



CITAB - Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas

RELATÓRIO DE ACTIVIDADES
2008

UNIVERSIDADE DE TRÁS-OS-MONTES E ALTO DOURO

Relatório Científico Submetido na FCT

CITAB

2008

1. Objectives and Achievements

This part of the report will allow you to describe the way in which the Unit or the LA is organized and managed, to give the general objectives of the research within the Unit or the LA and finally to give a brief description of the main achievements of the research carried out as a whole during the 2008 period. A maximum number of characters (without spaces) are allowed in each field. If the number of characters exceeds the maximum you will not be able to complete the form and an error message will appear when you try to save your work

1.1 Unit Description (3000 ca.) *Here indicate form of organization and management.*

The Centre for the Research and Technology of Agro-Environment and Biological Sciences (CITAB) is a R&D Unit from the University of Trás-os-Montes e Alto Douro (UTAD). This Unit resulted from a merging process, in 2007, of 3 Units with the policy of bringing together a multidisciplinary team in the areas of agri-food, forestry, environment and particularly the technological engineering with the objective of building the expertise to upgrade the science that has been produced in the agriculture field. This high demanding strategy, requires a close dialogue with the technological engineers but clearly differentiates CITAB from a more conventional attitude.

To cover vertical studies in all the systems the foci for the new centre were divided into four main research Groups: Integrative Biology and Quality, EcoinTEGRITY, Biosystems Engineering and Climate and Atmospheric Modelling. Although this organization, there is a straight link and interaction between the 3 Groups, to promote the cohesion of the Unit, through combined regular meetings between the managers of each Group.

At present the Unit has 156 members, from which 56 are integrated. Pursuing the policy of attracting scientists from other institutions, CITAB has already a Group from the University of Minho and members from the Escola Superior Agrária de Ponte de Lima. Others are expected to join in the near future.

CITAB is managed by a Direction (a Director and 2 Vice-Directors assisted by a secretariat), elected for a period of 4 years, which are responsible for the definition of the objectives and workplans that must be approved by a Scientific Council (SC) which include all the researchers with a Ph.D degree selected by benchmarking criteria; there is also a Executive Committee (with a President and 3 other members from each of the Research Groups) which is responsible for the compliance of the scientific activities agreed in the plenary session of the Scientific Board. Apart from this structure there are a Stakeholder Committee and a Advising Committee. The first one, is a recognition of the importance of the links to the private sector (a strategy pursued in CITAB) in which take part either managing and technical staff of companies and from our society, is envisaged to comment our activities, whilst the second is made of international and independent high qualified scientists which are expected to critical review the scientific results and options, in a international context. Every of these two Committees meets once a year.

1.2 General Objectives (3000 ca.) *This refers to the current aims of the Unit or LA as a whole.*

We defined two sets of objectives, scientific and co-scientific, which are explained below.

In our planning for CITAB, we have centered our objectives in the improvement of the quality growth of the Unit, through the incorporation of new members of high scientific quality, in the internationalization of the Research Groups, in the development of innovative research, in the promotion of contacts with industry and in the improvement of the image and visibility of CITAB. These are the collective driving objectives of the Unit in which each of the Research Groups has been asked to act and contribute to.

Scientific objectives

Within CITAB was accepted that the research topics would concentrate on the production chain on agri-food and forestry and fit under a more sustainable environment to make the companies more competitive. Thus, our research objectives are concentrated in every step of the chain and their constraints such as improvement of the knowledge and study plant stress adaptation to climate changes particularly the effect and overcoming of extremes, water shortage and quality and improvement of water management (for instance in grapes- Port wine region). Within the same line our objective is to develop studies on wild and agro-forest management and protection against biotic agents, on the control of fires and recovering of ecosystems, and the identification through physical and biological metrics of disturbances in the ecosystem of running waters.

The sustainable production and the organic farming of the vines and other major crops, such as olives and vegetables, their quality and health benefits, were some of the objectives of research within all the existing groups. Taking a novel approach, all these research lines benefit somehow from a close contribution of technology engineering with the objectives to further understand the environmental changes at a scale of the ecosystem and the individual (life organism) using signal and image processing, biosensing and remote sensing. A more specific contribution from the engineering was in the study and characterization of the forestry resources to be used in the industry and as biofuels and in the exploitation of biomaterials.

