2012 Planning Activities

March, 31

CITAB

Compiled by
CITAB Executive Committee

Edited by
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- **SAC**, Sustainable Agro-food Chains
- **EI**, Ecointegrity
- **BE**, Biosystems Engineering

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1 – Introduction

The Activity Plan for 2012 closely follows the guide-lines and major objectives set for the Strategic Plan 2011-2012, approved by FCT for CITAB.

This Plan has been designed to include a set of key activities, which are due to produce results, according to what is expected for a Unit that envisages a final goal- to achieve a classification of "Excellent" in a peer review by international experts.

We believe that we have obtained composition and critical mass of the number of scientists from UTAD and from other institutions across the three Working Groups. This is due to increased international performance according to international benchmarking criteria, although we are actively building collaborative ties with Research Units that are geographically closer to CITAB. CITAB is currently assessing and discussing a possible merger with another Research Units (i) at UTAD (CECAV), which shares some research projects and (ii) with the Associated Laboratory (CBQF) from the Catholic University in Porto. This second merger has a complementary strategy concerning several tasks from CITAB's ongoing projects. Should these mergers go ahead, CITAB will become part of an associated laboratory. A Plan to reach this goal will be presented by CITAB to the FCT to assure this goal as part of the 2012/2013 international peer evaluation exercise.

During this process we expect to further augment interaction within the three integrative projects and the members that are allocated to the project tasks (see below).

Internationalization of CITAB will continue via dissemination of the centre's activities through the Newsletter but also through international cooperation with anchor institutions and participation in FP7 and Horizon 2020 projects and consortia. Members will be selected within each group to undertake and develop such links and procure solid financial support, which must include the QREN Programme. CITAB will also forge links with "PORTUGAL FOODS" an "umbrella" mark in the Portuguese Agro-food sector promoted by the Agro-food Competitiveness and Technology Centre and the Douro Wine Cluster, in order to ensure that our results reach our key stakeholders. Regular mails will be sent divulging our major results to these organizations.

External funding is a major concern for CITAB. Current administrative ruling concerning spending of Plurianual Funding from FCT are jeopardizing our Activity Plan. It is imperative that a viable alternative is found within the University to ensure trouble free implementation of our budget.

The "CITAB cycle of conferences" will gradually become part of the centre's major dissemination activities; for 2012 we anticipate 6 initiatives; outreach activities for secondary school students will be organised in collaboration with UTAD; some of the best students will work during short work placements in our research laboratories.

Like other before it, we have presented an ambitious Activity Plan when considering the teaching load of the members of CITAB. However, we expect to increase the number of scholarships, which already show an upward trend, to support the research activities,

CITAB had a ratio of 1 : 2,5 scholarships to fully integrated members at the end of 2011. To pursue this objective the Board will contribute with part of its budget to support short-term scholarships.

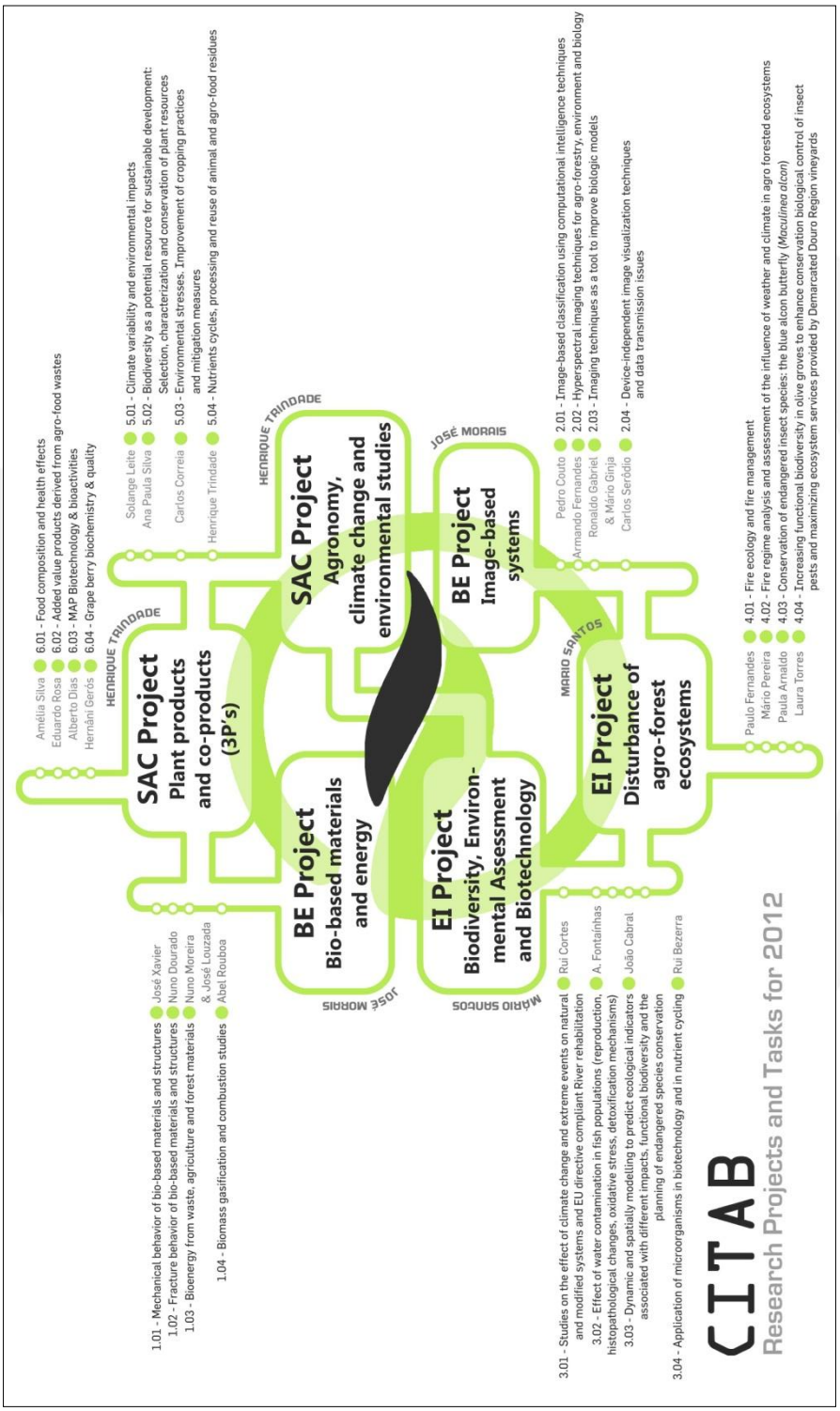
2 – Major objectives

The objectives for 2012 concur with the FCT approved Strategic Plan for 2011-2012. For 2012 the following major objectives have been set:

