




2012  
Activities  
Report

CITAB

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Committee

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-  Sustainable Agro-food Chains - SAC
-  Eointegrity - EI
-  Biosystems Engineering - BE

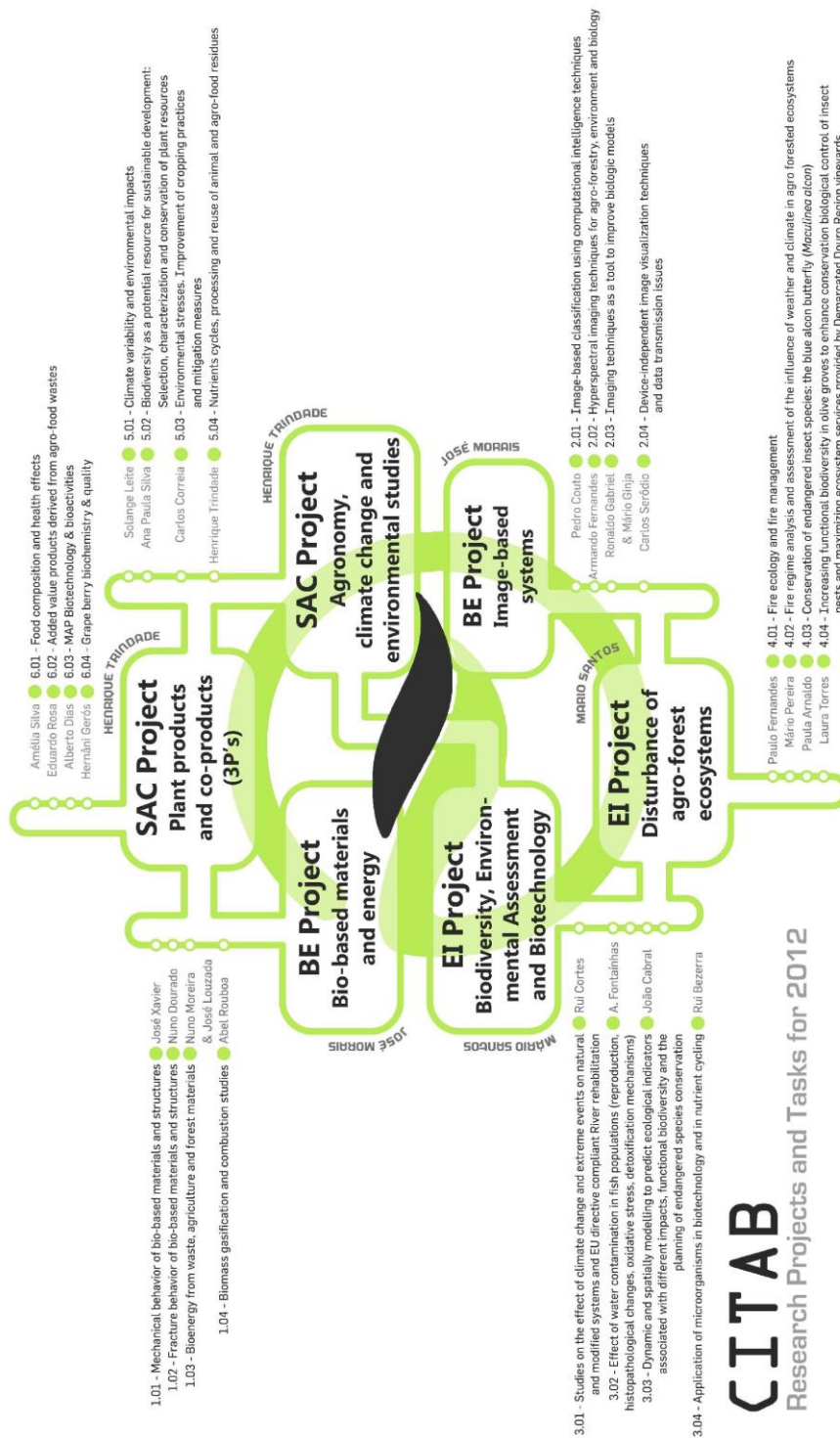
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# 1 Executive Summary

- ☺ CITAB's ongoing strategy is to achieve a FCT classification of "Excellent" by forming a consortium in order to build sustainable links for developing cohesive, integrated research initiatives based on key public and private sector partner needs.
  - The CITAB Directorate and Executive Committee met with members of 4 research units and associated laboratories and representatives of 2 major stakeholders across northern and central Portugal over 2012 to set up the consortium. The meetings were highly successful and the consortium will be formalised in 2013.
  - The consortium is vital for achieving excellence by building critical mass, promoting internationalisation, meeting key stakeholder needs and promoting collaborative high calibre scientific production. Once formalised, the consortium will apply for FCT funding during 2013 to develop research projects, post graduate training and vocational doctoral programmes.
- ☺ Members of CITAB research lines started to draw up international doctoral programmes in late 2012. The programmes, once completed, will be submitted to the national accreditation system and will be submitted for FCT funding in 2013. One doctoral programme "*Agricultural production chains - from fork to farm*" has been completed and submitted to the 1<sup>st</sup> call for FCT funding. Coordinators of the second doctoral programme "*Biodiversity and Environmental Sustainability*" successfully contacted national and international partners in 2012 to meet and draw up the course syllabus in time for the second FCT call for funding anticipated for the last quarter of 2013.
- ☺ Two editions of CITAB's newsletter were published over 2012, divulging the centre's activities to actual and potential international partners.
- ☺ Outreach activities for 2012 included a series of actions aimed towards the scientific community, private and public sector stakeholders and the general public, in particular secondary schools in order to capture the interest of potential young scientists. Secondary school students were invited to work with CITAB researchers as part of two work experience initiatives held in the summer of 2012.
- ☺ CITAB's scientific productivity has shown a sharp improvement due to centre's commitment to effective mid and long term strategies to improve collaboration between members, national and international research institutes and key stakeholders to obtain critical mass.



**CITAB**  
Research Projects and Tasks for 2012

## 2 Objectives and achievements

### 2.1 Unit description

CITAB's core activities remain focused on interdisciplinary research on agro-food, forestry and the environment, with input from engineering technologies to enhance development of agro-food and forestry production chains in Portugal.

CITAB's research activities are organized into 6 multidisciplinary projects to optimise research group expertise via the development of integrated, multidisciplinary research (see organigram). This approach maximises participation of integrated members and collaborators. Some changes were made in 2012 to streamline BE projects by reducing the number of tasks in each project.

CITAB's activities rely on the contribution of integrated members (members with a PhD) and collaborators (members without PhD), selected according to international benchmarking criteria. Since most of the CITAB members are primarily lecturers, the Unit supports post-graduate courses offered by the host institution and others centres of learning.

CITAB is managed using a bottom-up approach. The Directorate (1 Director and 2 Vice-Directors) is supported by the Executive Committee (ExCo; 6 members- 2 from each Working Group) forming a two way link between CITAB members and the Directorate concerning policy orientation defined by the Directorate.

The ExCo is also responsible for compiling information and collaborating in actions that promote the visibility of the Unit. Both the Directorate and the ExCo meet approximately once a month. Research group members also hold regular meetings to evaluate group progress according to the Plan of Activities for the current year. The Scientific Council meets a minimum of 4 times a year, as stipulated by regulations. Given the considerable size of the Unit, a secretary has been contracted to deal with all administrative duties and provide support to the Directorate and the ExCo.

### 2.2 General objectives

CITAB'S 2012 activities focused mainly on promoting scientific excellence, supported by complementary development in key areas such as internationalization by promoting mobility of researchers, receiving visiting researchers, increasing cooperation with stakeholders and improving dissemination of results and social responsibility by interacting in particular with pupils at secondary schools.

During 2012, CITAB started creating a high quality scientific consortium through a series of meetings with key players over 2012. The consortium will result in critical mass of high calibre member numbers by bringing together 3 other Research Units situated in northern and central Portugal. The consortium will comprise national research units (Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas

CITAB and Centro de Ciência Animal e Veterinária – CECAV – both situated at the UTAD and the Centre for Functional Ecology - CEF - at the University of Coimbra), associated laboratories (Centre for Biotechnology and Fine Chemistry - CBQF - Catholic University of Porto) and major stakeholders (Portugal Foods, Douro Region Wine Cluster). Based on the work carried out during the meetings held in 2012, this consortium will apply for FCT funding during 2013 to develop research projects, post graduate training and vocational doctoral programmes. As a result of this merger, CITAB will achieve one of its major objectives by becoming part of an associated laboratory.

Members of CITAB research lines started developing international doctoral programmes for FCT funding with national and international partners towards the end of 2012. One doctoral programme “Agricultural production chains - from fork to farm” was completed and submitted for funding in early 2013. A second doctoral programme “Biodiversity and Environmental Sustainability” is well underway based on work initiated in 2012.

Two editions of CITAB’s newsletter were published in 2012, divulging the centre’s activities to actual and potential international partners. Outreach activities were very successful over 2012, comprising actions aimed towards the scientific community, the private sector, the general public but focusing in particular on capturing the interest of potential young scientists in the region’s secondary schools. CITAB offered work placements to young scientists in the centre’s laboratories during the summer of 2012 via two outreach activities, entitled "Evaluation of cellular proliferation using animal cell lines in culture", and "Yeast from floral nectar".

### **2.3 Scientific objectives**

Scientific activities and objectives continue to be developed within the 6 structural projects and their respective tasks (see organigram). The tasks are developed in order to use, whenever possible, novel approaches that involve interaction and inputs from experts in areas of engineering and communication technology. These interactions give added value and advance science in CITABs key areas of agro-food, forestry and the environment, using innovative methods such as signal and image processing, biosensing and remote sensing to better understand how agricultural activities drive environmental change at different scales of the ecosystem and the organism.

### **2.4 Co-scientific objectives**

Essential collaborative foundation work carried out over 2012 paved the way for establishing a regional consortium and initiate the development of national/international doctoral programmes based on recognised expertise in CITAB’s research lines. These key mid to long term strategic actions are vital for strengthening CITABs objectives to increase funding, international collaborations, human resources and JCR scientific production via collaborative actions. Other initiatives involved collaboration via mobility of CITAB researchers or CITAB receiving visiting scientists with universities in Brasil, the USA and Canada. A visit to UTAD in

October 2012 by Professor Zhihong Xu, an academic at the Third World Academy of Sciences (TWAS), the Chinese Academy of Sciences (CAS) and Chairman of the Chinese Society of Plant Biology resulted in mutual interest in establishing cooperation in scientific research and advanced training via joint PhD courses and post-doc training in biotechnology and development of new cultivars adapted to climate change.

## **2.5 Main achievements during 2012**

The main achievements of CITAB's research over 2012 are summarised for each group.

### **2.5.1 Sustainable Agro-food Chains**

Preservation of biodiversity and reduction of environmental impact was a major focus of SAC-CITAB research. A chestnut germplasm bank was set up, hazelnut germplasm was evaluated. A study to improve sustainability in olive groves through cover crops in rainfed systems also started. Reduced chemical input to suppress phytopathogenic fungi was achieved by composting photochemical-rich plant materials (e.g. brassica). Special concern was given to the climate change and mitigation measures such as downscaling of viticulture zoning and the use of kaolin-based particle film to prevent leaf sunburn damage and drought stress on grapevines. Research was carried out on new, pathogenic disease resistant chestnut and hazelnut Portuguese varieties and the use of cover cropping techniques to improve the profitability and the sustainability of rainfed olive orchards. SAC researchers worked to reduce greenhouse gas emissions from animal slurries by treating them nitrification inhibitors prior to soil application. At cellular level, a new model for biochemical and biotechnological applications (nutrient transport, toxicological assessments, etc) was developed from grape cells to study the effects of abiotic stress in several crops, in particular vine, chestnuts and olives.

Specific achievements on health related phytochemicals are the anticancer effects (colorectal cancer cells) from *Salvia*, *Hypericum* and olive leaves extracts and selected phenolic compounds. New products for the market were developed from the same research line such as biofunctional textiles using resveratrol and other plant extracts, and nanoencapsulation of plant bioactives.

### **2.5.2 Ecointegrity Group**

EI researchers continue to lead the ways in developing monitoring, modelling and restoration techniques that address how anthropogenic impacts affect terrestrial and aquatic ecosystems.

New integrative tools were developed by combining environmental bioindicators and biomarkers to detect the multiple stresses occurring in aquatic systems, including the toxic effects of heavy metals. These findings are highly relevant for improving Water Framework Directive compliant monitoring programs.



Monitoring was successfully linked with practical river restoration initiatives including improvement of the global connectivity along different streams (in north and south Portugal) and soil bioengineering techniques to control erosion and the quality of improve riparian vegetation. Spatially Explicit Stochastic Dynamic models (StDM) were developed to model complex spatial ecological patterns for ecosystem management and conservation, using a wide number of environmental variables. StDM results have been applied to wildlife conservation, fire effects in forest ecosystems, wind farm impacts, peri-urban patches and exotic plant invasion. MIKE BASIN modelling software was also used to calibrate and validate data for analysing multisectoral water demands, to study and simulate the catchment behaviour to extreme events such as wildfires and heavy rainfall.

Work on forest systems included analysis and assessment of climate on fire in agro forested ecosystems, analysis of temporal, spatial and spatio-temporal clustering of fires in thannational territory and potential impact of regional climate change on wildfires in Portugal using an appropriate Burnt Area Model (BAM). Real data and simulations were also used to assess the effect of weather conditions on chestnut productivity in Portugal and European chestnut orchards.

Species, of high conservation value such as the Alcon Large Blue butterfly *Maculinea alcon* and vertebrates such as different species of bats, birds, mammals and game species were monitored and conservation strategies were defined.

Achievements in biotechnology included detoxification of biodiesel waste by fungal fermentation and their subsequent use as animal feedstuffs; thermo chemical characterization of biomass from different types of wood and forest wastes. Studies were developed in the use of autochthonous bacteria, yeasts and filamentous fungi in bioremediation.