At the agri-food and forestry transformation units we envisaged to give an added value to the co-products of these industries to make them to be more sustainable and competitive in the globalization market.

Co-scientific activities

Increase the funding and at the same time increase the JCR scientific production, are key objectives. We envisaged a growth in the number of scholarships, and in the number of national and particularly international links (application of the concept of anchor institution), to increase the mobility of researchers and build projects under the FP7. The attraction of the private sector to our research is another main objective.

1.3. Main Achievements during the year of 2008 (3000 ca.) *Highlights from past research over the reported period.*

During 2008 we consolidated the merging process of the 3 Units, meeting all the objectives that have been set for this process.

At the stage of the FCT evaluation and visit of the international panel (Jan. 2008) we had 42 integrated members and gradually we admitted new members to reach 56 integrated members at the end of 2008, including one Group from U. Minho and members from the Escola Superior Agrária de Ponte de Lima. Thus we grew on critical mass whilst keeping high quality standards for admission of new members.

Regarding cooperation we expanded our links to several SME's particularly in the area of Agri-Food and Environment, which lead to the opportunity of designing joint research projects, pursuing the resolution of problems during the production and transformation chain and in the reduction of the environmental impact of their effluents. Similarly we made contacts at international level to set a long lasting cooperation with our "anchor" research institutions. Each group has achieved this goal establishing at least one link. Moreover, to gain further visibility and

better approach to companies, CITAB has been involved in the successful application to a National Competitiveness Pole on Agri-Food in which around 40 companies are involved. Similarly is also taking part in a Technological Platform between North Portugal and North of Spain (Galicia) in which around 150 companies are participating.

An improved image and visibility of CITAB was achieved and now an innovative site is available, where each member can input his data thus reducing the costs of updating and passing more responsibility to everyone.

At scientific level we gave specific contributions to the progress of science in the area covered by CITAB, which are addressed ahead under the description of each Research Group. For instance, in the domain of the phytochemicals and health we gain new knowledge on the effect of some compounds in the bacteria of human gut; regarding the environmental studies we can stress the achievements on new bio-indicators and monitoring of waters, on the development of stochastic-dynamic methodology and on forest ecosystems monitoring; also on the domains of precision agriculture and digital image processing; we also developed a new method for the characterization of wood mechanical properties among others; regarding the climate we put forward a parametric model for wine productivity, an extreme important crop for Portugal that had been submitted to climate extremes with detrimental effect on the quality of wine.

Under the co-scientific activities CITAB has increased the number of SCI papers, from 1.4 SCI/cap to 2.0 SCI/cap. Similarly the number of scholarships has increased from 21 to 29.

2. Activities

This part of the report will allow you to describe general activities of the Unit or the LA that are aimed at integrating the research of various groups of which multidisciplinary and/or trans-disciplinary activities are of particular relevance. The second part is aimed to describe work that the Unit or the LA does to extend beyond the scientific environment and to reach the general public, schools or other forms of engaging the public in the work of the Unit or the LA.

2.1. Integrative/multidisciplinary activities during the year of 2008 (3000 ca.) *Special activities that aim to carry out research across disciplines.*

CITAB was built under the strategy of multidisciplinary. Although some of the activities of the 4 Research Groups were conducted individually most of the activities were the result of an active and permanent collaboration between Research Groups, often resulting in sinergetic teams assembled to cope with specific tasks. Although the research is attributed to a Group, mainly for management purposes, which acts as a leader, members from other Research Groups are requested to participate according to the specific tasks building an interdisciplinarity team.

For instance, the comprehensive studies (i.e., plant stress, water request and irrigation planning, biological pest control) on the influence of climate change and particularly the extremes on the production chains in major crops, such as grapes, chestnuts and olives was a team work between the Climate group and the Integrative Biology and Quality. Similarly for the quality evaluation of the respective crops products and the respective potential health effects.

The development of data processing was also a joint research between the Integrative Biology and Quality and the Biosystems Engineering. The research on the Assessment of stream condition and use of bioindicators to study the effects of environmental impacts at various spatial scales, river rehabilitation and catchment management, involved 3 groups: climate, biosystems engineering and the ecointegrity.

Another important example of interdisciplinarity is the study of the role of microorganisms in nutrient cycling, leaf breakdown and in ecological succession; their potential use as ecological indicators and in biotechnology and treatment of agro-industrial effluents; these activities involved the Groups of Ecointegrity, Integrative Biology and Quality and Climate and Atmospheric Modelling.