- Approach to key research Units on the same area to build an Associate Laboratory or at least a Research National Network;
- Approach to PORTUGAL FOODS and Cluster of Douro Wine for a closer cooperation with our stakeholders;
- Internationalization of the Unit, through a more direct link with our anchor institutions and mobility of our members;
- Increase scientific productivity in JCR Journals and in other publications;
- Increase the number of scholarships;
- Improve the outreach activities and social responsibilities.

3 – Activities

The scientific activities are focused in 6 integrated projects, splitted by the 3 Working Groups, with specific tasks. For each project has been nominated a coordinator; the



implementation of tasks is a team work.

3.1 – Scientific development

Project #1 – Bio-based materials and energy

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 bio-based materials and structures

This task aims the mechanical characterisation of bio-based material based on full-field measurements provided by a suitable optical method. To start with, novel mechanical tests are proposed for evaluating orthotropic stiffness of wood at both macro and meso scales. Moreover, wood quality is discussed in terms of spatial variation of mechanical properties within and among trees of maritime pine. A single heterogeneous plate bending test is also proposed for characterising wood and wood-based products based on the deflectometry technique. Issues that can be addressed are gradient properties within the wooden plate and visco-elastic behaviour of wood products such as MDF. A complete mechanical characterisation of cortical bone tissues is also aimed by coupling digital image correlation with several test methods. Finally, a homemade digital image correlation toolbox will be developed integrated with the available equipment in the mechanical testing laboratory. In summary, the following subtasks are aimed:

a) Assessing wood quality by spatial variability of mechanical properties within and among trees.

b) Mechanical characterisation of wood and wood products from heterogeneous plate bending tests.

c) Evaluating orthotropic stiffness of clear wood from 3D full-field displacement measurements.

d) Identification of mechanical properties of bovine cortical bone from digital image correlation.

e) Developing an integrated toolbox for digital image correlation.

Task #1.02 - Fracture behaviour of bio-based materials and structures

The main goals of this task are the (a) development of appropriate methods to provide reliable measurements of fracture properties in bio-based materials, under pure mode I, II and III loading, as well as the combination of failure modes: I+II+III, both submitted to quasi-static loading; (b) the identification of appropriate failure criteria to allow designers to perform reliable analyses when bio-based materials are used at different size scales; and (c) fatigue characterization under mode I loading.

Investigations in wood aim at providing important contributions for the next revision process of the Eurocode 5. Research activities in this Task also envisages characterizing bone fracture, making possible to correlate fracture properties (e.g. toughness) with age, drugs, diseases and exercise practicing. This issue also provides vital data to develop bone substituting materials and prosthesis.

a) Fracture mechanical testing of wood and bone in pure mode III loading.

b) Size effect studies on the strain energy release rate of wood, involving mode I loading (TDCB and DCB).

c) Fracture mechanical testing in mixed mode I+II (SLB and ELS) in cortical bone.

d) Fatigue characterization of cortical bone in pure mode I loading (DCB).

e) Development of an integrated toolbox to determine cohesive laws from full-field displacement measurements.

Task #1.03 - 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. Moreover, 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:

a) Identifying the most favourable technologies for conversion depending on the forest and agriculture material characteristics

b) 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;

c) Research and development on methanisation technologies more appropriate to available resources, with the aim of creating the specification of technologies

d) Create a specification for the biomethane to be injected in the NG network

e) Set a price recovery for the biomethane produced according to the resource and technology used.

Task #1.04 - Biomass gasification and combustion studies

The biomass gasification is gaining renewed attention, as a way to use a renewable feedstock to produce a valuable synthesis gas. It can then be used to generate electricity in a gas turbine or internal combustion engine, used as a feedstock to produce methanol, dimethyl ether, or, used in a Fischer-Tropsch system to produce diesel and other liquid fuels. The present task is motivated by the lack of numerical/experimental data on combustion in static chamber operated on alternate fuels. In particular, we are interested in Dilute Oxygen combustion of syngas fuels containing H2, CH4 and CO as the reactive species. For example, hydrogen–syngas and Methane-syngas produced from pines biomass residues, an abundant specie in the region of Trás-os-Montes e Alto Douro, contains 15–40% H2, 10-20% of CH4 and 20–45% CO, depending upon the gasification process. In addition, within this task a sub-task is included within this task, providing a deeper analysis about the performance and understanding of a fuel cell activation procedure.

The main objectives of in 2012 are:

a) To study, numerically, the influence of the dilute oxygen on the syngas combustion;

b) To understand the fuel cell activation procedure and the energy analysis.

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 - 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.

a) Application of artificial intelligence and soft computing techniques in visual tracking.

b) Automatic object feature extraction for classification and tracking.

c) Fuzzy logic based models for motion analysis.

d) Application of classification methodologies for meat quality assessment.

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

Hyperspectral imaging will continue to be used for non-destructive analysis of grapes chemical content and in the determination of wood characteristics. Advanced machine learning algorithms will be used to extract from hyperspectral information the values of parameters to be measured.

a) Development of software for training support vector machines and committee machines such as AdaBoost and mixtures of experts.

b) Determination of grape parameters such as sugar content, pH and anthocyanin content.

c) Classification of grapevine varieties.

d) Measurement of wood density and meat quality assessment.