### **2.5.3 Biosystems Engineering Group**

Main achievements in imagery include submission of a patent on plant clone identification using artificial intelligence methods and spectroscopy; Publication in a ISI indexed journal of a worldwide innovative method for intra growth ring measurement of wood density using hyperspectral imaging; development of an experimental methodology for natural territories and smart sustainable cities to improve the carbon footprint by promoting intelligent use of energy; development of an experimental methodology to predict lower limb biomechanics during trail walking which can be employed to assess the ability of a trail in promoting a healthy lifestyle. A direct search method methodology was developed to calibrate a mobile terminal for use in location systems.

Wood mechanical and quality evaluation achievements include evaluation of bending stiffness evaluation of MDF panels comprising a mixture of eucalyptus fibres and recycled sugarcane particles. Heterogeneous plate bending tests that couple deflectometry with virtual field method. Local identification of earlywood and latewood constituents at the growth ring scale by coupling digital image correlation

with a virtual field method. Direct evaluation of cohesive law in mode I for wood by coupling CBBM with full-field measurements provided by digital image correlation.

## **2.6 Outreach activities**

Outreach activities are an important part of CITAB's agenda, since they promote and divulge the Centre's research activities to key sectors such as the scientific community, stakeholders in both the private and public sector, to budding future scientists that are still at secondary school and the general public. As a result, CITAB's activities are specifically developed to meet different levels of knowledge according to the needs of the organizations CITAB interacts with.

### **2.6.1 Interacting with other members of the scientific community**

CITAB promoted several activities within the scientific community over 2012 aiming to guide research activities and generate new ideas (individual and joint activities with other research Units).

SAC Researchers gave talks or presented posters in workshops as part of the "*Fascination of Plants Day*" organized by the European Plant Science Organisation (EPSO) in May 2012 and the Open Door to Science Technology initiatives in November 2012 at the University of Minho.

EI researchers gave a 3 day workshop "*Introduction to benthic macroinvertebrate identification of the streams in the Algarve*" in November 2012 at the laboratories of the Faculty of Science and Technology, University of Algarve as part of the European funded project "*IMPACT - Developing an Integrated Model to Predict Abiotic habitat ConDiTions and biota of rivers for application in climate change research and water management*". The course will be repeated in 2013 and the EI researchers responsible for the course have been invited to act as consultants to the IMPACT project. EI researchers also participated in the Forestry Department's annual "*Forestry Week*" event in April 2012 at UTAD which had the theme "*Forest and Well Being*".

A keynote talk was given by a BE researcher in "*Multidisciplinary contributions for promoting healthy lifestyles in a sustainable natural environment*" at the 7th workshop of the Marcaduro project.

### **2.6.2 Interacting with stakeholders**

CITAB continued to develop ties with key regional and national stakeholders over 2012 through talks, poster presentations and demonstrations of research that has direct applications to specific sectors.

SAC researchers gave a series of talks or poster presentations covering subjects of specific interest to Douro Region wine growers, represented by the "*Associação para o Desenvolvimento da Viticultura Duriense*". Talks were given on the study of the effect of extreme climate events on wine growing in the region while poster presentations covered the use of technology such as digital imagery, web based water management systems and wireless sensors in the wine growing sector.

Ecointegrity researchers developed protocols with the National Forest Authority during 2012 on 'Portuguese Forest Adaptation to Climate Changes' and Scientific support to the national project "Common Forest". EI researchers gave "e-learning" lessons on game hunting via the "Know how to hunt" e-platform available at Nature Gest (<http://www.naturagest.com/moddle>). The course was approved by the Portuguese National Authority for Animal Health.

BE researchers presented a method of measuring wood density using hyperspectral imaging in November at *International Trade Fair for Machinery, Equipment and Services* (EMAF), which was held at EXPONOR in the city of Porto in November 2012. The demonstration took place at the INFAIMON stand – a company that specializes in artificial vision systems.

### **2.6.3 CITAB and the community at large**

CITAB is building on previous successful initiatives and developing new activities for the general public and secondary schools. A cornerstone of CITAB's outreach philosophy is that today's secondary school students with an interest in science are tomorrow's potential researchers. CITAB outreach policy builds on this potential, which is strongly reflected in several of the 2012 initiatives.

For the general public and the university population in general, CITAB continued to actively promote the "Science at Lunchtime" cycle of monthly conferences where invited scientists talk on themes related to their research. Other initiatives included collaborations with regional municipal councils. As part of the "Biodiversidade de Vila Real" programme (Vila Real Municipal Council) EI researchers organized a "Save the frog" voluntary event comprising a seminar and two days of fieldwork in March 2012. Several EI researchers collaborated in the setting up of the "UTAD-biodiversity museum" in summer of 2012. EI researchers also organized and taught in collaboration with the Mirandela Municipal Council a one day course in "Freshwater Bioindicators and Riparian Galleries" in the River Tua as part of the World Environment Day celebrations in June 2012.

Two separate outreach activities involving nocturnal bat observation for the general public were organized by EI researchers in August and October 2012 as part of the "Year of the bat" activities.

EI researchers wrote and published a free downloadable guide to the flora of the western Transmontan highlands, which is available on the UTAD botanical garden website <http://jb.utad.pt/material-informativo/guias/28>. SAC and EI researchers organized and participated in a series of activities specifically developed to involve young scientists in activities directly related to research underway in CITAB. These initiatives were organized as part of initiatives such as "Universidade Junior", "Ciência Viva" and "Ocupação Científica de Jovens nas Férias" (the latter two activities are FCT funded). SAC activities included observation and manipulation of *Drosophila*, biotechnological techniques to improve grape vine, micropropagation of plants and experiments in gene transfer. EI activities included work on yeasts in floral nectar, fish as indicators of river health and "CSI river environment".

### 3 Funding

	2010	2011	2012	Subtotal
FCT Base	200.062,50 €	65.945,10€€	65.085,64€	265.148,14€
FCT Projects	1.108.512,37 €	703.901,91 €	886.153,71€	2.698.567,99€
Other (National)	2.152.074,58 €	958.036,58 €	2.091.093,01€	5.201.204,17 €
Other (International)	266.568,50 €	83.388,33 €	219.746,77€	569.703,60€
Industry (National)	58.400,00€	381.443,84 €	213.684,83€	653.528,67€
Industry (International)	0,00 €	,00 €	0,00€	0,00€
<b>Total</b>	<b>3.785.617,95 €</b>	<b>2.126.770,66 €</b>	<b>3.418.93,29€</b>	<b>9.388.152,57 €</b>

### 4 General indicators

	2008	2009	2010	2011	2012	Total
Contracted Researchers (Ciência Programme)	1	4	1	0	0	5 <sup>a)</sup>
Researchers (FTE)	42	55	66	73	74	--
Masters degrees (Master thesis completed)	26	52	15	38	29	160
PhDs (PhD thesis completed)	4	11	11	9	6	41

*a) Due to serious health issues one of the Contracted Researchers could not proceed with his work (since 2011)*

## 5 Research Groups

Reference	Group Title
RG-Norte-4033-134	<u>Sustainable Agro-food Chains</u>
RG-Norte-4033-135	<u>Ecointegrity</u>
RG-Norte-4033-136	<u>Biosystems Engineering</u>

### 5.1 Sustainable Agro-food Chains

#### 5.1.1 Group description

Principal Researcher	Henrique Trindade
Research area	Agricultural Sciences
Home Institution	Universidade de Trás-os-Montes e Alto Douro

#### 5.1.2 Funding

	2010	2011	2012
FCT Projects	327.933,70€	361.903,30€	361.944,00€
Other (National)	158.946,00€	525.443,50€	982.314,67€
Other (International)	91.543,90€	80.388,33€	93.922,77€
Industry (National)	43.400,00€	227.293,40€	14.869,87€
Industry (International)	0,00€	0,00€	0,00€
<b>Total</b>	<b>621.823,60€</b>	<b>1.195.028,53€</b>	<b>1.453.051,31€</b>

### 5.1.3 Objectives

#### 5.1.3.1 Project #5 - Agronomy, climate change & environmental studies (ACES)

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

#### 5.1.3.2 Project #6 - Added-value plant products & co-products (APPC)

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

### 5.1.4 Main achievements

Over 2012, the SAC projects “*Agronomy, climate change & environmental studies*” and “*Added- value plant products & co-products*” achieved the following:

Preservation of biodiversity and reduction of environmental impact was a major focus of CITAB research. A chestnut germplasm bank was set up, hazelnut germplasm was evaluated. A study to improve sustainability in olive groves through cover crops in rainfed systems also started. The reduction of chemical inputs to suppress phytopathogenic fungi was achieved after composting photochemical-rich plant materials (e.g. brassica).

Special concern was given to the climate change and mitigation measures. Downscale of viticulture zoning was developed and the use of kaolin-based particle film to prevent leaf sunburn damage and drought stress on grapevines was tested. New, adapted chestnut and hazelnut Portuguese varieties to pathogenic diseases, and the use of cover cropping techniques to improve the profitability and the sustainability of rainfed olive orchards were investigated. Reduced greenhouse gas emissions from animal slurries were also achieved following treatment with nitrification inhibitors prior to soil application.

At cellular level, a new model for biochemical and biotechnological applications (nutrient transport, toxicological assessments, etc) was developed following purification of intact, functional protoplast and vacuole populations from grape cells; this will help to study the effects of abiotic stress in several crops, in particular vine, chestnuts and olives.

Specific achievements on health related phytochemicals are the anticancer effects (colorectal cancer cells) from *Salvia*, *Hypericum* and olive leaves extracts and some of their phenolic compounds, the anti-proliferative effect of endopolysaccharides extracted from the fungi *Ganoderma resinaceum*, *Phlebia rufa* and *Tramete*, the antioxidant properties of elderberries on the activity of stress induced enzymes (SOD, CAT, GPx), the neuroprotective properties of extracts and compounds from *H. perforatum*, the anti-ageing and antioxidant defences in human fibroblasts, from Curcumin, production of biopolymers from molecular farming in lettuce, and isothiocyanates as anti-microbial compounds against human pathogenic bacteria. New products for the market were developed from the same research line such as biofunctional textiles using resveratrol and other plant extracts, and nanoencapsulation of plant bioactives.

#### 5.1.4.1 Mobility

Mobility included invitations to teach as postgraduate level “*Masters in Engineering for Rural Development*” University of Santiago de Compostela, Spain, a Master class in grape vine physiology as part of the post graduate course in Enology at the Biotechnology School of the Portuguese Catholic University (ESB-UCP). Several researchers obtained funding to study, take sabbatical abroad or continue to develop studies with foreign institutions. Collaborative research on copper impacts in the grape berry was conducted by Professor Hernâni Gerós (CITAB Universidade do Minho nucleus) and Viviana Martins, an FCT funded PhD student (FCT grant no. SFRH/BD/64587/2009) in collaboration with Professor Eduardo Blumwald of UC Davis (USA). Hernâni Gerós was a Fulbright scholar at the Department of Plant Sciences (Eduardo Blumwald's Laboratory), during this visit ([http://fulbright.ucdavis.edu/profile\\_geros\\_hernani.shtml](http://fulbright.ucdavis.edu/profile_geros_hernani.shtml)). Collaborative studies included work on physiological, biochemical and molecular copper uptake mechanisms and intracellular compartmentation. Results of part of these studies were recently published in the International scientific journal *Plant and Cell Physiology* (Martins et al. 2012. “*Copper Transport and Compartmentation in Grape Cells*” *Plant Cell Physiol* (2012) doi: 10.1093/pcp/pcs125). Ongoing research resulting from this mobility initiative will investigate the effects of copper application on the metabolism/quality of the grape berry, which may provide important practical implications. SAC researcher Ana Lúcia Rebocho Lopes Pinto e Sintra continued activities at the Tissue Culture and Transformation Laboratory, Department of Biology and Genomic of Fruit Plants at Edmund Mach Foundation, Instituto Agrario di San Michele all'Adige (IASMA). Trentino, Italy building on work developed during her sabbatical leave in 2010. Researcher João Santos and Climate Team members regularly visit other Portuguese R&D units and/or universities that share common scientific projects, namely University of Lisbon, University of Aveiro and University of Évora. Further, the strengthening of the international collaborations with the University of Cologne (Germany), the University of Salamanca (Spain) and the University of Reading (UK) is underway, with several joint publications and communications in scientific meetings.