The Ecointegrity and Biosystems Engineering are acting together to develop a new data reduction scheme for wood fracture characterization and the development of an inverse identification procedure of fracture properties of wood.

Under the Wireless Farm concept, the input of the technologies (BE Group) in the agriculture production chain (IB&Q) was also evident in the development of multipowered small stationary data acquisition device as well as a soil-moisture laboratorial prototype sensing device.

Thus, these are only a few examples of research activities involving most of the Research Groups which reveal the added value of CITAB in designing and implementing research in the agriculture production chains.

It must be stressed that most of these activities also imply a rational use and share of equipments to keep costs at the lowest levels.

2.2. Outreach activities during the year of 2008 (3000 ca.) *Science and Society/general public/schools, etc.*

A large number of researchers from CITAB have been involved, for quite a few years, in the national Project named “Ciência Viva”. This is seen a close relationship with the high schools, their teachers and students, to promote our research activities and create a long lasting link. Within these projects we bring students to our labs and they see and handle some experiences being more motivated to science activities. Below we give some examples of the projects that have been managed during 2008.

A Floresta e as Ciências da Natureza. Ciência Viva VI-ID 1457

Aplicação das tecnologias da electrónica e da informação no ensino da Física. Ciência Viva Concurso PVI – ID1031.

Estação de radioescuta e rastreio de comunicações. Ciência Viva VI – ID 1560.

Ocupação Científica de Jovens 2008 da Agência Nacional para a Cultura Científica e Tecnológica – Ciência Viva.

Apart from “Ciência Viva”, there was an involvement of our researchers in some general conferences more focused on mediatic problematics which attract the attention of our society, such as: i) Bioactive compounds and health in which was discussed the effects of some foods on the potential protective health effect; ii) what option for the biomass production in which was discussed the feasibility of use of biomass as an energy source. Also very important for policy making decisions; iii) the campaign of “Douro Limpo” which addressed issues and produced

leaflets regarding the society behaviour to keep this World Heritage Region much cleaner; iv) several interventions in a joint action with the “Administração da Região Hidrográfica do Norte- ARH-N)” on media regarding the water policy; v) dissemination through basic training courses regarding the SIG and their potential uses in our society.

3. Funding

In this section include funding details during the reporting period. In the item LA FCT include the total sum of the Base+Programmatic funding of the Associate Laboratory.

Units FCT	0,00	0,00	0,00	0,00	116100	116.100,00
Projects FCT	0,00	0,00	0,00	0,00	1 629 638.00	0,00
Other (National)	0,00	0,00	0,00	0,00	3 416 743.47	0,00
Other (International)	0,00	0,00	0,00	0,00	1 729 444.69	0,00
National Industry	0,00	0,00	0,00	0,00	310 529.97	0,00
International Industry	0,00	0,00	0,00	0,00	0	0,00
	0,00	0,00	0,00	0,00	116.100,00	116.100,00

4. General Indicators


4.1 Composition and Training

In this section indicate the number of researchers hired through the Ciência Programme, during the reporting period. Include also the total number of integrated Researchers with PhD and the PhD or Mater thesis completed in the period.

	2004	2005	2006	2007	2008	Total
No. of Researchers Hired (Ciência Programme)	0,00	0,00	0,00	0,00	1	1,00
No. of Researchers (FTE) (*)	0,00	0,00	0,00	0,00	42	
Training Masters (Master thesis completed)	0,00	0,00	0,00	0,00	26	26,00
Training PhDs (PhD thesis completed)	0,00	0,00	0,00	0,00	4	4,00

4.2 Researchers Hired

In this section indicate the individual researchers hired in the period by introducing the public key, their starting date and if applicable their finishing date. In case the researchers also hold a part-time position at another institution (teaching at University or Polytechnic) also indicate this in Other Institution.

Nome	Start Date	End Date	Other Institution
 Ana Maria Monteiro Paiva Coimbra	01-04-2008	31-03-2013	

4.3 Technical Personnel Hired

In this section indicate individual technical personal hired. To do so all personal must be registered at the FCT and have a public key.

4.4 Additional Comments

In this space you can provide any additional information regarding the section General Indicators

Within the Ciência Programme 2007, the Research Group EcoinTEGRITY benefited from a contract of a Ph.D. researcher, Ana Maria Coimbra, who is studying biomarker histological, molecular biochemical on fishes.