Task #2.03 - Imaging techniques as a tool to improve biologic 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. Three major activities will be conducted:

a) Functional dog evaluation and application on canine hip dysplasia diagnosis and characterization.

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

c) Development of diagnostic ultrasound techniques for monitoring the development of mammary tumors in rats.

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

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.

a) Device independent image codification.

b) Modelling of the transmission channel in vegetative environments.

Project #03 - Biodiversity, Environmental Assessment and Biotechnology

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

a) to create appropriate tools for capturing, characterising and predicting the spatial and temporal dynamics, structure and function of terrestrial and aquatic ecosystems affected by human disturbance over different spatial and temporal scales;

b) to develop and promote typologically appropriate management plans, based on the ecological assessment of different environmental componentsin order to rehabilitate or restore degraded systems.

Postgraduate and advanced courses

EI has drawn up several advanced courses that will be taught from 2012 onwards, pending accreditation. The aim of the advanced courses is to (i) draw upon known areas of expertise of members with direct relevance to specific sectors of the employment market; (ii) raise the national and international profile of CITAB/UTAD as a teaching and research centre of excellence and (iii) to attract paying participants with at least degree level qualifications, thereby creating an alternative source of funding for the research centre.

The courses will be given both here in UTAD and in Brazil under the Luso-Brazilian agreement established for the Masters degree in Environmental Engineering or will form part of the “Campus do Mar” syllabus.

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

a) A project proposal on PTDC/AAC-AMB/118021/2010 "Predicting ecological conditions in large reservoirs from climate and landscape changes" will be revised and resubmitted for funding during 2012. This highly multidisciplinary project, which was classified as "excellent" by the FCT but not funded in 2011 due to FCT budget cuts, aims to develop tools to predict change in reservoirs in the Douro region of Northern Portugal, using climate, land use and hydrological network change scenarios and a sequential modelling process. The complementary model techniques developed during the project will be used to produce a tool to predict the evolution of physicochemical and biological change (community composition, structure and function) from aquatic stressors (temperature, water quality, hydrology, river channel) and terrestrial stressors (changes along the river corridor, catchment level land occupation and landscape patterns, global warming)..

b) Studies on the hydrological cycle at regional scale will continue to contribute to the understanding, simulation and modelling of the hydrological cycle processes across catchment areas. Specific objectives for 2012 are:

- To proceed with the climatological, geological and hydrological characterization of river basins located in the Northern region of Portugal;
- To calibrate the MIKE BASIN model that runs on a Geographic Information System (GIS) to perform hydrologic modelling at basin-scale. This software allows a set of multisectoral water demands (domestic and industrial water supply, irrigation, hydropower generation, among others); the model will be calibrated and tested using topography, soil type and use as well as vegetation cover maps of the region, meteorological data and comparing model runoff estimates with observed data.
- To use MIKE BASIN and other modelling tools to simulate the river basin catchment behaviour concerning specific conditions associated with hydrological extreme events (e.g., heavy precipitation and prolonged drought) and expected changes on spatiotemporal precipitation distribution patterns as a consequence of future global changes;

Results will be presented in nationals and international conferences and submitted to JCR journals; Results from this task are also associated with master thesis.

c) Various members of EI group are drafting a proposal for modelling climate change, hydrological change and extreme event effects on fluvial macroinvertebrate communities in northeastern Portugal's fluvial systems and the consequences for predicting trends in WFD compliant ecological quality assessment. The provisional title of the proposal is "Modelling climate change effects on fluvial ecosystems: implications for future WFD compliant biomonitoring, mitigation & adaptation". EU directive compliant

River rehabilitation is a a multidisciplinary task takes into account broad spatiotemporal dimensions and the use of bioindicators, physicochemical and hydromorphological elements to characterise and restore aquatic habitats and riparian ecotones. More specific EU directive compliant River rehabilitation actions that will take place in 2012 include:

d) Contribute to WFD oriented planning, development and execution of regional freshwater monitoring and management and planning of aquatic resources. This will include a close cooperation with Spain for the international catchments in order to define similar metrics and indices to obtain intercalibrated procedures. Collaborative actions (Spain – Portugal) will analyse divergences in assessment international waterbodies, analyse and produce a programme of measures in catchment plans, define strategies to promote efficient exchange and assimilation of information and data and improve public participation in WFD matters related to selected Iberian international basins.

e) Assess the role of land-use and pressure parameters as predictors of ecological quality across different river typologies and waterbodies with no previous ecological or physicochemical data.

f) Development and implementation of river restoration and requalification programmes for aquatic ecosystems and organisms affected by the river regulation or habitat disturbance;

g) Post restoration action monitoring and assessment of biodiversity.

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", linked to sub-organism level processes. This allows 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.

Results will come from studies underway as part of the following FCT funded projects PTDC/AAC-AMB/118021/2010 "*River biomonitoring: an integrative approach*" and PTDC/CVT/102453/2008, "*Ovary apoptosis in zebrafish (Danio rerio): pathways characterization, role in sexual differentiation and as endocrine disruptors*" and "*Primeira avaliação nacional de lesões toxicopáticas em peixes capturados nos estuários dos rios Mondego, Douro e Ave*" PTDC/mar/70436/2006.

Objectives for 2012 include:

a) Evaluation and validation of multiple biochemical markers of exposure in lotic and estuarine fish populations.

b) Continue field studies initiated in 2011 related to biomarker sensitivity and further validation in 2012. Results will contribute to the development of integrated bioassessment methods in heavily polluted streams and rivers (this task is related with the previous task).