## 5.1.5 Group productivity

### 5.1.5.1 International Projects

SAC members participated in 3 international projects during 2012 (see table below):

Project name	CITAB Funding
ReUseWaste - Recovery and Use of Nutrients, Energy and Organic Matter from Animal Waste. CITAB Coordinator: Henrique Trindade. Starting date: January 2012, duration: 48 months (FP7-PEOPLE-2011-ITN). <a href="http://www.reusewaste.eu/">http://www.reusewaste.eu/</a>	€212.796,06
"Good Practice in Traditional Chinese Medicine Research in the Post-genomic Era". CITAB coordinator: Alberto Dias. Starting date: May 2009, duration: 36 months (FP7-HEALTH-2007-2.1.2-7; Coordination action)	€80.215,00
MoDeM IVM "A Web-based System for real-time Monitoring and Decision Making for Integrated Vineyard Management". CITAB coordinator: Manuel Teles Oliveira. Starting date: January 2011, duration: 24 months (FP7-SME-2010). <a href="http://www.modem-ivm.eu/ngcontent.cfm?a_id=9968">http://www.modem-ivm.eu/ngcontent.cfm?a_id=9968</a>	€82.680,00

### 5.1.5.2 National Projects

SAC researchers participated in 35 national projects during 2012:

Project name	CITAB Funding
AlertCast - Implementation of a Network Information for promoting chestnut quality. CITAB coordinator: Teresa Pinto. Starting date: January 2012, duration: 36 months. Promotor: Cooperativa Agrícola Penela da Beira, CRL (QREN Vale I&DT 23628).	€33.400,00
IrrigOlive - Deficit irrigation on olive, in the region of "Terra Quente Transmonta", to optimization water resources, productivity and olive oil quality. CITAB coordinator: Anabela Silva. Starting date: January 2012, duration: 36 months. Promotor: Aviaz Produção e Comercialização de Vinhos e Azeites, Lda - (ProDer).	€202.257,88
Developing processes and technologies aiming the production of ink disease resistant chestnut rootstocks, compatible with national varieties certified with molecular markers. CITAB coordinator: José Laranjo. Starting date: January 2012, duration: 36 months. Promotor: Certifruteiras.com Lda. (ProDer PA 45967)	€15.792,14



Project name	CITAB Funding
GreenVitis - Effects of soil management on productivity and sustainability of grape vineyards system. CITAB coordinator: Armindo Afonso Martins. Starting date: January 2012, duration: 36 months. Promotor: Quinta do Vallado Lda. (ProDer PA 43879)	€413.397,29
“Good Agricultural practices for the Sustainable Use of Wastewater”. CITAB coordinator: Henrique Trindade. Starting date: January 2012. Duration: 36 months (ProRede RuralNacional PA 0400238)	€83.805,69
Molecular biology of grape berry phenolic maturation. CITAB coordinator: Ana Alexandra Oliveira. Starting date: February 2012. Duration: 36 months (PTDC/AGR-PRO/120264/2010)	€118.740,00
Animal slurry management: sustainable practices at field scale. CITAB coordinator: Henrique Trindade. Starting date: January 2012, duration: 36 months (PTDC/AGR-PRO/119428/2010)	€45.000,00
In-Nitro: conceptualizing the effects of increased nitrogen availability in a Mediterranean ecosystem. CITAB coordinator: Henrique Trindade. Starting date: January 2012, duration: 36 months (PTDC/BIA-ECS/122214/2010)	€15.411,00
EcoDeep - Eco-efficiency and Eco-management in the Agro-Food sector. CITAB coordinator: Henrique Trindade. Starting date: September 2011, duration: 24 months. (QREN - Sistema de Apoio a Ações Coletivas)	€11.4625,00
“Caracterização funcional de novos transportadores ABC de planta com regulação diferencial em células especializadas na acumulação de alcalóides medicinais em <i>Catharanthus roseus</i> (L.) G. Don”. CITAB coordinator: Hernâni Gerós. Starting date: 2011. Duration: 36 months. (PTDC/BIA-BCM/119718/2010)	N/A
Molecular mechanisms of Agrobacterium recognition and defense activation in recalcitrant plant species. – How do recalcitrant plants avoid T-DNA transfer?. CITAB coordinator: Franklin Gregory. Starting date: December 2011. Duration: 36 months. (PTDC/AGR-GPL/119211/2010)	€153.000,00
AQUAVITIS - Understanding water transport in <i>Vitis vinifera</i> : biochemical characterization of aquaporins upon their heterologous expression in yeast. CITAB coordinator: Hernâni Gerós. Starting date: 2010, duration: 36 months. (PTDC/AGR-AAM/099154/2008)	€14.400,00
3DWikiU - Wiki 3D for Urban Environments. CITAB coordinator: João Paulo Moura. Starting date: April 2010. Duration: 36 months (PTDC/EIA-EIA/108982/2008)	N/A

Project name	CITAB Funding
CLIFE - Climate change of precipitation extreme episodes in the Iberian Peninsula and its forcing mechanisms. CITAB coordinator: João Santos. Starting date: January 2011. Duration: 36 months (PTDC/AAC-CLI/111733/2009)	€37.409,00
"Cover cropping: a decisive strategy for the sustainable management of rainfed olive orchards". CITAB coordinator: Carlos Manuel Correia. Starting date: March 2010, duration: 36 months. (PTDC/AGR-AAM/098326/2008).	€93.987,00
"Understanding Resistance to Pathogenic Fungi in Castanea sp." CITAB coordinator: José Laranjo. Starting date: February 2010, duration: 42 months. (ResCast).	€8.400,00
RAIDEN - Lightning activity in Portugal: variability patterns and socioeconomic impacts. CITAB coordinator: João Santos. Starting date: June 2009, duration: 42 months. (PTDC/CTE-ATM/101931/2008). <a href="http://raidem-project.ul.pt/">http://raidem-project.ul.pt/</a>	€72.356,00
ERLAND - Direct and indirect impacts of climate change on soil erosion and land degradation in Mediterranean watersheds (FCT, PTDC/AAC-AMB/100520/2008. CITAB coordinator: João Carlos Andrade dos Santos. Starting date: 2010, duration: 36 months	N/A
Effect of phytochemicals on organic matter transformation and on key processes of carbon and nitrogen cycles in soil. CITAB coordinator: Henrique Trindade. Starting date: January 2010, duration: 36 months (PTDC/AGR-AAM/102006/2008).	€125.680
Trace gas emissions from Portuguese irrigated rice fields in contrasting soils, by the influence of crop management, climate and increase concentration of CO2 in the atmosphere. CITAB coordinator: Henrique Trindade. Starting date: March 2010, duration: 36 months (PTDC/AGR-AAM/102529/2008)	€45.360,00
ClimVineSafe - Short-term climate change mitigation strategies for Mediterranean vineyards. CITAB coordinator: José MoutinhoPereira. Starting date: April 2011, duration: 36 months. (PTDC/AGR-ALI/110877/2009)	€111.456,00
Functional foods for neuroprotection: a role to Hypericum perforatum (Hyperic-Food). CITAB coordinator: Alberto Carlos Pires Dias. Starting 2010, duration: 36 months (PTDC/ AGR-ALI /105169/2008).	N/A
Infowine - Thematic Networks of Information and Dissemination. CITAB coordinator: Eduardo Rosa. Starting date: January 2011, duration: 36 months (ProDer PA 14301)	€60.739,50
Myrtillus with innovation. CITAB coordinator: Ana Paula Silva. Starting date: December 2010, duration: 36 months (QREN Co-Promoção 13736 - Myrtillus)	€158.393,00
NanoSKIN: Chemotherapeutic agent-loaded nanoparticles for innovative therapy of severe skin diseases – muco-/cutaneous Leishmaniasis and squamous cell carcinoma as examples. CITAB coordinator: Amélia Silva. Starting	N/A

<b>Project name</b>	<b>CITAB Funding</b>
date: July 2010, duration: 24 months (ERA-Eula/0002/2009)	
NaturAge - Anti-aging properties of natural compounds. CITAB coordinator: Cristóvão Lima. Starting date: May 2010, duration: 36 months (PTDC/QUI-BIQ/101392/2008). <a href="https://sites.google.com/site/naturageproject/home">https://sites.google.com/site/naturageproject/home</a>	€145.884,00
NutriDouro - Healthy crystalised fruits and jams with a traditional flavor. CITAB coordinator: Amélia Silva. Starting date: June 2010 duration: 36 months (QREN Co-Promoção 13111)	€476.838,00
Physical exercise role on Human' lymphocyte DNA damage reduction: possible influence of oxidative stress and DNA repair capacity. CITAB coordinator: Amélia Silva. Starting date: 2012, duration: 36 months (PTDC/DES/121575/2010)	N/A
OlivaTMAD - Thematic Networks of Information and Dissemination of Olive Cultivation Line of Trás-os-Montes and Alto Douro. CITAB coordinator: Eduardo Rosa. Starting date: January 2011, duration: 48 months (ProDer PA 14346)	€241.791,00
Scots pine in Portugal: the "Southwest end" or just "the end"?. CITAB coordinator: Domingos Lopes. Starting date: January 2011, duration: 36 months (PTDC/AGR-CFL/110988/2009)	€181.781,00
PromoAgro - Promotion of Agro-food Competitiveness. CITAB coordinator: Eduardo Rosa. Starting date: October 2010, duration: 36 months (NORTE - 07 - 0162 - FEDER - 000042)	€1.480.724,56
KlimHist - Reconstruction and model simulations of past climate in Portugal using documentary and early instrumental sources (17th-19h). CITAB coordinator: João Santos. Starting date: March 2012, duration: 36 months (PTDC/AAC-CLI/119078/2010)	€19.678,00
SambucusFRESH - Improving productivity and quality in the production of elderberry in fresh, chilled and frozen. CITAB coordinator: Eunice Bacelar. Starting date: June 2012, duration: 36 months. Promoter: Regiefrutas (QREN Co-promoção 23109)	€248.242,96
SerCast- Reinforce of chestnut productivity in Sernancelhe municipality. CITAB coordinator: José Laranjo. Starting date: May 2012, duration: 36 months (Protocol with Sernancelho Municipality)	€44.609,00
WUSSIAAME - Water use, survival strategies and impact of agrochemicals on water resources in agricultural Mediterranean ecosystems. CITAB coordinator: Aureliano Malheiro. Starting date: February 2012, duration: 36 months (PTDC/AAC-AMB/100635/2008)	€51.574,00

### 5.1.5.3 Publications in peer review journals

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Azevedo Raquel, E. R., Figueiredo Daniela, Peixoto Francisco and Santos Conceição. (2012). Methodologies for the study of filamentous cyanobacteria by flow cytometry. *Fresenius Environmental Bulletin*, 21: 679–684. [http://www.psp-parlar.de/details\\_artikel.asp?tabelle=FEBArtikel&artikel\\_id=3901&jahr=2012](http://www.psp-parlar.de/details_artikel.asp?tabelle=FEBArtikel&artikel_id=3901&jahr=2012)

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### **5.1.5.7 Books**

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### **5.1.5.8 Masters and Ph.D.theses completed**

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- MSc CANTÓ, Rocío Gómez. 2012. Respuestas fisiológicas y vitícolas de las variedades Moscatel Gallego Blanco y Boal en la Región Demarcada del Duero. Master in Engenharia Agronómica. UTAD, Vila Real. Supervisors: Aureliano Malheiro and José Moutinho Pereira (UTAD)
- MSc GONÇALVES, A. T. C. (2012) - Estudos de crescimento de *Arundo donax* para utilização no tratamento de efluentes de aquaculturas Salinas. Master in Ecologia, Ambiente e Território - Faculdade de Ciências da Universidade do Porto. Supervisors: Maria Teresa Borges (FCUP) and Isabel Aguiar Pinto Mina (UM).
- MSc GUIMARÃES, M. C. V. S. (2012) - A Física no campo: como uma saída de campo em Biologia ou Geologia pode incluir a Física. Master in Ciências – Formação contínua de Professores, Área de Especialização em Física e Química – ECUM. Supervisors: Mário Almeida and Isabel Aguiar Pinto Mina (UM).
- MSc LOPES, E.S. (2012) - Caracterização química e avaliação da actividade antioxidante de *Coriandrum sativum*. Master in Biotecnologia e Qualidade Alimentar, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Ana Lúcia Sintra and Francisco Peixoto (UTAD).
- MSc MARQUES, E.S.D. (2012) - Avaliação do potencial antioxidante e da actividade antimicrobiana de extractos vegetais alimentares em isótopos de alimentos, animais e humanos. Master in Biotecnologia e Qualidade Alimentar, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Maria José Felix Saavedra e Alfredo Aires (UTAD).
- MSc PINTO, P.A.A. (2012) - Avaliação do efeito da anestesia com propofol, em

- ratos, na funcionalidade mitocondrial hepática. Master in Biologia Clínica Laboratorial, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Francisco Peixoto and Carlos Venâncio (UTAD).
- MSc ROCHA, N.N.B.A. (2012) - Promoção de Rotas de Produtos Regionais. Master in Informática, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Pedro Mestre and Paula Cristina Oliveira (UTAD).
- MSc RODRIGUES, Jorge Miguel Pires (2012) - Flow cytometry as a novel tool for structural and functional characterization of isolated yeast vacuoles. Master in Biofísica e Bionanossistemas. Escola de Ciências. Universidade do Minho. Supervisors: Manuela Côrte-Real and Hernâni Gerós (UM).
- MSc SILVA, P.A.S. (2012) - Caracterização do perfil hematológico e dos parâmetros bioquímicos do soro da Cabra (*Capra aegagrus hircus*) e sua comparação com os de indivíduos da sub-família *Caprinae* já caracterizados. Master in Biologia Clínica Laboratorial, Universidade de Trás-os-Montes e Alto Douro, Vila Real. Supervisors: Amélia M. Lopes Dias da Silva and Maria Isabel R. Dias (UTAD).
- MSc SOUSA, R. C. C. (2012/13) - Rhizosphere characterization of a Constructed Wetland and relation to Enteric Bacteria. Mestrado em Biologia Molecular, Biotecnologia e Bioempreendedorismo em Plantas. Orientação de Isabel Aguiar Pinto Mina (DB-ECUM) e Maria Cristina Calheiros (ESB-UCP).
- MSc VERÍSSIMO, Taciana Margarida Lourenço Silva. (2012) - Visualização 3D na Web. Master in Comunicação e Multimédia, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Paula Cristina Oliveira and João Paulo Moura (UTAD).
- PhD FELGUEIRAS, M.M.L. (2012). Avaliação de respostas fisiológicas e de mecanismos de defesa induzidos pela aplicação de agentes de controlo biológico em videiras (cv. Alvarinho) infectadas com *Phaeomoniella chlamydospora*. Universidade do Minho. Doctor in Ciências – Especialidade de Biologia. Supervisors: Alberto Dias (UM) and José Moutinho Pereira (UTAD).
- PhD GALHANO, V.M.F. (2012) - Impact of herbicides on non-target organisms in sustainable rice production systems. Effects of bentazon and molinate on the autochthonous cyanobacteria *Anabaena cylindrica* and *Nostoc muscorum*. Doctor in Engenharia Biológica. Supervisors: José Gomes Laranjo and Francisco Peixoto (UTAD).
- PhD RODRIGUES, A.S. (2012) - Caracterización del perfil polifenólico y de otras características de calidad en variedades regionales de cebolla (*Allium cepa* L.) portuguesas", Abril, 2012, *Doctor in Qualidade, Segurança e Tecnologia Alimentar*. Universidade de Vigo, Faculdade de Ciências de Ourense, Espanha. Supervisors: Jesus Simal-Gandara (UVigo) and Domingos Paulo

Ferreira de Almeida (U.Porto).

### **5.1.5.9 Patents/prototypes**

N/A

### **5.1.5.10 Organization of conferences**

Workshop “Auditing of Internal Systems in Quality Assurance: framework, principles, criteria and benchmarks” A3ES, Viana do Castelo, May-2012. Coordinator: Ana Sofia Rodrigues.