5. Research Groups

In this section of the report you have the names of each Research Group and the Principal Investigators that were indicated in the last report. By following the link in the groups name you will be able to access the individual form of the group.

This list includes the currently active Research Groups as well as the Research Groups reported to be active in the previous year.

Reference	Group Title
RG-AGR-Norte-VilaReal-4033-134	1- Integrative Biology and Quality
RG-AGR-Norte-VilaReal-4033-135	2- EcoinTEGRITY
RG-AGR-Norte-VilaReal-4033-136	3- Biosystems Engineering
RG-AGR-Norte-VilaReal-4033-137	4- Climate and Atmospheric Modelling

1.Group Description -[Integrative Biology and Quality](#)

Please indicate mains sources of funding for the research of your group. Include all types of funding, like FCT projects, FCT Base, as well as funding from other institutions. You should indicate an approximate amount in EUROS, and the source to which the funds apply.

- **Research Group Title:** (RG-AGR-Norte-VilaReal-4033-134) - Integrative Biology and Quality
- **Principal Investigator:** Richard Neil Bennett
- **Research Area:** N/D
- **Home Institution:** Universidade de Trás-os-Montes e Alto Douro

1.1. Funding, source, dates (1000 ca.)

FCT BASE: 32 400,00€

Total Funding of Projects running and concluded on 2008:

FCT Projects: 600 822.00€

Funding from Other Institutions: 1 302 186.93 € (International Projects: 571 415.00€ and National Projects: 730 771.93€)

1.2. Objectives and Achievements

This section allows you to provide the objectives and achievements during the reporting period.

1.2.1. Objectives (2000 ca.)

This Group, formed through a rational unification of selected members from 3 research Units, set the following key objectives which, although presented separately, are closely integrated into each sub-area of this Group. Within these objectives is the common, major driving-force of the Unit - to increase associations and collaborations with agro-food companies to improve methods and solve problems relating to whole production chains (from crop and animal production, post-harvest effects, and to the final industrial processing stages with associated waste generation). This focus on agro-food chains and companies is of high relevance at both national and particularly at regional levels.

1. Contribute with research studies to the sustainable agriculture concept of the major socio-economic crops in the northern area of Portugal, such as Brassica vegetables, grapevines, olives, chestnuts, dry fruits, cherries and apples;
2. Develop focused studies on plant stress biology and biochemistry to further identify the biological and biochemical mechanisms of abiotic, biotic and climate-induced stress in the major crops identified above;
3. Plant food quality and health- under this topic it was envisaged the identification and quantification of nutrients and phytochemicals in European and non-European crop plants and to use this data to i) explain the effect of climate change in relation to plant stress and composition; ii) identify eventual influences on the taste of food; iii) identify effects on plant pathogenic bacteria iv. identify effects on intestinal microflora of pigs and humans and ultimately the consequences for animal and human health;
4. Development of comprehensive research and experimental studies on agro-food co-products (waste) to give the companies an added economic value e.g. potential new products

1.2.2. Main Achievements (2000 ca.)

The effective integration of activities and resources in the Integrative Biology & Quality Group has led to an overall increase in effective research with associated achievements in the major objectives defined above.

1. Sustainable Agriculture: there have been major publications from the chestnut and hazelnut research areas (from recently completed and ongoing active projects). Especially successful, in terms of research and publications in peer-reviewed journals, is the olive biology group and the international EU hazelnut project (SAFENUT) involving many researchers from IB&Q.
2. Stress Biology: there have been major publications related with physiological and yield effects of elevated CO₂ on grapevine, leaf structure and function of sweet cherry tree cultivars and physiological responses of different olive genotypes to drought conditions. The group is taking the first steps in the main Mediterranean crop responses to mycorrhization to increase water and mineral uptake efficiency.
3. Plant Food Quality and Health: There have been major achievements with associated publications, including i. identification of natural dietary compounds (isothiocyanates and other glucosinolate-derived hydrolysis products) with high antimicrobial activities against antibiotic-resistant human bacteria and against economically-important plant pathogenic bacteria, ii. identification of phytochemicals from Brassica

- species (isothiocyanates) with nematicidal activity against pine wood nematode; iii. extensive compositional data on nutrients and secondary metabolites in raw and processed Portuguese and Global foods.
4. Completion of initial compositional studies (total and specific phenolics; free amino acids; ergosterol and related sterols; carotenoids; tocopherols) in various commercial edible and wild mushrooms and in *Agaricus* mushroom residues as part of an ongoing and evolving collaboration with a major Portuguese mushroom producer.