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 main part of this task will assess scales, indicators and tools to evaluate monitor and forecast the effects of land use change on biodiversity at both regional and local scales. There will be an emphasis on the use of modelling frameworks, scenarios and projections developed in order to improve the final use of management models in the scope of programs to measure and monitor ecological integrity. This task will include the following subtasks and will produce at least two/three manuscripts in 2012.

a) This subtask will focus on the effects of land use change and anthropogenic perturbation on the distribution and abundance of selected ecological indicators, including two case-studies. In the first study, scales, datasets and tools for assessing the spatial distribution and abundance of local passerine guilds and changes in habitat conditions in rural landscapes will be evaluated, using results from the prediction of the ecological changes which can be expected when olive orchards are being intensified. In the second study, scenarios and projections from a dynamic model developed to predict the effects of wind farm installations in the ecological integrity of mountain areas will be used to forecast trends of the ecological diversity spatial distribution, with a focus on wild vertebrates as relevant ecological indicators.

b) This subtask will forecast the effects of land use change on the distribution and abundance of selected animal species by using complementary modelling frameworks to forecast species dynamics in changing landscapes.

   This subtask will include also two case-studies. Based on previous research, the first study will discriminate the effects of regional and local drivers of change to forecast trends of an endangered species (*Tetrax tetrax*) spatial distribution in response to changes induced by the ongoing power lines installation in agricultural areas of south Portugal.

   Multi-scalar effects will further be assessed in the second study, which will model the effects of land use change to understand how landscape/environmental features influence dispersal patterns and genetic structure of Red-billed Chough (*Pyrrhocorax pyrrhocorax*) in the scope of the practical implementation of conservation actions for this endangered species in Portugal.

Projects

The Laboratory of Applied Ecology (LEA), part of EI, has expertise in ecological modelling, ecological monitoring, conservation and analysis of ecosystem integrity. LEA uses a combined strategy for funding activities and database compilation for scientific productivity using several long-term technical projects that focus on the ecological impacts of anthropogenic disturbance on terrestrial vertebrate communities, such as the installation of wind farms in mountain ecosystems.

Collaboration with other national and international institutions is intensifying through the participation in R&D and PhD projects, such as PTDC/AUR-URB/104044/2008, "*Urban green structure: Relationships between the morphology of the public green spaces and plant and animal diversity*", the PTDC/AGR-AAM/100979/2008, "*Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests*" and SFRH/BD/77872/2011, "*Modelling the landscape genetic structure and dispersal patterns of endangered Red-billed Chough* (*Pyrrhocorax pyrrhocorax*) *populations in Portugal: new insights for conservation and management".*

Task #3.04 - 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.

a) Isolation and characterization of autochthonous microorganisms from natural environments and from effluents.

b) Biochemical characterization of isolates in terms of relevant enzymatic activities for biodegradation of lignin and xenobiotic compounds;

c) Test the toxicity of effluent and their main compounds, before and after biodegradation;

d) Test compounds toxicity from Jatropha curcas, before and after white rot fungi biodegradation;

e) Understand the kinetic of enzymes involved on xenobiotic, lignin biodegradation;

f) Understand the enzymes involved on detoxification of Jatropha curcas.

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

This project includes studies on ecological abiotic (mainly fire) and biotic disturbance that act on forests, woodlands and agro-forestry systems. Tasks aim to characterize spatial and temporal patterns, disturbance regimes and to develop management guidelines for disturbance mitigation and adaptation measures.

Task #4.01 - Fire Ecology and Management

During 2012 this task will be associated to these projects:

"COST Action FP0701 - *Post-fire Forest Management in Southern Europe*", European Science Foundation. Coordinated by Francisco Moreira (CEABN-UTL). Overall budget 80.000 €.

"FIREGLOBULUS – Prescribed fire use in blue gum (Eucalyptus globulus) stands", QREN - SI I&DT - Co-Promoção – 2011/021555. Coordinated by Carlos Loureiro (GIFF S.A) and Paulo Fernandes (CITAB-UTAD). Total budget: 458,202.16€. UTAD budget: 189,426.73 €.

"FIRE-ENGINE - Flexible design of forest fire management systems", MIT/FSE/0064/2009. Coordinated by João Claro (INESC-Porto). Total budget: 329,110.00 €. UTAD budget: 30,935.00 €.

Factors affecting the post-fire natural regeneration variability in Pinus pinaster and Eucalyptus globulus in Portugal: implications for biodiversity and post-fire management. PTDC/AGR-CFL/099420/2008. Coordinated by Francisco Moreira (CEABN-UTL). Total budget: 116,123.00 €. UTAD budget: 36,331.00 €.

The tasks outlined for 2012 are:

a) Completion of ongoing modelling work on the post-fire mortality of conifer and broadleaved Mediterranean trees;

b) To contribute to a national study on the factors that affect post-fire regeneration variability in *Pinus pinaster* and *Eucalyptus globulus*;

c) To start a study of fire behaviour in Eucalyptus globulus plantations. The study will assess the effectiveness of different fuel treatments; results will be used to draw up guidelines for prescribed burning;

d) To develop a model (from a combination of empirical data and fire behaviour modeling) of how fuel treatments and fire suppression contribute to and interact with determining fire control.

e) To examine and assess the impact of alternative fire management strategies on fire policy effectiveness.

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

Projects associated with this task are:

"Forest fires under climate, social and economical changes in Europe, the Mediterranean and other fire-affected areas of the world" (FUME) (FP7-ENV-243888-2009). Coordinator: Jose Moreno (Universidad de Castilla – La Mancha). Total budget: 6.18 million €.