International Congress in the Valuation of of Traditional Products Ponte de Lima, 3th – 5<sup>th</sup> May, 2012. Member of the organizing committee - Ana Sofia Rodrigues.

“Sustainability of Wine growing - Wine Tasting and Olive Oil”; 14th – 15th June 2012. Organized by CITAB, CAP, CVRTM, AOTAD, ADVID. <http://www.vitilabtek.com/sfv2012/>

"Technical Seminar on the Chestnut – Multifunctional Management"l". Murça, 21st July 2012. AFLODOUNORTECITAB -UTAD (<http://castanha.utad.pt/jornadas>)

6th UTAD Biology Seminars “Past, Present and Future”. 18th – 19th October 2012 University of Trás-os-Montes e Alto Douro, Vila Real, Portugal.

XIX Seminar in Classification and Data Analysis (JOCLAD2012), JoCLAD2012 <http://www.joclad2012.ipt.pt/>

### **5.1.5.11 Industry contract research**

N/A

### **5.1.5.12 Internationalization**

Among others, SAC researchers have active and effective collaborations in several activities:

2<sup>nd</sup> International Conference on Antimicrobial Research, 21-23 November 2012, Lisbon, Portugal. This important microbiology International Conference provided interesting, novel scientific information for thousands of worldwide research on microbiological fields, food compostion and Human health. The meeting provided a chance to discuss solutions to future challenges. Alfredo Augusto de Carvalho Aires and Eduardo Augusto dos Santos Rosa researchers.

International Conference on Environmental and Occupational Health. October 17-19, Porto, Portugal. Amélia Dias da Silva researcher.

9<sup>th</sup> Central European Symposium on Pharmaceutical Technology, September 20-22, Dubrovnik, Croatia. Amélia Dias da Silva researcher.

6<sup>th</sup> Spanish-Portuguese-Japanese Organic Chemistry Congress. 18-20 July, Faculdade de Ciências da Universidade de Lisboa, Portugal. Amélia Dias da Silva researcher.

8<sup>th</sup> World Meeting on Pharmaceutics, Biopharmaceutics and Pharmaceutical Technology. 19<sup>th</sup> to 22<sup>nd</sup> March 2012, Istanbul, Turkey. Amélia Dias da Silva researcher.

12<sup>th</sup> International symposium of Controlled Release Society (Indian Chapter), 9 - 10 February. Mumbai, India. Amélia Dias da Silva researcher.

II International Symposium on Bee Products, September 9 - 12 2012, Bragança, Portugal. Ana Cunha researcher.

MPA 2012 – 6<sup>th</sup> Int. Meeting on Developments in Materials, Processes and Applications of Emerging Technologies, 2-4 July 2012, Alvor-Algarve (Portugal). Ana Cunha researcher.

Redox Signaling and Oxidative Stress in Health and Disease. Valencia (Spain), June 5-7, 2012. Ana Cristina Pontes Carvalho and Cristovão Lima researchers.

Collaboration with Tissue Culture and Transformation Laboratory, do Department of Biology and Genomic of Fruit Plants at Edmund Mach Foundation, Instituto Agrario di San Michele all'Adige (IASMA). Ana Lúcia Sintra researcher.

Mobility Action Erasmus Program LLP/Erasmus, Universidad de Zaragoza, Escuela Politécnica Superior de Huesca, Departamento de Agricultura y Economía Agraria. June 4-6.

European project InnoVine- “Combining innovation in vineyard management and exploration of genetic diversity for a sustainable European viticulture” Call identifier: FP7-KBBE-2012-6. Hernâni Gerôs researcher.

Action COST FA1106 "An integrated systems approach to determine the developmental mechanisms controlling fleshy fruit quality in tomato and grapevine – “QualityFruit”. Hernâni Gerôs researcher.

V Congresso Ibérico de Ciência do Solo. September 6-10 2012, Angra do Heroísmo. Afonso Martins researcher.

Master classes of "Máster en Enxeñaría para o Desenvolvemento Rural" e participação no "Seminário de Doutores" da Universidade de Santiago de Compostela (Campus de Lugo). De 10-12-2012 até 14-12-2012. Aureliano Natálio Coelho Malheiro researcher.

#### **5.1.5.13 Prizes**

Award of Professional Qualification: Senior Level Member of the Order of Engineers. José Luís da Silva Pereira

#### **5.1.5.14 Government/Organization contract research**

Regional Water Forum - participation in working groups to develop policies at a series of meetings: 2<sup>nd</sup> February 2012 (Theme “knowing”, held at Viana do Castelo – Municipal Library), March 15<sup>th</sup> (Theme “Value”, held at Municipality of Santo Tirso) and March 29<sup>th</sup> (Theme “Recovery”, held at Auditorium Lipor I Baguim Mount)



International Conference Ecosaldo – “Accounting in the green economy” – held at Gaia Biological Park, May 2012.

SerCast- Reinforce of chestnut productivity in Sernancelhe municipality. (Protocol with Sernancelho Municipality). Starting date: May 2012, duration: 36 months

## 5.1.6 Future research

### 5.1.6.1 Objectives

Climate variability and environmental impacts research objectives include regionalization of the atmospheric electrical activity over the Iberian Peninsula, by modelling lightning activity and identifying major forcing factors; high spatial resolution of viticultural climatic zoning over Europe and Portugal and assessment of climate change impacts on the winemaking sector and development of adaptation/mitigation measures; Paleoclimatic reconstructions over Portugal and validation of reconstructed time series.

Biodiversity resource research will include selection of organically produced blueberry cultivars best adapted to the soil and climate of northern Portugal; characterization of blueberries, raspberries and blackberries produced in Portugal (analysis of the effects of harvest time and shelf life period); Exploitation of traditional fruits from the island of Madeira in terms of sustainability, nutritional data and health impact; Continue studies initiated in 2011 on the implementation of dual axis conduction system on apple trees.

Studies on environmental stress will include, improving cropping practices and mitigation measures to ameliorate the physiological responses of *Vitis vinifera* L. and *Olea europaea* L. using reflective antitranspirants; Improve water use and productivity of rainfed olive orchards by cover crops; Early detection and management of drought stress in *O. europaea* L.; the study of the physiological mechanisms of salicylic acid application in drought tolerance of *O. europaea* L.; morpho-physiological characterization of Portuguese varieties of *Sambucus nigra* L. and their responses to abiotic stress; Genotypic variation in tolerance to long-term high RH in cut roses (*Rosa hybrida* L.). Nutrient cycles, processing and reuse of animal and agro-food residues research will work on the improvement of animal slurry agronomic value and environmental impact after treatment with selected bacteria strains and enzymes; Gas emission evaluation from treated stored animal slurries and field application and gas emissions of slurry treated by additives and mechanical separation to an intensive double crop forage system. Assessment of organic N net mineralization, ammonia and greenhouse gas emissions from soils amended with composts rich in phytochemical compounds – effects of temperature and soil humidity content.

Plant products and co-products (3P's) will work on composition and health effects of essential oils water and ethanolic extracts from *Thymus vulgaris* L. and *Thymus mastichina* L. and investigate how the anti-oxidant properties of these extracts modulate several biological mechanisms by using *in vitro* assays in selected cell lines. Work will also be carried out on the anti-proliferative effect of various salads leaf extracts by using two different cell lines and the chemical characterization and

antioxidant activity of *Coriandrum sativum* extracts, biochemical protection against t-BHP toxicity using HepG2 cells. SAC researchers will assess the hepatoprotective effect of coffee lees oil against carbon tetrachloride on rat wistar model. And evaluate parabens (food preservatives) toxicity and relevance on the reproductive capacity in male animals.

Added value products derived from agro-food wastes will work on the biological role of different vegetables and aromatic and medicinal plants as natural source of bioactive compounds with antioxidant and antimicrobial activities; Evaluate potential of development of new food- products with antioxidant and antimicrobial potential against relevant pathogenic bacteria; evaluate co-products development from agro-food wastes residues with biological added value; develop new extraction and implement new methods for assessing compounds with biological added value. As a result a patent will be submitted

MAP Biotechnology & bioactivities will study biological control agents and biopesticides against in vineyards and study the effect of plant polyphenols on intestinal SGLT1 glucose transporters, insulin secretion from beta-cells, mechanisms of colon anti-cancer effects.

The use of plant extracts for obtaining functional foods with antioxidant and neuroprotective activities will be assessed as well as the nanoencapsulation of plant extracts and selected compounds with the aim of brain targeting.

Grape berry biochemistry & quality will concentrate on cellular processes such solute (sugars/acids/phenolics) transport/metabolism in grapevine, under the effect of heat and drought, subcellular localization of copper transporters (VvCTrs) in *Vitis vinifera*, VvCTr expression during berry development by qPCR, the effect of Bordeaux mixture application in grape berry metabolome, the role of polyol metabolism in grapevine defense against drought, characterization of water transport through VvSIP1 aquaporin and grape berry photosynthesis in the fruit carbon balance.

## 5.2 Ecointegrity

### 5.2.1 Group description

Principal Researcher	Mário Gabriel Santiago dos Santos
Research area	Environment
Home Institution	Universidade de Trás-os-Montes e Alto Douro

### 5.2.2 Funding

	2010	2011	2012
FCT Projects	638.918,00 €	227.859,00€	347.873,00€
Other (National)	1.659.081,45 €	739.246,97 €	747.159,20€
Other (International)	80.000,00 €	0,00 €	0,00€
Industry (National)	15.000,00 €	337.923,98 €	198.814,96€
Industry (International)	0,00 €	0,00 €	0,00€
<b>Total</b>	<b>2.392.999,45 €</b>	<b>1.305.029,95 €</b>	<b>1.293.847,16€</b>

### 5.2.3 Objectives

Research in this group focuses on ecosystem characterization (natural or changed by human activities) at different scales of observation. Results are used to select appropriate ecological indicators or ecosystem processes that allow modelling the different components, dynamics and to set guidelines for ecosystem management, namely the conservation of natural resources, biodiversity and the restoration of disturbed areas or target species. The EI Group research is grouped into two main projects:

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

Researchers working in tasks within this project study the effects of large scale environmental change on the sustainability, resilience and diversity of disturbed natural ecosystems and agro-systems. Research aims include:

- ④ the creation of appropriate tools for capturing, characterising and predicting the spatial and temporal dynamics, structure and function of terrestrial and aquatic ecosystems affected by human disturbance;
- ④ The development and implementation of typologically appropriate management plans, based on the ecological assessment of different components of the environment, in order to rehabilitate or restore degraded systems.
- ④ Bioremediation of systems affected by anthropogenic disturbance.
- ④ Conservation of threatened species of terrestrial and aquatic ecosystems

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

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

- ④ To characterize spatial and temporal patterns of abiotic disturbance regimes and to develop management guidelines for disturbance mitigation and adaptation measures.
- ④ The ecology of endangered arthropods and their role in the functioning of ecosystems.
- ④ Integration of ecosystem services in agriculture to decrease the use of pesticides and associated costs.

### 5.2.3.3 Main achievements

Main achievements for Project #03 - Biodiversity, Environmental Assessment and Biotechnology 2012 include the development of a new integrative ecological assessment tool for aquatic ecosystems, by combining environmental bioindicators and biomarkers based on benthic and fish communities to detect the multiple stresses occurring in aquatic systems. Biomarkers for contamination assessment of fish and new applications on macroinvertebrate species were validated to detect the effects of xenobiotic compounds. Biomarkers were tested to assess toxic effects of heavy metals, namely: cadmium exposure on fish osmoregulation; waterborne copper action in cell death induction in fish gill; effect of endocrine disrupting compounds in developmental and reproductive parameters of zebrafish. Monitoring was successfully linked with

practical river restoration initiatives, especially the improvement of overall connectivity along different streams (in north and south Portugal) These findings may have a large EU relevance for Water Framework Directive monitoring programs.

EI researchers in 2012 developed of a worldwide unique and novel spatially explicit modelling framework, designated by the acronym StDM (Stochastic Dynamic Methodology), which predicts the ecological indicators responses to realistic scenarios of environmental changes. StDM integrates Multi-Model Inference statistical analysis, Stochastic-Dynamic Modelling and Geographic Information Systems within a common framework that relates ecological trends to changes in the surrounding habitats and environmental conditions at local and regional scales. Published results show that StDM can effectively captures the dynamics of the studied ecosystems by predicting the behavioural pattern of key components that operate in very complex and variable environmental scenarios, such as systems affected by man-induced disturbances.

The growing potential of StDM will ensure further collaboration with other national and international institutions in R&D and PhD projects, such as the 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”*, the PTDC/AAG-MAA/4539/2012, *“IND\_CHANGE - INDicator-based modelling tools to predict landscape CHANGE and to improve the application of social-ecological research in adaptive land management”* and the SFRH/BD/77872/2011, *“Modelling the landscape genetic structure and dispersal patterns of endangered Red-billed Cough (Pyrrhocorax pyrrhocorax) populations in Portugal: new insights for conservation and management”*.

Specific species, of high conservation value like invertebrates (e.g. the butterfly *Maculinea alcon*) and vertebrates (different species of bats, birds or mammals) were monitored and defined conservation strategies, increasing also the economic value like the hunting species. CITAB’s research on the Alcon Large Blue Butterfly , *Maculinea alcon* has been divulged in the national and international press. <http://www.publico.pt/ciencia/noticia/ha-formigas-a-cuidar-da-borboleta-mais-rara-do-pais-1460935>,

EI biotechnological research has included the detoxification of biodiesel waste treatment using fungal fermentation; the end product is subsequently used as animal feedstuff. EI researchers have thermo chemically characterized biomass from different types of wood and forest wastes and made important contributions to the bioremediation of these refractory materials and agro-food wastes using autochthonous bacteria, yeasts and filamentous fungi in the biodegradation of recalcitrant molecules. Isolates of entomopathogenic fungi and entomopathogenic nematodes were isolated from Douro Demarcated Region (DDR) vineyards with the aim to select the most effective biological control agents against pests of these agroecosystems. There was continuing research on optimal immobilization procedure of environmental yeast isolates, in alginate and alginate-kitosan beads, for application in the dephenolization of agricultural wastewaters (e.g. olive mill wastewaters and

winery effluents) and the antimicrobial activity of phenolic extracts, including the best extraction process, from olive mill wastewaters as a waste valorization process.

