and communications in International Congress
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (Spain) Subdirección General de Investigación y Tecnología; "Red ibérica de evaluación de eficacia y efectos secundarios de tratamientos para el control de plagas en el olivar (Proyecto/Acción nº AC2009-00045-00-00)
IRTA, Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Spain (Dr. Mercè Rovira): Join research and communications in International Congress, join EC project.
Lundbeck Pharmaceuticals: join research (consultant) and publications; Active FCT Project (2010-2012; 1 submitted project in 2009)
NAGREF - National Agricultural Research Foundation (Greece): (Prof Setefanos Diamandis), submitted FCT Project (2009); (Dr Pavolina Drogoudi and Dr. Metzidakis, Institute of Olive Trees and Subtropical Plants), Samples Analyses
Plant Research International B.V. Wageningen, NL (Doctor Rene van der Vlugt): Join research and join publications
Univ. Santiago Compostela: (Prof Santiago Pereira Lorenzo), FP7 consortium, book chapter and collaborations in INTERREG projects; (Prof. Cristina Cabaleiro), Join supervision of PhD student and join publications
UNiv. Torino (Italy); Prof Roberto Botta; FP7 consortium ;

University of Zagreb (Prof. Mirna Curkovic-Perica) FP7 consortium
Added-value plant products & co-products
KNUST, Ghana (Mr. Newton Amaglo): Ghanaian Plant Samples & Joint Papers
SGGW, Poland (Prof. Ewa Rembiałkowska): Student Exchange (Erasmus), Active Projects & Joint Papers
Swiss Federal Institute of Technology in Lausanne (Switzerland) & College of Engineering and Technology, University of Dar es Salaam (Tanzania) (Dr. Markus Schneider-Mmary): Sample Exchanges/Analyses & Joint Papers
Uni. Bordeaux, France (Prof. Stéphane Quideau): Phytochemical Standards & Joint Papers
Uni. Messina, Italy (Prof. Bruno Lo Curto): Sample Analyses & Joint Papers
Uni. Novara. Italy (Prof. Marco Arlorio & Dr. Monica Locatelli): Sample Exchanges/Analyses & Joint Papers
Uni. São Paulo (Prof. Beatriz Cordenunsi): Sample Analyses & Joint Papers
Uni. Sri Jayewardenepura, Sri Lanka (Prof. KDDS Ranaweera): Joint Supervision of PhD Students, Provision of Sri Lankan Plant Samples, Joint Review Paper in 2010
GRAB, Agropark (France) (Sophie Joy Ondet) Colaboration in Ph.D work programme, FCT Grant SFRH(BD/63468/2009
HelmholtzZentrum Munchen – Institute of Stem Cell Research (ISF) (Germany): active FCT project PTDC/AGR-ALI/105169/2008
King's College, London (UK): active project “Good Practice in Traditional Chinese Medicine Research in the Post-genomic Era (Acronyme: GP-TCM)” European Project (Cooperation)
Max Plank Institute (Cologne): Studentds Exchange (PhDs), Active Projects & Joint Papers
Université de Bordeaux – ISVV, France (Serge Delrot): Purification of protoplasts and intact vacuoles from grape berry tissues; transport experiments and molecular studies, proteomic and metabolomic analyses. Co-supervision of a PhD thesis and joint papers.
Université de Montpellier, Ecole Polytechnique (France) (Pascale Chaliier) Colaboration in Ph.D work programme, FCT Grant SFRH(BD/63468/2009
University of Aarhus (Denmark) (Prof. Suresh Rattan): Scientific Advisement and Joint Papers
University of Leiden (Netherlands) (Robert Verpoorte): Metabolomics - Collaboration in the Ph.D work programme FCT Grants SFRH/BD/42513/2007

3.3.4 – Stakeholders

Biosystems Engineering

Through the submission of a Marie Curie Initial Training Network get the involvement of two companies, one from the technological area and one from the application area in order to establish a fruitful collaboration and the development of conjoint scientific projects.

Ecointegrity

EI will continue to increase the number of key stakeholders during 2011. Present stakeholders that will continue to interact with EI during 2011 include Energias de Portugal (EDP), the National Forest Authority (AFN), the National Civil Protection Authority, the National Water Institute (INAG) and Regional Water Authorities, in particular the Authority responsible for river basins in the Northern Portugal (ARH-N). Several municipal councils are also important stakeholders. 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 assessments or ecosystem rehabilitation, mainly associated with renewable sources of energy; this is the case of PROFICO AMBIENTE, PROSISTEMAS, ECOSFERA, ENERGIA VERDE and ENERGIEKONTOR-PARQUES EÓLICOS UNIPESSOAL, LDA.