"*Inter-relações fogo-vegetação-atmosfera: entender os processos para prever os regimes de fogos rurais em Portugal*" (FLAIR) (FCT, PDC/AAC-AMB/104702/2008). Coordinator: Carlos do Carmo de Portugal e Castro da Camara (Instituto Dom Luiz, Laboratório Associado). Total budget: 182,682.00€. UTAD budget: 21,240.00€.

a) To update the Continental Portuguese Rural Fire Database for the 1980-2011 period;

b) To assess the potential impact of regional climate change on wildfires in Portugal using an appropriate Burnt Area Model with simulated data for future scenarios by a regional circulation model;

c) To extend the methodology to fires in Europe using burnt area data from the European Forest Fire Information System, meteorological data from the European Climate Assessment and simulated values of temperature, precipitation wind and relative humidity from the COSMO-CLM model.

d) To proceed with the temporal, spatial and spatio-temporal clustering of fires in Portugal using different cluster analysis algorithms and assessing the influence of factors such as climate and vegetation type;

e) To assess the role of landscape and fire recurrence metrics on fire size distribution in Portugal through the use of several distribution functions;

f) To model how landscape pyrodiversity and fire weather contribute to area burned and fire size in Portugal.

and

g) This task will also assess the role of weather and climate on the chestnut agroecosystem. The European chestnut is cultivated for its nuts and wood. Several studies highlight specific chestnut productivity needs concerning soil and climate characteristics. Recently Pereira *et al* (2011) identified a set of meteorological variables/parameters with high impact on chestnut systems.

Specific objectives for 2012 will include continued assessment of meteorological impacts on chestnut productivity in Portugal; assessment of future climate change on chestnut productivity, diseases in Portugal as well as on European chestnut orchards, presentation of finding in national and international conferences and submitted to JCR journals

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

The main objective for 2012 is to study several conservation-related ecological issues of this insect life cycle. *P. alcon* flight period and oviposition preferences will be determined. Determination and identification of its host ant species will be made and new *Phengaris* populations will be studied.

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 new task will carry out the following in 2012:

a) Determine the sugar composition of the nectars and pollens of the flowering plant species that have been pre-selected to enhance conservation biological control of olive grove insect pests;

b) Determination of the sugar composition of the honeydews of *Saissetia oleae* and *Hyadaphis foeniculi*;

c) Evaluation of the attractiveness of several plant species on *C. carnea* using a 4-way olfactometer and analysis of plant volatiles;

d) Results obtained will be evaluated under the advice of Dr. Carsten Müller, Cardiff University, UK.

and

e) Develop spatial analysis methodology that will support activities within an ecological infrastructure network.

f) Apply mating disruption techniques to control *Lobesia botrana* to maintain and/or promote study farm biodiversity;

g) Characterization of ecological infrastructures and biodiversity at study sites and assessment of their role in the increase of natural enemies.

h) Publication of an informative brochure for farmers presenting the project's results.

Project #05 – Agronomy, climate change and environmental studies

Task #5.01 - Climate variability and environmental impacts

Study of dynamic 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.

More detailed studies on viticultural zoning in Europe will be undertaken using state-of-the-art observational datasets. The inter-annual variability of several 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 #5.02 – Biodiversity as a potential resource for sustainable development: Selection, characterization and conservation of plant resources

Chestnut fruit polispermic tendency will be analysed by controlled pollinations using different *C. sativa* pollinators. A germ bank will be prepared to preserve different genotypes from Côta variety; genotypic screening using molecular markers will be carried out. A project is in preparation for submission to the European commission – "Community programme on genetic resources in agriculture", with partners from 6 countries to continue the studies on the Safenut project. Studies on chestnut metabolite composition will continue. Analyses on fibre, organic acids and phenolics compounds will be carried out on wild blueberries.

Task #5.03 – Environmental stresses. Improvement of cropping practices and mitigation measures

We will focus on the implementation of two FCT projects: "Short-term climate change mitigation strategies for Mediterranean vineyards" and "Cover cropping - the decisive strategy for the sustainable management of the rainfed olive orchards"; other activities will include studies on the chestnut interaction with abiotic and biotic factors to develop greater resistance to ink disease.

Task #5.04 – Nutrients cycles, processing and reuse of animal and agro-food residues

Gas emission measurements from stored animal slurries will be made following chemical and biological treatment methods. The kinetics of gas emissions will be assessed under temperature scenarios corresponding to winter and summer conditions. We will investigate the effects of phytochemical compounds on the composting process and degradation pattern of compounds during the composting process.

Assessment of ammonia and greenhouse gas emissions from rice paddies in Mediterranean conditions under elevated atmospheric CO_2 and temperature will continue and associations between gas emissions and cropping practices, soil type, climatic parameters, and N cycle key-processes, like nitrification will be studied.

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

Task #6.01 – Food Composition and Health Effects

Continued analytical support for researchers in SAC/CITAB and other Researchers/Research Centers in UTAD – specifically further development of collaborations with CECAV. We aim to increase critical mass in the cell model area, a key research area for studying the health effects of dietary phytochemicals. This will be partly developed through an FCT funded post-Doctoral scholarship, a new project and scholarships proposals in 2011. In parallel with the co-products area (6.01) we will further development fundamental nutrient and compositional studies via international and national project proposals involving Anchor Institutes, Stakeholders (Ceres) and International Collaborators.

Task #6.02 – Added-Value Products from Agro-Food Wastes

Phytochemical biopesticides and "green manures": we aim to identify effective natural products (phytochemicals and secondary metabolites from non-plant organisms) that can be used in the food chain to control economically important pathogens, food pests and also diseases of animals and humans e.g. pesticide resistant bacterial and fungal pathogens of crops and antibiotic resistant bacteria in animals and humans. This research involves researchers from ACES and 3Ps and also an important collaboration with the Microbiology group of CECAV.

Functional Food Compounds from Agro-Food Wastes: Agro-food wastes have great potential as sources of functional food ingredients including phytochemicals, dietary fibre and important nutrients and minerals. This sub-task involves collaboration between ACES and 3Ps and also the Animal Nutrition group in CECAV.

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. We will study the effect of plant polyphenols on intestinal SGLT1 glucose transporters, insulin secretion from beta-cells, mechanisms of colon anti-cancer effects. We will also study the use of plant extracts for obtaining functional foods with antioxidant

and neuroprotective activities. The nanoencapsulation of plant extracts and selected compounds with the aim of brain targeting will be studied.