A basidiomycetous fungi from section *Luridi*, found in coastal sand dunes in NW of Spain, under *Cistus salviifolius* and maritime pines (*Pinus pinaster*), was described as a new species: *Boletus atlanticus* Blanco-Dios & G. Marques.

The role and distribution of autochthonous bacteria, yeasts and fungi in as functional indicators of lotic ecological quality has been assessed. Wild yeast isolates were tested for their ability to degrade dyes, and agro-industrial effluent bioremediation. El researchers collaborated in the development of molecular technology for direct detection and specific identification of the yeast *Cryptococcus neoformans*.

Studies continued in the detoxification of *Jatropha curcas* L. seed cake by fungi in order to promote its use in animal feed. Research in 2012 also focused on laccase kinetics and the role of this enzyme in fungi bioremediation and lignin degradation. El specialists hope that the results of these studies promote the sewage treatment and bioconversion of lignocellulose in products of added value (eg. ethanol and fibrous feedstuffs) and contribute to the development new added value products from lignocellulose with medicinal capabilities. The endopolysaccharides (IPS) from *Ganoderma resinaceum*, *Phlebia rufa* and *Trametes versicolor* were studied in order to assess the effect proliferation rate of HepG2 cells (tumor cells from liver).

The ntiproliferative effect of biopolymers (polysaccharides and glycoproteins) of the edible fungi *Boletus edulis* in human colon adenocarcinoma cells was another active research area. Growth inhibition was found to be associated with modulation of the p16/cyclin D1/CDK4-6/pRb pathway. Results indicate that a biopolymer BE3 from *Boletus edulis* possesses anticancer potential and may provide a new therapeutic/preventive option in colon cancer chemoprevention.

## Mobility

El researcher mobility included University of Kingston (UK) – in the field of remote sensing. University of Barcelona (Spain) \_collaborative studies on Ecological Modelling, applied to landscape planning. \_Iberian and European Centres of River Restoration (CIREF and ECRR – Spain) concerning conferences and exchange of information in the rehabilitation of disturbed aquatic ecosystems., Unversity of Paraíba and Universidade Federal de Minas Gerais (Brazil) \_exchange of scientists and Ph.D. students and teaching of advanced courses in the field of Aquatic ecology, ecological monitoring and restoration ecology. Estación Biológica de Doñana, CSIC, Spain.

Main Achievements 2012 for Project 04: Disturbance and management of forest, agro-forested and agricultural ecosystems, covered research on wildfire, basin level influences on water resource management decision making processes and the functional biodiversity of and ecosystem services provided by agricultural landscapes

Research on wildfire included updating of the Continental Portuguese Rural Fire Database, PRFD, (Pereira et al, 2011) for the 1980-2011 period and analysis of the temporal, spatial and spatio-temporal clustering of fires in Portugal (in collaboration with IGAR colleagues). The role of landscape and fire recurrence metrics on fire size

distribution in the national territory was assessed as well as the potential impact of regional climate change on wildfires using an appropriate Burnt Area Model (BAM) by assessing changes in meteorological variables and fire risk indices together with simulated data for future climate scenarios (COSMO-CLM RCM model).

The impacts of weather conditions on chestnut productivity in Portuguese and European chestnut orchards was assessed using observed data and simulations (COSMO-CLM RCM model) for recent climate conditions and ensemble projections for two climate scenarios (A1B and B1);

MIKE BASIN model was used to calibrate and validate data to generate and assess sets of multisectoral water demands (domestic and industrial water supply, irrigation, hydropower generation, among others) and study and simulate river basin catchment behaviour to specific conditions associated with wildfires and hydrological extreme events (e.g., heavy precipitation and drought) and future global changes.

The project “Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests” carried out several initiatives, such as the manipulation program of pest’s natural enemies, identification of Syrphid (Diptera: Syrphidae) community associated with the olive groves in NE Portugal, selection of subset of plant species for further consideration in habitat management; identification of limiting food resources for *Chysoperla carnea* (Neuroptera: Chrysopidae) in the Mediterranean olive groves, evaluation of effect of seven species of the family *Asteraceae* on longevity, growth and nutrient levels of *Episyrphus balteatus* (Diptera: Syrphidae) and development of phenological model to simulate olive moth, *Prays oleae* (Bernard), population dynamics in different scenarios

Studies carried out to Maximize ecosystem services provided by Douro Demarcated Region (DDR) vineyards included the identification of potential Ecological Infrastructures already present in project’s farms and principal parasitoids species of the grape berry moth, *Lobesia botrana* (Lepidoptera: Tortricidae); assessment of vineyard soils as reservoirs of entomopathogenic fungi (EPF) Collection of entomopathogenic nematodes (EPN) to be tested for the development of effective pest biocontrol strategy; Contributions for increasing functional diversity using environmental correlates and the distribution, abundance and richness of dragonflies, birds and bats in farms of the Douro region; Preliminary assessment of species richness and distribution of amphibian, reptile and mammal in relation to land use; Assessment of set of plant species for establishing Ecological Infrastructures in RDD farms selected; Publication of a brochure for farmers containing information about the establishment and maintenance of Ecological Infrastructures (specifically plant species communities) in vineyards from DDR region; Studies on mating disruption (MD) against *Lobesia botrana* in identified and discussed with expert *L. botrana* entomologist, Dott. Andrea Lucchi - Università di Pisa, Italy.

## Mobility

Dr. Mercedes Campos Aranda, Experimental Centre of Zaídin-CSIC, Spain as part of the project: *Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests* Contract PTDC/AGR-AAM/100979/2008.

## 5.2.4 Group productivity

### 5.2.4.1 International Projects

El researchers participated in 2 international projects during 2012:

Project Name	Funding
Post-fire Forest Management in Southern Europe. ESF, COST Action FP0701. Project coordinator CITAB: Paulo M. Fernandes. Starting date: 2008, duration: 60 months. <a href="http://uaeco.biol.uoa.gr/cost/">http://uaeco.biol.uoa.gr/cost/</a>	4.000,00€
Forest fires under climate, social and economical changes in Europe, the Mediterranean and other fire-affected areas of the world (FUME). CITAB Coordinator: Mário G. Pereira. Starting Date: January 2010, duration 48 months (FP7-ENV-243888-2009). <a href="http://www.fumeproject.eu/">http://www.fumeproject.eu/</a>	25.000,00 €

### 5.2.4.2 National Projects

El researchers participated in 49 national projects during 2012:

Project Name	Funding
Global Change and the Pine Processionary Moth: a New Challenge of a Summer Population (PINEPROMO). CITAB Coordinator: Paula Arnaldo. Starting Date: 2012, duration: 36 months (PTDC/AGR-CFL/118265/2010).	N/A
Ovary apoptosis in zebrafish ( <i>Danio rerio</i> ): pathways characterization, role in sexual differentiation and as endocrine disruptors. CITAB Coordinator: Ana Coimbra. Starting Date: June 2010.; duration: 36 months (PTDC/CVT/102453/2008).	137.516,00 €
Avaliação comportamental de peixes indígenas, perante estímulos primários induzidos (Luz estroboscópica, infrasons e cortina de bolhas). CITAB Coordinator: Rui Cortes. Starting Date: 2010, duration: 24 months (ADI)	N/A
River systems Biomonitoring: an integrated approach. CITAB Coordinator: Rui Cortes. Starting Date: January 2011, duration: 36 months (PTDC/BIA-ECS/114859/2009)	185.000 €
Boticas Nature and Biodiversity. CITAB Coordinator: António Fontainhas Fernandes. Starting Date: January 2010, (PTDC/BIA-ECS/114859/2009)	418.280,00 €
Science in Sinthony. CITAB Coordinator: Carla Marinho. Starting Date: March 2011, duration: 24 months (Ciência Viva)	157 700 €
Development of mycorrhizal inoculants and mycological management in marginal areas. CITAB Coordinator: Guilhermina Marques. Starting Date: January 2008, duration: 36 months (QREN Micoproject 1589)	418.764,91 €



<b>Project Name</b>	<b>Funding</b>
Desenvolvimento de uma barreira comportamental para peixes. CITAB Coordinator: Rui Cortes. Starting Date: January 2010, duration: 36 months (Project University-Industry: ADI & Original Consulting)	43.428,26 €
Economountain, Economy of biodiversity in the Vila Pouca de Aguiar mountains. CITAB Coordinator: Aurora Capapé. Starting Date: July 2012, duration: 36 months	50.000,00 €
Study of the integrated use of industrial by-products of biodiesel production in animal feed. The specific case of the use of bagasse <i>Jatropha curcas</i> . CITAB Coordinator: Rui Bezerra. Starting Date: March 2011, duration: 27 months	28 700 €
Estudo de Caracterização de Açudes Tradicionais do Médio e Alto Sabor (Aproveitamento Hidroelétrico de Baixo Sabor). CITAB Coordinator: Rui Cortes. Starting Date: 2012,	N/A
Complementary studies of fauna in the scope of Foz Tua reservoir construction. CITAB Coordinator: João Cabral. Starting Date: October 2011, duration: 12 months	75 208 €
Estudos relativos às medidas da Declaração de Impacte Ambiental (DIA) do aproveitamento hidroelétrico da Foz do Tua (AHFT). CITAB Coordinator: João Cabral.	62 842,67 €
ENAC - Evolution of North Atlantic Climate; the role of Blocking and Storm-tracks in the Past, Present and Future climate of Southern Europe (CITAB Coordinator: Mário G. Pereira. Starting Date: January 2010, duration: 36 months. (PTDC/AAC-CLI/103567/2008)	135 445,00 €
Factors affecting the post-fire natural regeneration variability in <i>Pinus pinaster</i> and <i>Eucalyptus globulus</i> in Portugal: implications for biodiversity and post-fire management. CITAB Coordinator: Paulo Fernandes. (PTDC/AGR-CFL/099420/2008)	38 338,00 €
FIRE-ENGINE - Flexible Design of Forest Fire Management Systems. CITAB Coordinator: Paulo Fernandes. (MIT/FSE/0064/2009). Starting date: 2009.	30 935,00 €
FIREGLOBULUS - Prescribed fire use in blue gum plantations. CITAB Coordinator: Paulo Fernandes. (MIT/FSE/0064/2009)	189 427 €
Flora Digital de Portugal. CITAB Coordinator: António Crespi.	35 500 €
Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests. CITAB Coordinator: Laura Torres. Starting Date: April 2010, duration: 36 months (PTDC/AGR-AAM/100979/2008)	107 800 €
FLAIR - Fire – Land – Atmosphere Inter-Relationships: understanding the processes to predict wildfire regimes in	21 240,00 €

<b>Project Name</b>	<b>Funding</b>
Portugal. CITAB Coordinator: Mário G. Pereira. Starting Date: January 2010, duration: 36 months (PDC/AAC-AMB/104702/2008)	
Maximizing Eco-services into Douro Demarcated Region vineyards. CITAB Coordinator: Laura Torres. Starting Date: January 2011, Proder	321.829,50€
Medida Compensatória MC10, designada Programa de Protecção e Valorização de Répteis, Anfíbios e Invertebrados no vale do Sabor no âmbito do Aproveitamento Hidroeléctrico do Baixo Sabor. CITAB Coordinator: Rui Cortes.	25 000,00 €
Medidas Compensatórias Nº 9 – Programa de protecção e valorização da avifauna rupícola no Nordeste Transmontano, no âmbito do Aproveitamento Hidroeléctrico do Baixo Sabor (AHBS). CITAB Coordinator: João Cabral.	85 257,33 €
Monitorização da actividade e mortalidade de Avifauna na área dos parques eólicos de Ribabelide e Lagoa de D. João e Feirão. CITAB Coordinator: João Cabral.	15 869,07 €
Monitorização de avifauna na área da futura linha eléctrica do PE Alto da Coutada. CITAB Coordinator: João Cabral.	7 765,33 €
Monitorização de avifauna no Parque Natural de Montesinho. CITAB Coordinator: João Cabral.	12 961,33 €
Monitorização de avifauna no PE Negrelo e Guilhado. CITAB Coordinator: João Cabral	7 386,67 €
Monitorização de quirópteros e avifauna no PE Sobrado. CITAB Coordinator: João Cabral.	103.480,00 €
Monitorização de quirópteros no interior dos túneis ferroviários da linha do Tua. CITAB Coordinator: João Cabral.	3 896,00 €
Monitorização de avifauna no PE Alto da Coutada. CITAB Coordinator: João Cabral.	21 792,80 €
Monitorização de quirópteros no PE Alto da Coutada. CITAB Coordinator: João Cabral.	17 048,43 €
Monitorização de quirópteros no PE Negrelo e Guilhado. CITAB Coordinator: João Cabral.	4 312,53 €
Monitorização de quirópteros no PE Outeiro. CITAB Coordinator: João Cabral.	34 537,32 €
Monitorização de quirópteros no PE Serra do Alvão. CITAB Coordinator: João Cabral.	6 300,00 €

<b>Project Name</b>	<b>Funding</b>
Monitorização de quirópteros no PE Serra do Ralo e Alto do Monção. CITAB Coordinator: João Cabral.	15 169,00€
Monitorização do Rio Cávado – Salamonde II e do Rio Rabagão – Venda Nova III. Comunidades biológicas: Ictiofauna, Macroinvertebrados bentónicos, Fitobentos e Macrófitos. CITAB Coordinator: Rui Cortes.	N/A
Monitorização dos impactes sobre as aves e distribuição de habitats e vegetação na área do parque eólico de Mafômedes, incluindo monitorização do efeito de exclusão de aves na linha eléctrica associada. CITAB Coordinator: João Cabral.	11 494,40 €
Monitorização dos sistemas ecológicos dos Parques Eólicos de Penedo Ruivo, Seixinhos e Mafômedes. CITAB Coordinator: João Cabral.	23.040,00€€
Monitorizações da actividade e mortalidade de aves junto a torres de medição de potencial eólico. Serra de Montesinho. CITAB Coordinator: João Cabral.	11 301,33 €
ForeStake - The role of local stakeholders to the success of forest policy in areas affected by fire in Portugal. CITAB Coordinator: Paulo Fernandes.	176 094,00€
Monitoring plan for the target-species Margaritifera margaritifera, Chioglossa lusitanica, Galemys pyrenaicus, Canis lupus signatus of the Sernancelhe region. CITAB Coordinator: João Cabral. Starting Date: June 2010, duration: 18 months.	73 791,90 €
Projecto AQUARIPORT: Programa Nacional de Monitorização de Recursos Piscícolas e de Avaliação da Qualidade Ecológica de Rios	N/A
Protecting is Knowing. CITAB Coordinator: António Fontainhas Fernandes. Starting Date: July 2010, duration: 24 months. (NORTE - 07 - 0162 - FEDER – 000042)	65 383,56 €
Protocolo de Colaboração no Âmbito do Projecto de Valorização das Galerias Ribeirinhas do Programa Ambiental do Empreendimento de Odelouca	N/A
Urban Green Structure: Study of the relation between public space morphology and flora and fauna diversity in the city of Porto. (PTDC/AUR-URB/104044/2008)	184 209 €
Boticas Park: Nature and Biodiversity. CITAB Coordinator: Frederico Rodrigues. Starting Date: 2009,	75 000 €
Research of Mediterranean Species Silviculture - Cedrus. CITAB Coordinator: João Carvalho.	N/A

Project Name	Funding
Seivacorgo. CITAB Coordinator: António Fontainhas Fernandes. Starting Date: February 2010, duration: 24 months	184 021,64 €
Medidas Compensatórias Nº 10 – Programa de protecção de répteis, anfíbios e invertebrados no vale do Sabor, no âmbito do Aproveitamento Hidroeléctrico do Baixo Sabor (AHBS). CITAB Coordinator: João Cabral.	74 822,67 €

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Blanco-Dios, J.B. & Marques, G. (2012). *Boletus atlanticus* sp. nov., a new species of section *Luridi* from coastal dunes of NW Spain. *Mycotaxon* **122**: 325–332.