1.3. Group Productivity

This section allows you to provide the productivity during the reporting period.

1.3.1. Publication in peer review Journals (6000 ca.)

ISI Articles

AMARAL, C., LUCAS, M., COUTINHO, J., CRESPI, A., ANJOS, M.R., PAIS, C. (2008) *Bioresource Technology*, 99: 7215-7223.

BORGES, O.; GONÇALVES, B.; CARVALHO, J.; CORREIA, P. & SILVA, A.P. (2008) *Food Chemistry* 162 (3), 976-984.

FANGUEIRO, D.; COUTINHO, J.; CHADWICK, D.; MOREIRA, N. & TRINDADE, H. (2008) *J. of Environmental Quality*, 37 (6): 2322-2331.

FANGUEIRO, D.; PEREIRA, J.; COUTINHO, J.; MOREIRA, N. & TRINDADE, H. (2008) *European J. of Agronomy*, 28: 625-634.

FANGUEIRO, D.; PEREIRA, J.; CHADWICK, D.; COUTINHO, J.; MOREIRA, N. & TRINDADE, H. (2008) *Nutrient Cycling in Agroecosystems*, 80: 107-120.

FANGUEIRO, D.; SENBAYRAN, M.; TRINDADE, H. & CHADWICK, D. (2008) *Bioresources Technology*, 99: 7132-7142.

Furniss, CSM; Bennett, RN, Bacon, JR; LeGall, G; Mithen, RF (2008) *J. Nutrition* 138: 1840-1845.

GOMES-LARANJO, J., COUTINHO, J. P., GALHANO, V. & FERREIRA-CARDOSO, J. V. (2008) *Photosynthetica*, 46 (1): 63-72.

GONÇALVES, B.; CORREIA, C.; SILVA, A.P.; BACELAR, E.; SANTOS, A. & MOUTINHO-PEREIRA, J. (2008) *Scientia Horticulturae* 116: 381-387.

Hollands, W; Brett, GM; Radreau, P; Saha, S; Teucher, B; Bennett, RN; Kroon, PA (2008) *Food Chem.* 108: 869-878.

MARTINS, F., GOMES-LARANJO, J., AMARAL, C., ALMEIDA, J., & PEIXOTO, F. (2008) *Ecotoxicology and Environmental Safety*, 69: 480-487.

OLIVEIRA, A.A., CORREIA, M.J. (2008) *J. Int. Sci. Vigne Vin*, 48 (2): 73-78.

PEIXOTO, F., GOMES-LARANJO, J., VICENTE, J., MADEIRA, V. (2008) *J. of Plant Physiology* 165 (11): 1125-1133.

PEIXOTO, F., MARTINS, F., AMARAL, C., GOMES-LARANJO, J., ALMEIDA, J., & PALMEIRA, C.A. (2008) *Ecotoxicology and Environmental Safety*, 70: 266-275.

ROSÁRIO, L. M.; BARBOSA, R. M.; ANTUNES, C. M.; BALDEIRAS, I.; SILVA, A. M.; TOMÉ, A. R.; SANTOS, R. M. (2008) *Endocrine J.* 55(4):639-650.

SILVA, A. M.; RODRIGUES, R. J.; TOMÉ, A. R.; CUNHA, R. A.; MISLER, S.; ROSÁRIO, L. M. & SANTOS, R. M. (2008) *Pancreas* 36 (3): 279-283.

ISI Proceedings

GALHANO, V.M., GOMES-LARANJO J., PEIXOTO F. (2008) *Biochimica et Biophysica Acta (BBA) - Bioenergetics*, Volume 1777, Supplement 1, 19 July 2008, Page S24.

GALHANO, V.M., PEIXOTO, F., GOMES-LARANJO, J. (2008) *Molecular Bioenergetics of Cyanobacteria: Towards Systems Biology Level of Understanding*. ESF-EMBO Symposium.