Task #6.04 – Grape berry biochemistry & quality

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.

3.2 – Dissemination & Image

CITAB will continue having **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	**Engineering**	**Ecology and Environment**
Sustainability of the Wine Sector	New technologies applied to agriculture	Extreme and Climatic changes
	Research methods in biomechanics	
CITAB Scientific Journeys		

Research Group Coordinators will be responsible for organizing each conference.

Concerning the BE project, the following workshops are planned, oriented for both academic and industrial audiences: “New technologies for agriculture” and “Workshop of Biosystems Engineering”. CITAB members engaged on the BE projects will also integrate the scientific committees of two international conferences: the “World Congress on Engineering 2012” and the “10th International Conference on Application of Fuzzy Systems and Soft Computing”. Moreover, a member of BE project will be co-organizer of the special session “Soft Computing in Computer Vision” in the “14th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems”. One more way for disseminating the research activities related with the BE project will be through 24 communications in national and international conferences.

SAC group members are collaborating in the organization of the XXXIII Spring Meeting of the Portuguese Grassland Society (Elvas, 2nd-4th May) and the VI Simpósio Nacional de Olivicultura – (Mirandela, 15th-17th November). This year, SAC is organizing on a monthly

basis "research seminars" where students and fellowships of the group are invited to present and discuss their research topic and methodologies. Several workshops are planned at CITAB-UM; these events are organized to provide training of graduate students and researchers on specialized topics (e.g. 3rd Annual BioPlant Workshop). SAC Members will be participating in several international and national meetings, where research results will be presented as oral and poster presentations.

EI members have collaborated to draw up advanced courses that, once accredited by UTAD's "Gabinete de Formação", will be taught during 2012 both here in UTAD and in Brazil under the Luso-Brazilian agreement established for the Masters degree in Environmental Engineering. The aim of the advanced courses is to:

a) draw upon known areas of member expertise that are relevant to specific sectors of the employment market;

b) raise the national and international profile of CITAB/UTAD as a teaching and research centre of excellence, thereby promoting further collaboration initiatives;

c) attract paying participants with at least degree level qualifications, thereby creating an alternative source of funding for the research centre.

Several complementary and advanced course have also been drawn up and submitted to the "Campus do Mar", an international project developed by the University of Vigo and promoted by the three Galician universities, the Spanish Council of Scientific Research (CSIC) and the Spanish Institute of Oceanography (IEO), bringing together socio-economic agents and researchers from the Galicia and Northern Portugal, including CITAB/UTAD.

Dr. Samantha Hughes has been invited by Professor Marcos Callisto (Laboratório Ecologia de Bentos (LEB), Instituto de Ciências Biológicas (ICB), Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil) to give a 2 week advanced course in "*Freshwater biomonitoring and restoration: principles, concepts and methods*" at UFMG in May 2012. Following this, Dr. Hughes will spend one week at the Universidade Estadual de Paraíba (UEPB) with Professor Etham Barbosa, where she will give a small selection of talks from the course given at UFMG and discuss future research in semi-arid ecosystems.

A list of the advanced courses drawn up by Ecointegrity members for 2012. (A = Advanced course; C = Complementary Course; S = Specialized Course)

Course Title	Type	ECTS	Proponent	Scope
Determining environmental instream flow regimes	Advanced	2	Rui Cortes	Campus do Mar
Stochastic Dynamic Modelling of ecological and environmental systems	Advanced	2	João Alexandre Cabral, Mario Santos, Edna Cabecinha	Campus do Mar/ CITAB/UTAD Luso-Brazilian agreement
Biomonitoring and Restoration of Aquatic Ecosystems	Advanced	2	Rui Cortes	Campus do Mar
Coastal Sediment Dynamics	Advanced		M.Nombela – Rui Cortes	Campus do Mar
Aquatic Bioindicators and Biomarkers	Complementary	2	Rui Cortes, Fontainhas-Fernandes	Campus do Mar/ CITAB/UTAD Luso-Brazilian agreement
Aquatic Ecotoxicology and Environmental Markers	Complementary	3	Fontainhas-Fernandes, João Carrola	Campus do Mar/ CITAB/UTAD Luso-Brazilian agreement
Ecological Monitoring of River systems: Benthic Macroinvertebrates and Hydromorphological Support Elements"	Advanced Course	2	Samantha Jane Hughes , Simone Varandas	CITAB/UTAD Luso-Brazilian agreement
Fish based ecological monitoring and associated river restoration measures	Specialized	2	João Manuel Oliveira	CITAB/UTAD Luso-Brazilian agreement
Freshwater biomonitoring and restoration: principles, concepts and methods	Advanced	3	Samantha Jane Hughes	Instituto de Ciências Biológicas Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil) & Universidade Estadual de Paraíba (UEPB)

EI will be collaborating in the organisation of at least one national and one international conference:

a) The Portuguese Malacology Conference (National conference - 7-9 September, Polytechnic Institute of Bragança http://www.ipmalac.org/ and http://esa.ipb.pt/bivalves)

b) International Meeting on Biology and Conservation of Freshwater Bivalves (4-7 September, Polytechnic Institute of Bragança, http://esa.ipb.pt/bivalves).

Members of this task form part of the Organizing Committees of both of these meetings, which will take place at the Polytechnic Institute of Bragança. Organizing institutes include the Instituto Português de Malacologia, o Centro de Investigação de Montanha do Instituto Politécnico de Bragança, Centro Interdisciplinar de Investigação Marinha e Ambiental da Universidade do Porto (CIIMAR) and CITAB - Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas da Universidade de Trás-os-Montes e Alto Douro

EI Members will be participating in at least 12 international and national meetings, where findings two projects will be presented mostly as oral presentations. Some presentations will include several members from EI as co-authors.