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Fernandes, P. M., Fernandes, M., Loureiro, C. (2012). Survival to prescribed fire of plantation-grown Corsican black pine in northern Portugal. *Annals of Forest Science*, **69** (7) 813–820. <http://link.springer.com/article/10.1007%2Fs13595-012-0211-6#>

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[http://www.shirazu.ac.ir/EN/files/extract\\_file.php?file\\_id=1574](http://www.shirazu.ac.ir/EN/files/extract_file.php?file_id=1574)

Sousa, R. Varandas S., Cortes R., Teixeira A., Lopes-Lima M., Machado J. & Guilhermino L. (2012). - Massive die-offs of freshwater bivalves as resource pulses. *Ann. Limnol. – Int. J. Lim.*, 48: 105–112.

<http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8518435&fulltextType=RA&fileId=S0003408812000039>

Sturm, T., P.M. Fernandes, R. Šumrada. (2012). The Canadian Fire Weather Index System and wildfire activity in the Karst forest management area, Slovenia. *European Journal of Forest Research*, 131: 829–834.

<http://link.springer.com/article/10.1007/s10342-011-0556-7/fulltext.html>

Viana, H., Aranha, J., Lopes, D., & Warren B. Cohen. (2012). Estimation of crown biomass of *Pinus pinaster* stands and shrubland above-ground biomass using forest inventory data, remotely sensed imagery and spatial prediction models. *Ecol. Model.*, 226: 22–35.

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species from central Portugal and NW Spain. *Fuel*, 102: 737-745.  
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#### 5.2.4.4 Other publications International

Aurora Monzón, S. V. da S., Filipa Torres Manso. (2012). Integrating the deer (*Cervus elaphus*) in the Portuguese forests: Impacts and new challenges for forest certification. *Foreco*, 267, 1–6.

Bezerra, R. M. F., Sampaio, A., Dias, A. A. (2012). Trivial nomenclature of gluco-hexose in Portuguese language and other Latin based languages. *Scientific Research and Essays*, 270–271.

Cortes RMV, Jesus JB, Boavida IMBM, Hughes SJ, Varandas SGP (2012). Programa de requalificação da ribeira de Odelouca. In Jordi Camprodon M. Teresa Ferreira Marc Ordeix (Editors). *Restauro e gestão ecológica fluvial Manual de boas práticas de gestão de rios e ribeiras*. Pages 288-399. CTFC e ISA Press. ISBN: 978-972-8669-51-5.

Ribeiro C., Urbatzka R., Castro F., Carrola J., Fontáinhas-Fernandes A., Monteiro R., Rocha E. and Rocha M. (2012). In vitro exposure of Nile tilapia (*Oreochromis niloticus*) testis to estrogenic endocrine disrupting chemicals: mRNA expression of genes encoding steroidogenic enzymes. *Toxicol Mech Method*, 22: 57-43.

#### 5.2.4.5 Completed Master and Ph.D. theses

- MSc GONÇALVES, Ana Sofia Pinhanços (2012) -Aves e Parques Eólicos. Modelação e avaliação dos impactes cumulativos imputáveis à localização dos parques eólicos sobre as populações de *Alauda arvenses*. Master in Ecologia, Ambiente e Território. Faculdade de Ciências da Universidade do Porto. Supervisors: João Honrado (UPorto) & João Alexandre Cabral (UTAD).
- MSc LOPES, P.V.A. (2012) – Ligações Clandestinas nos Sistemas Públicos de Águas Residuais Domésticas – Caso de Estudo em Vila Real. Master in Engenharia Civil, Universidade de Trás-os-Montes e Alto Douro. Orientação de Luís Filipe Sanches Fernandes (UTAD)
- MSc FRAGA, C.M.M. (2012) – Vulnerabilidade de Águas Subterrâneas à Poluição na Bacia Hidrográfica do Rio Sôrdo com aplicação dos métodos GOD e AVI. Master in Engenharia Civil, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Luís Filipe Sanches Fernandes (UTAD).
- MSc CARVALHO, A.S.R. (2012) – Necessidades e Disponibilidades Hídricas na Rega da Vinha na Região Demarcada do Douro. Master in Engenharia Civil, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Luís Filipe Sanches Fernandes (UTAD).
- MSc PEREIRA, S.I.R (2012). Efeitos da genisteína no desenvolvimento embrionário e na diferenciação sexual de peixe-zebra (*Danio rerio*). Master in Biologia

Clínica Laboratorial, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Ana Maria Coimbra e Sandra Mariza Monteiro.

PhD MACHADO, B. C. C. A. (2012) - Caracterização das litologias e patologias da Sé de Lamego. Um estudo sobre alteração em monumentos graníticos. Doutoramento em Ciências da Terra e da Vida, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Elisa Preto Gomes (UTAD), Luís Manuel Oliveira Sousa (UTAD) e Guilhermina Marques (UTAD).

PhD Viana, H. (2012) - Modelling and mapping aboveground biomass for energy usage and carbon storage assessment in mediterranean ecosystems. Doutoramento em Ciências Agronómicas e Florestais, Universidade de Trás-os-Montes e Alto Douro. Supervisors: José Aranha (UTAD).

#### **5.2.4.6 Patents/propotypes**

N/A

#### **5.2.4.7 Organization of conferences**

Presentation of the "*Biodiversity web platform*" and inauguration of the "*Entomology expressed through painting.*" CMVR, Vila Real, June 12. Organization UTAD: Paula Arnold Seixas (CITAB-EI)

2012. International Meeting on Biology and Conservation of Freshwater Bivalves; 4<sup>th</sup> - 7<sup>th</sup> September. School of Agriculture, Polytechnic Institute of Bragança, Bragança. (Simone Varandas CITAB-EI was a member of the Scientific and Organizing Committee).

Portuguese Congress of Malacology; 7<sup>th</sup> – 9<sup>th</sup> September 2012. School of Agriculture, Polytechnic Institute of Bragança, Bragança. (Simone Varandas CITAB-EI was a member of the Scientific and Organizing Committee).

Red-List Training Workshop 2012. 29<sup>th</sup> September, given by Dr. Mary Seddon, Chair of IUCN SSC Mollusc Specialist Group. School of Agriculture, Polytechnic Institute of Bragança, Bragança. (Simone Varandas CITAB-EI was a member of the Organizing Committee).

International Workshop on *Margaritifera margaritifera*. 3<sup>rd</sup> – 4<sup>th</sup> September School of Agriculture, Polytechnic Institute of Bragança, Bragança (Simone Varandas CITAB-EI was a member of the Organizing Committee).

IV Congress on Wild Animals. WAVES-Portugal. School of Agriculture, Polytechnic Institute of Bragança, 28<sup>th</sup> – 29<sup>th</sup> September. Aurora Monzón was a member of the Scientific and Organizing Committee.

6th Seminars in Biology- "Past, Present, Future" UTAD, 18<sup>th</sup> -20th October 2012, Vila Real. About 160 participants.



Course on "Collecting and identifying mushrooms." Action Training in the 6th Seminars in Biology- "Past, Present, Future", 20 October 2012, UTAD, Vila Real. Teaching and organization: Wilhelmina Marques. Guilhermina Miguel da Silva Marques.

One Day seminar on "Integrated Aquatic Resource Management". 13th December 2013. Organization - Samantha Jane Hughes (CITAB-EI). With 7 guest speakers (CITAB, University of Minho and Portuguese Environment Agency).

#### **5.2.4.8 Industry contract research**

The Buck, amphibians, reptiles, mammals and birds. Monzón, A., Santos, A., Carneiro, C., 2012. "Boticas Nature and Biodiversity". Boticas.

Mammals and Amphibians. Monzón, A., Brito, A., Santos, A., 2012. "Protect is Knowing" and "project SeivaCorgo."

DVD production and promotion of the ecological interpretive guide the Course of Lamosa, Sernancelhe. (2012). City Council Sernancelhe; Mário Santos and João Alexandre Cabral; Amount: € 68,500.00.

Monitoring Activity of Bats and prospecting Mortality of Avifauna and Bats from Wind Park High's Marco during the 2nd year of the Exploration Phase. (2012). Wind Farm Gevancas, Ltd.; Mário Santos and João Alexandre Cabral; Amount: € 11,324.00.

Identification of potential sites for the placement of shelter boxes for bats and respective application, under the compensatory measures of the Lower Hydroelectric flavor. (2012). Odebrecht - Low Taste, Ltd.; Mário Santos and João Alexandre Cabral; Amount: € 11,580.00

Identification of sites for shelter and arboreal species fissurícolas to be submerged and alternate locations for placing boxes under - Lower Hydroelectric flavor. (2011/2012). Odebrecht - Low Taste, Ltd; Mário Santos and João Alexandre Cabral; Amount: € 13,826,67.

BIODIVINE. LIFE + Nature & Biodiversity. Task: Species richness and abundance of birds in vineyards. (2012). Facilitator in the Douro: advid. Coordination: Institut Français de la Vigne et du Vin (IFV), Mário Santos and João Alexandre Cabral; Amount: € 3,800.00.

Evaluation of Plant Protection and Security of 16 trees on the premises of the French School of Porto. (2012). Association of the French School of Porto - Marius Latour; Mário Santos and João Alexandre Cabral; Amount: € 1,726.67.

R. Cortes (Coordination), Varandas S., S. Hughes, A. Teixeira, A. Crespí, Jesus J., C. Santos Pereira and V. 2012. Monitoring River Rabagão, SALE NEW III. Reinforcement Program - Harnessing the Power of Venda Nova Dam. UTAD, 33 pp.

R. Cortes R, (Coordination), Varandas S., S. Hughes, A. Teixeira, A. Crespí, Jesus J., C. Santos Pereira and V. 2012. Monitoring River Cávado, Salamonde II. Reinforcement Program to Harness Salamonde II. UTAD.

Teixeira, S. Varandas (Coordinator), C. Santos, M. Lopes Pereira and V. 2012: Monitoring Ichthyofauna the Ribeira de Santa Natalia. Final Report. IPB-CIMO, Bragança.

Teixeira, S. Varandas (Coordinator), M. Lopes and Saraiva A. 2012. Study of the population of *Margaritifera margaritifera* (L.) in the vicinity of the Hydroelectric (River Tuela). IPB-CIMO, Bragança.

Chinita A.T. and Ramos Andreia (Coord. Profico Environment), A. Teixeira, R. Cortes S. Varandas (Coord. technical and scientific), S. Hughes, A. Crespi, Jesus J. Santos c., M. Lopes Pereira and V. 2012. Characterization Study of Traditional Middle Dams of the mid and lower Sabor River: Characterization of Water Masses Associated Dams. Final Report. Profico Environment and Planning.

Sousa R., Lopes-Lima M. Varandas and S. 2012. Biomonitoring of Ribeira de Oeiras: Freshwater Bivalves 2012. IMAR - Institute of Marine and Department of Life Sciences. University of Coimbra.

Cortes, R., Jesus, J., Teixeira, A., RENEWAL OF THE Vilarica RIBEIRA - HABITAT IMPROVEMENT fish. Technical Report for Profico / EDP.

PINTO, PA, Dias, AA, FRAGA, I., Marques, G., Rodrigues, MAM, Colaco, J., Sampaio, A., BEZERRA, RMF (2012). Influence of ligninolytic enzymes on straw saccharification during fungal pretreatment. *Bioresource Technology*, 111: 261-267.

#### **5.2.4.8.1 Internationalization**

Establishment of collaborative protocols with the Universidade Federal de Minas Gerais, Belo Horizonte, and the Universidade Estadual de Paraíba, Brasil.

ACTION COST - Advances in Homogenisation Methods of Climate Series: an Integrated Approach (HOME). ESSEM Action ES0601, CSO Reference COST306/06  
<http://www.homogenisation.org/>

European Forest Institute Project Center on Fire Ecology and Post-Fire Management. Network activities funded by national projects. CITAB is in the Steering Committee and lead workgroup "A scientific basis on post-fire management".