Sustainable Agro-food Chains

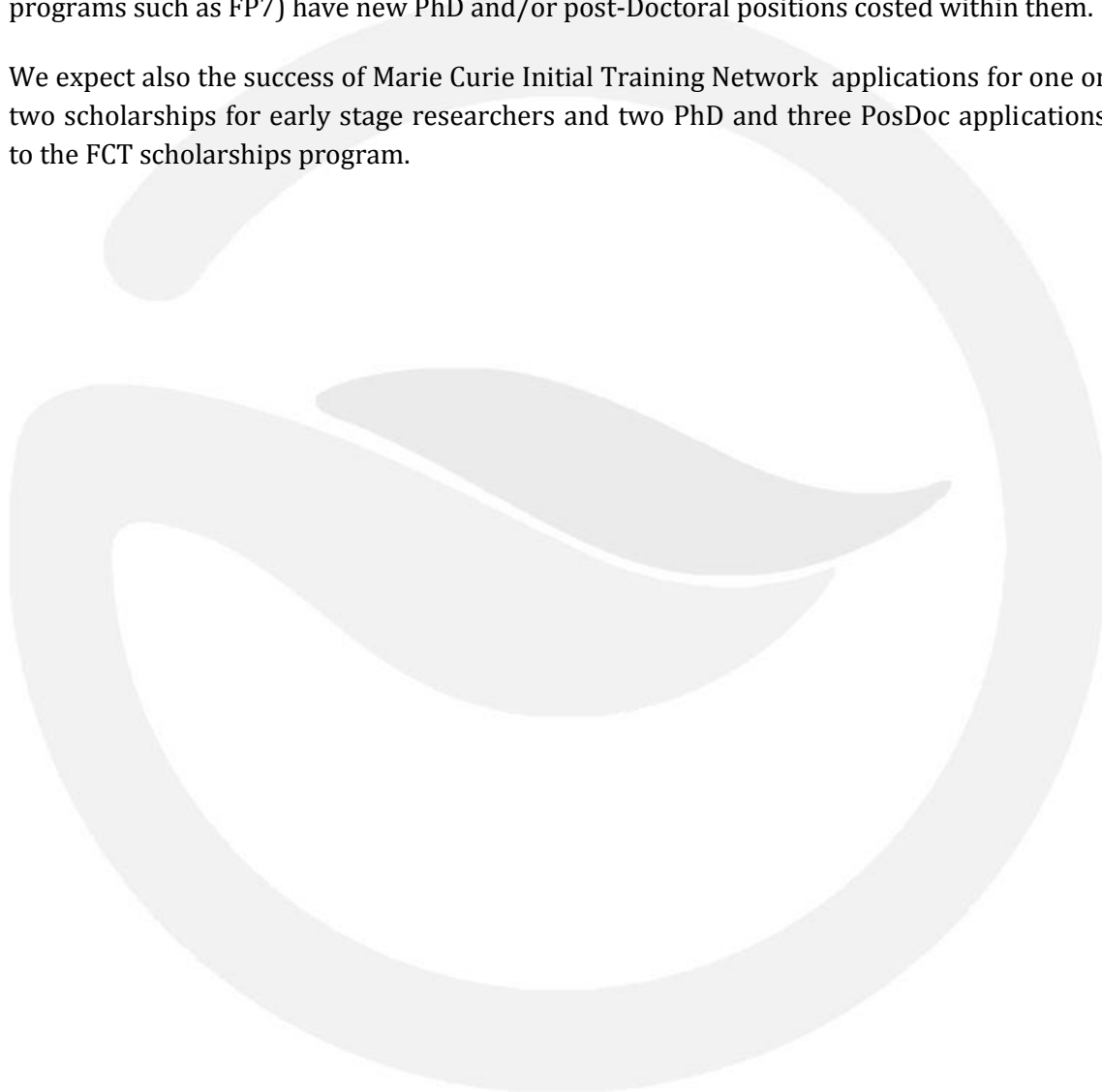
Research activities within this group are in close cooperation with agro-food industry covering areas from plant production to food processing and marketing, including aspects linked with waste production, processing and reuse as raw materials for co-products generation. Relations with stakeholders cover: joint participation in projects, know-how transfer, dissemination of results, development of new products and technological solutions.

Sousacamp (Mushrooms & Mushroom Residues), Douromel (Fruit Products & Fruit Residues), CERES (Cereals & Cereal Residues), Valpaços/Vila Flor (Olive Leaves and Fruit Residues), Noval (Wine & Grape/Wine Residues), ADVID, FENALAC, AGROS, Bioalvo, Ervital, Cant. Aromáticas, Marron-Glacé-Galiza, Mapprod Lda, Real Companhia Velha, Sogevinus, Natural Concepts, Palácio da Brejoeira, SA, Delta Cafés, AGERE, EM (Braga), Águas do Ave, SA

4 – Human resources

As mentioned in the introduction, the amount of time for dedicated research is constrained by the considerable teaching load of many CITAB members. This obstacle to increased scientific output can be solved by providing funding for students & researchers who will contribute to obtaining critical mass in all areas. Most of the recently submitted projects for National (e.g. FCT, QREN, PRODER, POCTEP) and International (e.g. EU programs such as FP7) have new PhD and/or post-Doctoral positions costed within them.

We expect also the success of Marie Curie Initial Training Network applications for one or two scholarships for early stage researchers and two PhD and three PosDoc applications to the FCT scholarships program.



5 – Summary table for 2011

These are our expected benchmark for 2011:

Item	BE	EI	SAC	TOTAL
ISI Publications	30	33	42	105
Publications: Books and Chapters	1	0	5	6
Publications: Proceedings	20	4	24	48
Projects: QREN	2	1	3	6
Projects: FCT	11	12	29	52
Projects: EU Programs	3	2	4	9
Projects: Other Programs	6	12	8	26
Degree Thesis	4	1	5	10
Master Thesis	10	4	7	21
PhD Thesis	2	1	3	6

6 – 2011 Budget

2011	
Budget Funds (FCT Funding 2010 and 2011)	263.310,88 €
Scientific Productivity	161.193,75 €
Board	37.170,26 €
Full members	65.359,37 €
UTAD Overheads	12.375,00 €
Board Budget	
Research scholarships	20.034,00 €
Scientific equipment	---
Administrative and computer equipment	2.342,54 €
Dissemination and promotion	
<i>Web site</i>	1.815,00 €
<i>Newsletter</i>	2.235,00 €
<i>Cycle of Conferences</i>	1.950,00 €
Secretariat	3.146,00€
Consultants	4.519,00€
Other expenses	1.128,72 €
TOTAL	37.170,26 €