3.3 – Cooperation

3.3.1 – Internal

We believe that the internal cooperation has not reached yet the level that we all wish and recognize as necessary. Thus, the ExCo members of each Working Group will continue to interact with the other members to stir internal discussion of ongoing activities and results which will be transmitted to the Board to define adequate policies.

The "*Science at lunchtime*" initiative launched in January 2011 will continue throughout 2012. Invited EI and CITAB members are invited to give presentations 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. 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.

Regular meetings (4 times a year) will continue 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.

SAC has set up a project "GREENVITIS – Effects of soil management on grape production and sustainability of the Douro Viticulture System" that merges most of the SAC members. This unifying project will cover topics from climate change, soil quality, nutrients cycling, water relations, vine plant physiology and biochemistry, plant protection, vine agronomic aspects and wine quality and economics. This core-project for the group benefits from the

expertise of BE group members on areas like electronic control of experimental setups, data acquisition and field data transmission and will start to be implemented in the Autumn 2012 and will be submitted to the QREN program for additional funding.

3.3.2 – National

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

Biosystems Engineering
IICT (Instituto de Investigação Científica Tropical - Lisboa): progress of the project "Scots pine in Portugal: the "Southwest end" or just "the end"?
ISA (Instituto Superior de Agronomia - Lisboa): progress of the project "Phenotypic plasticity of maritime pine to climate change".
ADAI (Association for the Development of Industrial Aerodynamics - Coimbra): collaboration within the impact of the Pinewood Nematode on the wood properties and in the forest biomass characterization and utilization.
Centro PINUS (Porto): conclusion of the research projects: "Strategic information for pine cluster". Acção 4.2.2, PRODER.
INESC Porto: second year of the collaborative project PTDC/EME-PME/114443/2009, "Numerical and experimental study of cohesive laws in bonded wood joints".
INEGI/UP: first year of the collaborative project PTDC/EME-PME/119093/2010, "Fracture behavior of cortical bone under mixed-mode I+II loading".
Hospitais da Universidade de Coimbra, E.P.E (HUC/UC): first year of the collaborative project PTDC/EME-PME/119093/2010, "Fracture behavior of cortical bone under mixed-mode I+II loading".
CECAV-UTAD: progress of the collaboration on meat quality evaluation and on body composition assessment.
IST, João Paulo Carvalho: conjoint publications and research on Soft Computing and Image Processing.
CM-UTAD, Centre for Mathematics of the University of Trás-os-Montes and Alto Douro: conjoint publications.
Laboratório de Óptica e Mecânica Experimental (LOME), do Instituto de Engenharia Mecânica e Gestão Industrial (INEGI): Development of a methodology to study the biomechanical behavior associated with outdoor based recreational activities land use.
Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD), Universidade de Trás-os-Montes e Alto Douro: Collaborating in the multidisciplinary analysis of itineraries and routes in natural spaces such as hiking trails, is an area of growing interest for promoting wealth, well-being and greater social conscience of these concepts.
UAveiro: progress of the project PTDC/EME-PME/105465/2008, "Physiologic supply system for in-vivo evaluation of bone implants behavior".

Ecointegrity
International Center for Coastal Ecohydrology (ICCE)
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 CIBIO Department of Botany Instituto de Ciências Biomédicas Abel Salazar - ICBAS)
Fundação da Faculdade de Ciências (FFC/FC/UL) of the University of Lisbon
Escola Agrária, Instituto Politécnico de Viana de Castelo
University of Évora
Escola Superior Agrária/Polytechnique Institute of Bragança (Mountain Study Research Centre)
Universidade do Minho
Sustainable Agro-food Chains
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; (Mª João Sousa; Mª 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, Mª 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 (Mª 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
Forest Products Laboratory of Forest Department of University of S. Paulo (Brazil): conjoint work and publications about the manufacture of MDF panels with mixture of Saccharum sp (cane sugar) fiber associated with the wood fibers of Eucalyptus grandis.
Forest Products Laboratory of Forest Department of University of S. Paulo (Brazil): Variation of physical and mechanical properties of Wood in Eucalyptus, under water and mineral stresses.
CIS - Madeira (Centro de Innovación e Servizos da Madeira, Ourense, Spain): Characterization and utilization of forest shrubs and agricultural wastes.
UFRRJ (Univ. Federal Rural do Rio de Janeiro, Brazil) conjoint work and publications about the wood properties of Eucalyptus (anatomical, mechanical and chemical).
Universidad Publica de Navarra (Spain): conjoint work and publications about image segmentation and image based classification methods using Soft Computing.
Universidade Politécnica da Catalunha (Spain): conjoint publications and research on Soft Computing and Image Processing.
Ghent University (Belgium): conjoint work and publications about the shape descriptor of wood micro-structure.

Universidad de La Rioja (Spain): conjoint work and publications about grape analysis and evaluation using hyperspectral images.
Laboratório de Bioengenharia do Departamento de Biomecânica, Medicina e reabilitação do Aparelho Locomotor da Faculdade de Medicina de Ribeirão Preto, da Universidade de São Paulo (Brazil): conjoint publications on biomechanics of the musculoskeletal system.
Centro de Tecnologia Biomédica da Universidade Federal de Minas Gerais (CTBio-UFMG), Brazil: conjoint publications on biomechanics of the musculoskeletal system.
Department of Biokinetics, Sport and Leisure Sciences, University of Pretoria, Pretoria, South Africa: conjoint publications on biomechanics methodologies to promote sustainable management of the natural as a resource for physical and mental health.
Universidad Politecnica de Cartagena (Spain): conjoint work and publications about the smart data acquisition devices.
Universidad Politecnica de Cartagena (Spain): FP7 proposal on Wireless Sensor Networks under Ipv6.
Université de Bordeaux I, Institut de Mécanique et d'Ingénierie –France: conjoint work and publications about size effect studies on the energy release rate and dowel-joints is being performed. A COST-Action (FP 1004) proposal has recently been submitted involving members of CITAB and this institution.
LMPF/Arts et Métiers Châlons-en-Champagne (France): conjoint work and publications about the development of the virtual fields method for extracting relevant constitutive parameters of wood and wood-based products from plate bending tests.
Universidad Politécnica de Madrid (Spain): conjoint work and publications about the characterization of clear wood from 3D full-field measurements.
Ecointegrity
Disturbances on forest ecosystems
Universidade de Castilla la Mancha, Toledo, Spain
University of Santiago de Compostela, Spain
Botany Department of the University of Salamanca (Salamanca, Spain)
Department of Biology and Botanical Garden, Fribourg (Switzerland).
Biodiversity, Environmental Assessment and Biotechnology
Universidade Federal de Minas Gerais (UFMG), Brasil
Universidade Estadual de Paraíba, (UEPB), Brasil
Freshwater Biological Association (FBA), United Kingdom
Université Libre de Bruxelles – ULB