<http://www.phoenixefi.org/content/2/17/homepage>

LE:NOTRE - Landscape Education: New Opportunities for Teaching and Research in Europe. :NOTRE is a project of ECLAS (European Council of Landscape Architecture Schools). ECLAS major objects are to foster and develop scholarship in landscape architecture throughout Europe by strengthening contacts and enriching the dialogue between members of Europe's landscape academic community. <http://www.le-notre.org>

#### **5.2.4.9 Other publications National**

N/A

### **5.2.4.10 Government/Organization contract research**

N/A

## **5.2.5 Future research**

### **5.2.5.1 Objectives**

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

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

Task #3.01 – Studies on the effect of climate change and extreme events on natural and modified systems and EU directive compliant River rehabilitation will continue the works initiated in 2012 associated with rivers, reservoirs and effects of land uses/cover on water quality and systems integrity. The principal planned activities include multivariate analysis of land use, landscape metrics and pressure parameters as predictors and drivers of ecological quality using integrated biological quality elements; Development of predictive models for extrapolating ecological status in surface water bodies and climate changes effects on ecological status; Continued ecological assessment of restoration and requalification programmes for aquatic ecosystems and threatened aquatic species and publication of 4 papers in JCR journals.

Task #3.02 Effect of water contamination in fish populations will publish 6 papers in JCR journals and establish new national and international collaboration to increase scientific critical mass and internationalization.

Task #3.03 Dynamic and spatially dynamic modelling: predicting ecological indicators associated with different impacts, functional biodiversity and planning of endangered species conservation measures will test the applicability of a novel spatially explicit modelling framework in predicting ecological indicators responses to realistic scenarios of environmental changes at local and regional levels. Results will emphasise use of these integrative modelling frameworks, scenarios and projections developed to improve the use of management models for measuring and monitoring ecological integrity. Researchers working under this task will start the FCT funded project “IND\_CHANGE - modelling tools based on indicators to predict changes in the landscape and promote the application of research on socio-ecological adaptive management planning” PTDC/AAG-MAA/4539/2012.

Task #3.04 - Application of microorganisms in biotechnology and in nutrient cycling will continue research on the the role of autochthonous bacteria, yeasts and fungi in bioremediation and as functional indicators of ecological quality of degraded ecosystems and promote the use of microorganisms and their enzymatic extracts in sewage treatment processes and the bioconversion of lignocellulose in products of added value.

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

Future aims include characterisation of spatial and temporal patterns of abiotic disturbance regimes and to develop management guidelines for disturbance mitigation and adaptation measures. Ecological studies of endangered arthropods and their role in the functioning of ecosystems. Integration of ecosystem services in agriculture to decrease the use of pesticides and associated costs.

Task #4.01 - Fire Ecology and Management will establish links between fire environment, fire behaviour and fire effects in eucalyptus plantations and attempt to understand how fire policy options affect the effectiveness of fire management in Portugal. Task #4.02 Fire regime analysis and assessment of the influence of weather and climate in agro forested ecosystems will assess climate change impacts on the occurrence and burnt areas by forest fires; develop select and apply new methodologies for analyzing the fire regime and assess climate change effects on European chestnut producing regions and cork productivity.

Task #4.03 Ecology and conservation of arthropods and their role in ecosystem function will continue work on on the conservation of the blue alcon butterfly (*Maculinea alcon*) in the Alvão Natural Park. This project is the only national initiative aimed at the conservation of this species in Portugal, which represents the peripheral distribution range of *M. alcon*. Future research will include the study of several ecological issues of this insect life cycle aimed his conservation: determinations of *P. alcon* flight period and oviposition preferences and determination and identification of its host ant species; Identification of new populations. Development of strategies for green corridors construction between identified populations and genetic characterization of these populations.

Task #4.04- Increasing functional biodiversity in olive groves to enhance conservation biological control of insect pests and maximizing ecosystem services provided by Demarcated Douro Region vineyards futre research include development of a phenological model to simulate olive moth, *Prays oleae* (Bernard), population dynamics in different scenarios: agricultural implications, developed; Syrphid community associated with the olive grove from northeastern Portugal identified; Food resources required to maximize conservation biological control exerted by *Episyrrhus balteatus* (De Geer) (Diptera: Syrphidae).

Planned activities for maximizing ecosystem services provided by Porto Wine Region (PWR) vineyards include development of spatial analysis methodology to support activities to establish an ecological infrastructure network at the project's farms and the application of "friendly" mating disruption technique to control *Lobesia botrana*,

that maintains or promotes farm biodiversity. Plant species to be used in the establishment of the ecological infra-structure network aimed at maximizing conservation biological control against *L. botrana*.

## 5.3 Biosystems Engineering

### 5.3.1 Group description

Principal Investigator	José Joaquim Lopes Morais
Research area	Engineering
Home Institution	Universidade de Trás-os-Montes e Alto Douro

### 5.3.2 Funding

	2009	2010	2012
FCT Projects	166.288,00 €	140.660,67 €	176.336,71€
Other (National)	1.042.492,26 €	334.047,13 €	361.619,14€
Other (International)	503.550,00 €	95.024,60 €	125.824,00€
Industry (National)	0,00 €	0,00 €	0,00€
Industry (International)	0,00 €	0,00 €	0,00€
<b>Total</b>	<b>1.712.330,26€</b>	<b>569.732,40€</b>	<b>663.779,85€</b>

### 5.3.3 Objectives

The general objective is the development of engineering technologies applied to agri-forestry systems, the environment and life towards providing sustainable development and better quality of life. During 2012, the Biosystems Engineering group focused the research activities into two ongoing projects.

#### Project #1 Wood mechanical and quality evaluation

This task aims the mechanical characterisation of bio-based materials through novel methodologies coupling full-field optical techniques with inverse identification methods. This project aims to develop a materials science approach to wood mechanics, from the micro to macro levels. This is fundamental for promoting wood as a thoroughly characterized engineering material. The project also aims to improve bioenergetic conversion technology of agricultural and forest materials and wastes.

## Project #2 Image-based systems

This project designed and developed computer vision and image processing based systems and solutions in the areas of agro-forestry, environment and biology. Image-based systems can be used in the guidance or control of many agricultural and food processes, providing a cheap, consistent and objective assessment for inspection, evaluation and measurement purposes. Artificial Intelligence and Soft Computing techniques, namely Fuzzy Sets Theory and its extensions, are also to be applied in image based feature/object tracking in team sports analysis. The complexity involved in these types of multi-tracking problems is huge. BE researcher work to better unravel this complexity by developing processes with necessary flexibility, while maintaining accuracy.

### 5.3.4 Main achievements

#### Project #1 – Wood mechanical and quality evaluation

#### Project #2 – Image-based systems

The main achievements for 2012 are summarized below:

- ☺ Submission of a patent on plant clone identification using artificial intelligence methods and spectroscopy.
- ☺ Publication in a ISI indexed journal of a worldwide innovative method for intra growth ring measurement of wood density using hyperspectral imaging
- ☺ An experimental methodology to applied in natural territories and smart sustainable cities to improve the carbon footprint by promoting more intelligent use of energy
- ☺ An experimental methodology was developed to predict lower limb biomechanics (over)loading during a walking trail that includes relevant information and proposes for a standardised survey and grading methodology, which can be employed to assess the ability of a trail in promoting a healthy lifestyle.
- ☺ Development of a methodology, based on direct search methods, to calibrate mobile terminal for use in location systems.

### 5.3.5 Mobility

Regular visits to key anchor and collaborating institutions included to La Rioja university in Logroño, Spain, and the Universidad Pública de Navarra (joint publications and projects submission and a Erasmus Mobility Grant for Professors Humberto Bustince, Prof. Eurne Barrenechea and Prof. Miguel Pagola).

## 5.3.6 Group productivity

### 5.3.6.1 International Projects

BE researchers participated in 4 international projects during 2012:

Project name	Funding
ADAPTACLIMA II - Adaptation to Climate Change in SUDOE. CITAB coordinator: Ronaldo Gabriel. Starting Date: November 2012, (SUDOE "SOE3/P2/E477")	100 000 €.
Computer Vision for UAV. CITAB coordinator: Pedro Pinto. Starting Date: January 2011, duration: 24 months (DPI2010-20751-C02-01)	140 000€
MARCADUERO "MARCA DUERO DURADERO: Sostenibilidad, Calidad y Promoción". CITAB coordinator: Ronaldo Gabriel. Starting Date: June 2011, duration: 30 months (0363_MARCADUERO_2_E)	106 980€
New Information Representation and Aggregation Model using Fuzzy Sets Extensions. Applications. CITAB coordinator: Pedro Pinto. Starting Date: January 2011, duration: 24 months	30 492€

### 5.3.6.2 National Projects

BE researchers participated in 11 national projects during 2012:

Project name	Funding
Biochemical, morphological and functional evaluation of breast cancer-induced muscle wasting: the role of exercise training. CITAB Coordinator: Mário Ginja. Starting Date: March 2011, duration: 36 months. (PTDC/DES/114122/2009.)	65 000€
BioGN. CITAB coordinator: Nuno Afonso Moreira. Starting Date: September 2010, duration: 36 months (QREN – SI Inovação)	170 000€
DouroBiogas. CITAB coordinator: Nuno Afonso Moreira. Starting Date: September 2008, duration: 36 months. (QREN – SI Inovação)	370 000 €
Hyper - Application of hyperspectral imaging and neural networks to viticulture. CITAB coordinator: Pedro Pinto. Starting Date: April 2012, duration: 36 months PTDC/EEA-AUT/121056/2010	74 910 €
Integrated Intelligent System for Monitoring, Management and Control of Road Infrastructure. CITAB coordinator: Carlos Serôdio. Starting Date: September 2012, duration 6 months (QREN)	198 950 €
Numerical and experimental study of cohesive laws in bonding wood joints. CITAB coordinator: José Morais. Starting Date: January	38 761 €



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 2011, duration 36 months (PTDC/EME-PME/114443/2009)
 

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Phenotypic plasticity of maritime pine to climate change. CITAB coordinator: José Louzada. Starting Date: November 2010, duration 36 months (PTDC/AGR-CFL/099614/2008)	14 400 €
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Scots pine in Portugal: the “Southwest end” or just “the end”? CITAB coordinator: José Luís Penetra Cerveira Louzada. Starting Date: January 2011, duration: 36 months. (PTDC/AGR-CFL/110988/2009).	181 781,13 €
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Strategic Information for Pine Row. CITAB coordinator: Maria Emilia da Silva. Starting Date: June 2010, duration: 36 months. INEF-PINUS (Acção 4.2.2, PRODER)	117 223,13 €
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Douro Empreendedor. CITAB coordinator: Carlos Serôdio. Starting Date: January 2012, duration: 24 months (SIGON2QREN – ON2-NORTE-07-0927-FEDER-001).	228 685 €
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Molecular biology of grape berry phenolic maturation. CITAB coordinator: Valter Silva. Starting Date: February 2012, duration: 36 months FCT (PTDC/AGR-PRO/120264/2010).	154 158 €
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### **5.3.6.3 Publications in peer review Journals**

Altonaga, J. R., Ginja, M. M., Regueiro-Purrinos, M., Melo-Alonso, B., Oliveira, P. A., & Gonzalo-Orden, J. M. (2012). Osteolysis with a cartilage flap in an OCD-like lesion of the femoral head in a mature dog. *Aust Vet Practit*, 42(1): 206–209.

Belini, U., Tomazello-Filho, M., Louzada, J., & Rodrigues, J. and A., J. (2012). Pilot study for MDF manufacture from sugarcane bagasse and eucalyptus fibers. *Eur. J. Wood Prod.*, 70: 537–539. <http://link.springer.com/article/10.1007%2Fs00107-011-0577-4?LI=true#>

de Jesus AMP, Pinto J. M. T., Morais J.L. (2012). Analysis of solid wood beams strengthened with CFRP laminates of distinct lengths. *Construction and Building Materials*, 35: 817–828. <http://www.sciencedirect.com/science/article/pii/S0950061812003285>

Dourado N., de Moura M.F.S.F., de Morais A.B., Pereira A.B.. (2012). Bilinear approximations to the mode II delamination cohesive law using an inverse method. *Mechanics of Materials*, 49: 42–50. <http://www.sciencedirect.com/science/article/pii/S0167663612000361>

Dourado N., Pereira F. A. M., de Moura M.F.S.F., Morais J.J.L. (2012). Repairing wood beams under bending using carbon-epoxy composites. *Engineering Structures*, 34: 342–350. <http://www.sciencedirect.com/science/article/pii/S0141029611003701>

Lucas-Borja M., Fonseca T., Lousada J., Silva-Santos P., García E. & Abellán M. (2012). Natural regeneration of Spanish black pine (*Pinus nigra* Arn. ssp. *salzmannii* (Dunal) Franco) at contrasting altitudes in a Mediterranean mountain area. *Ecol Res*, 27: 913–921. <http://link.springer.com/article/10.1007%2Fs11284-012-0969-x?LI=true#>

Martins, J., Ferreira, A. J., & Ginja, M. M. (2012). Morphometric assessment of the hip

joint in the Estrela Mountain Dog breed. *Vet Comp Orthop Traum*, 25: 202–210. <http://www.schattauer.de/en/magazine/subject-areas/journals-a-z/vcot/contents/archive-2003/issue/1544/manuscript/17367/show.html>

Monteiro Eliseu, Mantha V., Rouboa Abel. (2012). Portuguese pellets market: Analysis of the production and utilization constrains. *Energy Policy*, 42: 129–135. <http://www.sciencedirect.com/science/article/pii/S0301421511009505>

Oliveira FB, P. V. M. D., Trindade APNT, Shimano AC, Gabriel RECD, Borges APO (2012). Action of therapeutic laser and ultrasound in peripheral nerve regeneration. *Acta Ortop Bras*, 98-103. <http://www.scielo.br/aob>

Pereira FAM, M. J. J. L., de Moura MFSF, Dourado NM, Dias MIR. (2012). Evaluation of bone cohesive laws using an inverse method applied to the DCB test. *Engineering Fracture Mechanics*, 96: 724–736. <http://www.sciencedirect.com/science/article/pii/S0013794412003931#>

Pitanga, C. P. S., Pitanga, FJG, Beck, CC, Gabriel, RECD, Moreira, MHR (2012). Nível de atividade física para prevenção do excesso de gordura visceral em mulheres pós-menopáusicas: quanto é necessário? *Arq Bras Endocrinol Metab*. 56(6):358-63. [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0004-27302012000600003&lng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0004-27302012000600003&lng=pt).