Santos, A.; Santos-Ribeiro, R.; Cordeiro, V.; Bento, A.; Louzada, J. (2008) V International Cherry Symposium. *Acta Hort. (ISHS)* 795:567-570

Santos, A.; Santos-Ribeiro, R.; Parente, P.; Cordeiro, V.; Louzada, J.; Carvalho, L. (2008) V International Cherry Symposium. *Acta Hort. (ISHS)* 795:267-271

Articles on other international scientific journals

BATISTA, D., VALDIVIESSO, T., SANTOS, L., PAULO, O., GOMES-LARANJO, J., COSTA, R. (2008) *Acta Hort. (ISHS)* 784:107-112.

DE VASCONCELOS, M.C.B.M., BENNETT, R.N., ROSA, E.A.S. & FERREIRA-CARDOSO J.V.(2008) *Acta Horticulturae*, ISHS, 784: 43-48.

DINIS, L-T., GOMES-LARANJO, J., PEIXOTO, F., COSTA, R. E ABREU, C. (2008) *Acta Hort. (ISHS)* 784:153-158

DINIS, L-T. J., FERREIRA-CARDOSO., J., PIMENTEL-PEREIRA, M., PEIXOTO, F., COSTA, R., GOMES-LARANJO, J. (2008) *Acta Hort. (ISHS)* 784:49-54

GOMES-LARANJO, J., COUTINHO, J.P. E PEIXOTO, F. (2008) *Acta Hort. (ISHS)* 784:99-106

LOPES, S.M., PEIXOTO, F., GOMES-LARANJO, J., FERREIRA-CARDOSO, J., PINTO, T., ANJOS, R. & GOMES ABREU, C. (2008) *Acta Horticulturae*, ISHS, 784:169-174.

Santos, A.; Santos-Ribeiro, R.; Cordeiro, V.; Bento, A.; Louzada, J. (2008) *Acta Hort. (ISHS)* 795:567-570

Santos, A.; Santos-Ribeiro, R.; Parente, P.; Cordeiro, V.; Louzada, J.; Carvalho, L. (2008) *Acta Hort. (ISHS)* 795:267-271

SILVA, A.P.; GONÇALVES, B.; SANTOS, F.; CAVALHEIRO, J.; RIBEIRO, C. & SANTOS, A. (2008) *J. of Applied Horticulture* 9(2): 157-161

Articles on other national scientific journals

ARNALDO, P. S. & TORRES, L. M. (2008) *Bol.Mus.Mun.Funchal*, 14: 13-16.

GOMES-LARANJO, J., CRESPI, A., RAMOS, C. (2008) *Frutas, Legumes e Flores*. 99: 10-12.

GOMES-LARANJO, J., FERREIRA-CARDOSO, J. (2008) *Edição comemorativa. Frutas, Legumes e Flores* 100:

SILVA, A. P. & GONÇALVES, B. (2008) *Revista da Ass. Portuguesa de Horticultura*, 93: 21-26.

Torres, L.; Nave, A. & Gonçalves, F. (2008) *Frutas Legumes e Flores, Especial Olival e Azeite* 102: 25-26.

Torres, L.M. (2008) *Segredos da Terra*, 22: 14-18.

1.3.2. Other publications International (6000.)

International Books and Chapters

ABREU, C., PEIXOTO, F., GOMES-LARANJO, J. (2008). II Iberian Congress on Chestnut. Acta Hort. (ISHS) 784.

SANTOS, S.A.P.; CUNHA-QUEDA, C.; GONÇALVES, F.; PEREIRA, J.A.; BENTO, A. & TORRES, L.M. Organic olive growing in northeastern Portugal: present state and future prospects. In: Organic Farming: Methods, Economics and Structure. Nova Science Publishers, Inc., New York. https://www.novapublishers.com/catalog/product_info.php?products_id=9226.

SANTOS, S.P., GONÇALVES, F., REI, F., RAIMUNDO, A & TORRES, L. (2008). Coccinédídeos associados ao olival português. Importância na protecção contra a cochonilha-negra. Sector Editorial da UTAD. Vila Real, 28pp.

Vários Autores – Bioversity, FAO and CIHEAM. 2008. Descriptors for hazelnut (*Corylus avellana*, L.). Bioversity International, Rome, Italy; ISBN: 978-92-9043-762-8, 56pp.

Other Publications on International Scientific Meetings:

A. SOLAR, R. VEBERIČ, L. BACHETTA, R. BOTTA, P. DROGOUDI, I. METZIDAKIS, M. ROVIRA, J. P. SARRAQUIGNE, A. P. SILVA. 2008. Phenolic Characterization of Some Hazelnut Cultivars from Different European Germplasm Collections. 7th International Congress on Hazelnut – 23-27 June 2008, Viterbo, Italy.