Dresden University of Technology (TU Dresden)
Centro Ibérico de Restauração Fluvial (CIREF, Madrid Spain),
Departmento de Botánica, Universidad de Salamanca, Salamanca, Spain
Department of Biology and Botanical Garden, Fribourg (Suiça)
Sustainable Agro-food Chains
Aristotle Univ. of Thessaloniki (Greece)
Biocentrum - Technical University of Denmark
Consejo Superior de Investigaciones Científicas (CSIC) Estación Experimental del Zaidín (Spain)
CRA, Consiglio per la Ricerca e la Sperimentazione in Agricoltura, Italy
CRAB, Consorzio di Ricerche Applicate alla Biotecnologia, Italy
ENEA, Ente per le Nuove Tecnologie, l'Energia e l'Ambiente, Ital
Instituto Nacional de Investigación y Tecnologia Agraria y Alimentaria (Spain)
IRTA, Institut de Recerca i Tecnologia Agroalimentàries (IRTA)
Lundbeck Pharmaceuticals
NAGREF - National Agricultural Research Foundation (Greece)
Plant Research International B.V. Wageningen, NL
Univ. Santiago Compostela (Spain)
Univ. Torino (Italy)
Univ. Zagreb
GRAB, Agropark (France)
HelmhotzZentrum Munchen – Institute of Stem Cell Research (ISF) (Germany)
King's College, London (UK)
KNUST, Ghana
Max Plank Institute (Cologne, Germany)

SGGW (Poland)
Swiss Federal Institute of Technology in Lausanne (Switzerland)
College of Engineering and Technology, University of Dar es Salaam (Tanzania)
Univ. Messina, Italy
Univ. Novara. Italy
Univ. São Paulo
Univ. Sri Jayewardenepura, Sri Lanka
Univ. de Bordeaux – ISVV, France
Univ. de Montepelier, Ecole Polytechnique (France)
Univ. of Aarhus (Denmark)
Univ. of Leiden (Netherlands)

3.3.4 – Stakeholders

Biosystems Engineering

Presently, the main stakeholders of research activities developed within the BE project are Centro PINUS (which is a Portuguese association of major industrial consumers of the pine wood and the National Forest Authority) and DURATEX (which is a private producer of MDF panels form Brazil). During 2012 an effort will be made in order to increase the number of stakeholders, mainly related with the agro-food and forestry industries.

Ecointegrity

EI continues to interact with key stakeholders such as Energias de Portugal (EDP), the National Forest Authority (AFN), the National Civil Protection Authority, the National Water Institute (INAG) and Regional Water Authority responsible for river basins in the Northern Portugal (ARH-N). Several municipal councils, including Vila Real Municipal Council 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 assessment and ecosystem rehabilitation and renewable energy sources(PROFICO AMBIENTE, PROSISTEMAS, ECOSFERA, ENERGIA VERDE and ENERGIEKONTOR–PARQUES EÓLICOS UNIPESSOAL, LDA).

Sustainable Agro-food Chains

Research activities within this group maintain 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. As before, 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

In the context of BE project, during 2012 we expect to maintain, or even increase, the current number of MSc and PhD students joining in the research team. In order to achieve this goal, it is essential to get a number of scholarships, from CITAB budget (2 additional scholarships), FCT scholarships program (1 new scholarship) and external projects funding (2 scholarships). We expect that this human resources will contribute to improve or, at least, preserve the present individual scientific productivity of integrated researchers (around 2 ISI articles per integrated members).

As occurred in 2011, in 2012 the SAC group is committed to improve the number of students and fellowships associated to the group. This will be achieved with new projects starting this year and by direct submission of applications to FCT.

5 – Summary table for 2012

These are our expected benchmark for 2012:

Item	BE	EI	SAC	TOTAL
ISI Publications	**26**	**33**	**45**	**104**
Publications: Books and Chapters	**5**	**0**	**5**	**10**
Publications: Proceedings	**24**	**3**	**25**	**52**
Projects: QREN	**3**	**1**	**3**	**7**
Projects: FCT	**9**	**8**	**15**	**32**
Projects: EU Programs	**2**	**2**	**2**	**6**
Projects: Other Programs	**3**	**4**	**4**	**11**
Degree Thesis	**7**	**2**	**7**	**16**
Master Thesis	**20**	**3**	**8**	**31**
PhD Thesis	**7**	**1**	**2**	**10**

6 – 2012 Budget

	2012
Budget Funds (FCT Funding)	**439.634,00 €**
Scientific Productivity	252.789,55 €
Board	43.963,40 €
Full members	98.917,65 €
UTAD Overheads	43.963,40 €
Board Budget	
Research scholarships	31.146,02 €
Scientific equipment	---
Administrative and computer equipment	1.000,00 €
Dissemination and promotion	
Web site	500,00 €
Newsletter	250,00 €
Cycle of Conferences	3.000,00 €
Secretariat	2.003,82€
Consultants	5.000,00€
Other expenses	1.063,56 €
TOTAL	**43.963,40 €**