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### 5.3.6.5 Other National publications

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### 5.3.6.6 Book Chapters

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### 5.3.6.7 Books

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### 5.3.6.8 Completed Masters and Ph.D. theses

MSc ALVES, M. S. R. (2012) - Estudo de parâmetros morfométricos radiográficos de cotovelos de cães Serra da Estrela. Mestrado Integrado em Medicina Veterinária, Universidade de Trás-os-Montes e Alto Douro. Orientação Bruno Jorge Colaço e co-orientada por Mário Manuel Dinis Ginja.

MSc Bruno José Alves Diaquino. Identificação das propriedades elásticas do tecido ósseo cortical usando o ensaio de Arcan. M.Sc. thesis, University of Trás-os-Montes e Alto Douro, Vila Real. Supervision: José Morais, José Xavier.

MSc COUTINHO, L.G.M. (2012) - Sistema de Localização *indoor* baseado em *Fingerprinting* e Lógica Fuzzy. Mestrado em Engenharia Eletrotécnica e de Computadores, UTAD. Orientação de Carlos Seródio (UTAD) e Pedro Mestre (UTAD).

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MSc FAUSTINO, A.I.R. (2012) – Avaliação ultrasonográfica dos tumores da mama induzidos quimicamente em ratos fêmea Sprague-Dawley. Mestrado Integrado em Medicina Veterinária, Universidade de Trás-os-Montes e Alto Douro. Orientação Mário Ginja e co-orientada por Paula A.

Oliveira.

- MSc LEDO, Dniel Antunes (2012). Implementação de um protocolo de comunicações utilizando FPGA. Dissertação em Engenharia Electrotécnica e de Computadores. Orientadores: Carlos Serôdio (UTAD) e Pedro Mestre (UTAD).
- MSc MARTINS, J.M.C. (2012) - Morfologia radiográfica da articulação coxofemural na raça cão da Serra da Estrela - análise da influência da idade, sexo, e lateralidade na displasia da anca e lassidão articular. Mestrado Integrado em Medicina Veterinária Universidade de Trás-os-Montes e Alto Douro. Orientação Mário Manuel Dinis Ginja, co-orientado por António Ferreira (FMV-UTL).
- MSc MENDES, C.M.N. (2012) - Sistema de Monitorização e Controlo para uma estufa de cogumelos. Mestrado em Engenharia Eletrotécnica e de Computadores, UTAD. Orientação de Carlos M.J.A. Serôdio (UTAD) e Pedro Mestre (UTAD).
- MSc REIGOTO, L.C.M. - Técnicas Híbridas de Localização *Indoor*. Mestrado em Engenharia Eletrotécnica e de Computadores, UTAD. Orientação de Pedro Mestre (UTAD) e Carlos Serôdio (UTAD).
- MSc Ribeiro A. Caracterização de parâmetros de fractura de um epóxido usando correlação digital de imagem. M.Sc. thesis, University of Trás-os-Montes e Alto Douro, Vila Real. Supervision: José Xavier, José Morais
- MSc ROCHA, Nilza Nina Barbosa Amado (2012). Rotas de Promoção de Produtos Regionais. Dissertação em Informática. Orientadores: Pedro Mestre (UTAD) e Paula Oliveira (UTAD).
- MSc SILVA, F.B. (2012) – Impacto do Método de Reeducação Postural Global no Equilíbrio e Postura Estática dos Pés de Idosas. Mestrado em Ciências do Desporto – Especialização em Avaliação e Prescrição das Actividades Físicas e Desportivas, Universidade de Trás-os-Montes e Alto Douro. Orientação de Ronaldo Gabriel (UTAD).
- PhD OLIVEIRA, F.B. (2012) - Influência do fortalecimento e do alongamento muscular no tratamento conservador da recuperação funcional da síndrome fêmoropatelar, Doutoramento em Ciências do Desporto, Universidade de Trás-os-Montes e Alto Douro. Orientação de Ronaldo Eugénio Calçada Dias Gabriel (UTAD) e co-orientação de António Carlos

Shimano (USP).

### **5.3.6.9 Patents/propotypes**

Pedro José de Melo Teixeira Pinto: National Invention Patent 106 253 (Provisional registration) Fast Clone ID.

Carlos José Manuel Alves Serôdio: Morgado, L., Carvalho, F.; Mestre P., Serôdio, C., Ribeiro, T. - INFORMATION SYSTEM FOR PUBLIC SERVICE. Primary Derwent Accession Number: G69850, 2012 [43]. International Patent Classification: G06F-019/00; G06Q-010/00. Derwent Class Code (s): T01 (Digital Computers). Derwent Manual Code (s): T01-N012A2. PT105392-A1.

Pedro Miguel Mestre Alves da Silva: Pedro Mestre; Carlos Serôdio; João Paulo Moura; Paula Oliveira, Carlos Couto. SYSTEM AND METHOD BASED ON WIRELESS COMMUNICATIONS NETWORKS FOR APPLICATION IN HEALTH SYSTEMS AND LIFE SUPPORT. National Patent No. 105,472 (Current Phase: Application-Study Course)

Armando Garcia Manuel da Silva Fernandes: Fernandes, A., Melo-Pinto, P., Tardaguila, J., Millan, B. and Diago, M.. ULTRAFast IDENTIFICATION PROCESS, DESTRUCTIVE OR NON-DESTRUCTIVE AND ENVIRONMENTALLY FRIENDLY CLONES OF PLANTS USING SPECTROSCOPY, MULTIVARIATE ANALYSIS METHODS AND ARTIFICIAL INTELLIGENCE, Portuguese Patent 106,253, Pending.

### **5.3.6.10 Organization of conferences**

Seminar “*Research Methods in Biomechanics*”. 15th of March 2012, the Central Library Auditorium, University of Trás-os-Montes e Alto Douro. Ronaldo Eugenio Calcada Dias Gabriel, Organizing Committee

Seminar “*The Hybrid-Project, Gait as Rehabilitation for Spinal Cord Injured Patients*”. 5th June 2012, University of Trás-os-Montes e Alto Douro. Ronaldo Eugenio Calcada Dias Gabriel. Organizing Committee.

Seminar “*Biomechanics, Health and Sustainable Environment*”. 3rd May 2012, the Central Library Auditorium, University of Trás-os-Montes e Alto Douro. Ronaldo Eugenio Calcada Dias Gabriel Organizing Committee and Scientific Committee.

Special session “*Soft Computing in Computer Vision*”, 14th International Conference on “*Information Processing and Management of Uncertainty in Knowledge-Based Systems*”, 9<sup>th</sup> -13th July 2012. Catania, Italy. Co-organizer Pedro José de Melo Teixeira Pinto.

*11th European Geoparks Conference*, 20<sup>th</sup> September 2012, Arouca Geoparque, Arouca, Portugal. Ronaldo Eugenio Calcada Dias Gabriel. Scientific Committee and Chairperson.



ICEEE'11 - The 2011 International Conference of Electrical and Electronics Engineering, World Congress on Engineering 2011 (WCE2011), London, United Kingdom, 4 - 6 de July 2012. P. Mestre was member of the scientific committee.

ICWN'12 - The 2012 International Conference of Electrical and Electronics Engineering, World Congress on Engineering 2012 (WCE2012), London, United Kingdom, 4 - 6 de July 2012. P. Mestre was member of the scientific committee.

### **5.3.6.11 Industry contract research**

N/A

### **5.3.6.12 Internationalization**

Invited talk at Universidad de Granada. 13 Jan. 2012. Pedro Melo-Pinto.

"Mechanical behaviour of bio-based materials and structures". 4-5 April 2012. José Xavier.

"Mechanical behaviour of bio-based materials and structures" Conference/Worshop (INT-12-047). 19-20 April 2012. José Xavier.

"Mechanical behaviour of bio-based materials and structures" Conference/Worshop (INT-12-048). 29-31 May 2012. José Xavier.

Short-Term Scientific Mission (STSM) in the framework of COST Action FP0802 "Experimental and computational micro-characterisation techniques in wood mechanics". Host: Stéphane Avril, Ecole Nationale Supérieure des Mines, Center for Health Engineering, St-Etienne, France. 12-21 Sept. 2012. José Xavier.

COST Action FP0802 "Micro Characterisation of Wood Material & Properties", Edinburgh, UK, 24-26 October, 2012. José Xavier.

Determining stiffness components of wood from 3D measurements. Short-Term Scientific Mission (STSM) in the framework of COST Action FP1004 "Enhance mechanical properties of timber, engineered wood products and timber structures". Host: José Fernandez-Cabo, Polytechnic University of Madrid, Madrid, Spain. José Xavier.

Determining stiffness components of wood from 3D measurements. Short-Term Scientific Mission (STSM) in the framework of COST Action FP1004 "Enhance mechanical properties of timber, engineered wood products and timber structures". Host: José Fernandez-Cabo, Polytechnic University of Madrid, Madrid, Spain. 24 June-1 July 2012. José Xavier

Invited Speaker, Themes: - Canine hip Dysplasia in europe - Early Diagnosis of Canine hip Dysplasia .I Simpósio Internacional de Displasia Coxofemoral - Faculty of Veterinary Medicine of Minas Gerais, Brazil. 5-7 July 2012. Mário Manuel Dinis Ginja.

Meeting at Instituto de Ciencias de la Vid y del Vino for a mid term evaluation of the jointresearch work and possible new projects to be carried out. 30-31 Jul. 2012. Pedro Melo-Pinto.

### **5.3.6.13 Other publications National**

N/A

### **5.3.6.14 Government/Organization contract**

N/A

### **5.3.6.15 Awards**

Carlos Manuel José Alves Serôdio: Certificate of Merit: The 2012 International Conference of Wireless Networks: *“RSS and LEA Adaptation for Indoor Location using Fingerprinting”*. Mestre, Pedro; Reigoto, Luís; Coutinho, Luís; Correia, Aldina; Matias, João; Serôdio, Carlos. The World Congress on Engineering 2012, London, United Kingdom, 4<sup>th</sup> – 6<sup>th</sup> July 2012.

## **5.3.7 Future research**

### **5.3.7.1 Objectives**

BE streamlined its structure during 2012 by reducing the number of tasks within the projects.

#### **Project #1 - Bio-based materials and energy**

The following activities are planned: Task #1.01 - Mechanical behaviour of bio-based materials (wood and bone) will characterise stiffness components of wood at the growth ring scale from full-field measurements: quasi-static and dynamic analyses. Wood quality will be assessed based on spatial variability of elastic properties within and among trees: multi-scaling modelling and experimental study. Heterogeneous plate bending tests will be used to evaluate mechanical characterisation of wood. Orthotropic stiffness of clear wood will be evaluated from 3D full-field displacement measurements. Mechanical properties of bovine cortical bone from digital image correlation will be evaluated and an integrated toolbox for digital image correlation, grid method/deflectometry and feature-tracking method will be developed.

Task #1.02 - Fracture behaviour of bio-based materials and structures future objectives are the study of the fracture behaviour of cortical bone under mixed-mode I+II loading, numerical and experimental study of cohesive laws in bonded wood joints; Characterization of steel-wood doweled joints and study of behaviour of wood repair and the fixation of bone structures by rigid pins. Finally, Task #1.03 – Bio-based fibre and particle components will characterize stiffness components of wood products (MDF, OSB) from heterogeneous plate bending tests.

#### **Project #2 - Image-based systems**

Future research in this complex field of research will include the development of novel methodologies for image classification by using soft computing techniques; the development of robust methodologies for feature tracking in image sequences using FSs concepts along with feature behavioral characterization methodologies for feature identification and tracking; Application of the developed feature tracking methodologies in indoor team sports context to access both player and team dynamics; Application of classification methodologies based on FSs concepts and its extensions for meat quality assessment and characterization. Task #2.02 Hyperspectral imaging techniques for agro-forestry, environment and biology will continue to be used for non-destructive analysis of biological materials. Advanced machine learning algorithms will continue to be developed to extract from hyperspectral information the values of parameters to be measured. Researchers will further develop internationalization initiatives of Hyperspectral imaging research by procuring new international anchor institutions and participating in European projects. Task #2.03 Imaging techniques as a tool to improve biological models will employ biomechanical and environmental analysis, using computer assisted imaging techniques, to assess the quality and type of the movement in biological models. Different techniques will be used for kinematic and kinetic analysis of plantar pressure abnormalities, biomechanical load over walking trails to assess the accumulating effects of the external and internal biomechanical loads to which the pedestrian is subject, radiographic and ultrasound imaging abnormalities - development of methodologies to improve the imaging diagnosis. Task #2.04 - Device-independent image visualization techniques and data transmission will develop embedded communication protocols and instrumentation (sensor) systems for precision agriculture and food quality evaluation applications such as the characterization and performance of automatic control over activities (design of devices) related with agricultural environments. They will also be applied to the study of animal behaviour (design of communication and control algorithms).

## 6 Unit Composition

### **DIRECTOR**

Eduardo Augusto dos Santos Rosa

### **VICE-DIRECTOR**

Pedro José de Melo Teixeira Pinto

### **VICE-DIRECTOR**

Rui Manuel Vítor Cortes

### **EXECUTIVE COMMITTEE**

#### **PRESIDENT**

Samantha Jane Hughes

#### **MEMBERS**

José Manuel Cardoso Xavier  
Pedro Miguel Mestre Alves da Silva  
José Manuel Moutinho Pereira  
Alberto Carlos Pires Dias

Eunice Luis Vieira Areal Bacelar  
Paulo Alexandre Martins Fernandes  
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## **SUSTAINABLE AGRO-FOOD CHAINS**

### **PRINCIPAL INVESTIGATOR**

Henrique Manuel da Fonseca Trindade

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Ana Paula Calvão Moreira da Silva	Hernâni Varanda Gerós
Ana Sofia Rodrigues	João Carlos Andrade dos Santos
Armindo Aires Afonso Martins	Jorge Ventura Ferreira Cardoso
Aureliano Natálio Coelho Malheiro	José Gomes Laranjo
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Ana Maria Araújo de Beja Neves Nazaré Pereira	Manuel João Teles de Oliveira
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