AIRES A, MOTA VR, BENNETT R N, ROSA EAS., SAAVEDRA MJ, MARTINEZ-MURCIA A. (2008). Antibacterial activity of phytochemicals: the effects of glucosinolate enzymatic hydrolysis products against *Aeromonas* spp. 9th International Symposium on *Aeromonas* and *Plesiomonas*, 10-12 September, Vila Real, Portugal, pp: 50-51.

ARNALDO, P.S., LOPES, D., CHACIM, S., TORRES, L. (2008). Evaluation of the defoliation effect due to the processionary moth, *Thaumetopoea pityocampa* (Den. & Schiff.), on *Pinus* biomass increment using biomass prediction models. International Symposium of Entomological Research in Mediterranean Forest Ecosystems, Estoril, 5-8 Maio.

BACCHETTA, L.; AVANZATO, D.; BOTTA, R.; DROGOUDI, P.; DUVAL, H.; METZIDAKIS, I.; ROVIRA, M.; SILVA, A. P.; SOCIAS, R.; SOLAR, A. AND SPERA, D. (2008) Safenut: an European project for the valorization of autochthonous almond and hazelnut genetic resources. International Research Conference: Plant Genetic Stocks – The basis of Agriculture of Today, 13-14 June, Plovdiv, Bulgária.

CARLOS, C.; ALVES, F. & TORRES, L. (2008) Eight years of practical experience with mating disruption to control grape berry moth, *Lobesia botrana*, in Porto Wine Region. VII International Conference on Integrated Fruit Production, Avignon, France, 27-30 October, pp: 118-119.

CARNEIRO, J.P.; FREIRE, J.J.; COUTINHO, J. E TRINDADE, H. (2008). Disponibilidade de azoto resultante da utilização de resíduos orgânicos na fertilização do milho. Livro de resumos do III Congresso Ibérico de Ciência do Solo, 2 a 6 de Julho, Évora, pp. 127.

CORREIA, C.; GONÇALVES, B.; BACELAR, E. & MOUTINHO-PEREIRA, J. (2008). Air Pollution and Climate Change at Contrasting Altitude and Latitude, 7-12 September 2008, Murten, Switzerland. pp. 84.

- CORREIA, C.; MOUTINHO PEREIRA, J.; BACELAR, E.; GONÇALVES, B.; FREIRE, I. & BARROS, A. (2008). Evolution of physical parameters, phenolic compounds and antioxidant activity in olive fruit (*Olea europaea* L.) during maturation. Sixth International Symposium on Olive Growing, 9-13th September 2008, Évora, Portugal, pp. 271.
- DINIS, L.-T., LUZIO, A., FERREIRA-CARDOSO, J., PEIXOTO, F., COSTA, R. & GOMES-LARANJO, J. (2008). Characterisation of Judia genotypes (*Castanea sativa* Mill.) from several Trás-os-Montes regions. IV International Chestnut Congress, Beijing (China), September 25-28.
- FERNADES-SILVA, A.A.; FERREIRA, T.C.; CORREIA, C.M. & VILALLOBOS, F.S. (2008). Yield response of olive to water deficit in the Portuguese region of "Terra Quente Transmonatana". Sixth International Symposium on Olive Growing, 9th-13 th September 2008, Évora, Portugal 210.
- GOMES, S.; BACELAR, E.; MARTINS-LOPES, P.; CARVALHO, T.; PEREIRA, J.; CORREIA, C. & GUEDES-PINTO, H. (2008). Infection process of *Colletotrichum acutatum* on *Olea europaea* L. Sixth International Symposium on Olive Growing, 9th-13 th September 2008, Évora, Portugal pp. 163
- GOMES-LARANJO, J., ALMEIDA, P., FERREIRA-CARDOSO, J. & PEIXOTO, F. (2008). Ecophysiological characterization of *C. sativa* trees growing under diferent altitudes. IV International Chestnut Congress, Beijing (China), September 25-28.
- GOMES-LARANJO, J., ALMEIDA, P., LUZIO, A.G., PEIXOTO, F. (2008). Photosynthetic characterization of *C. sativa*, *C. crenata* and *C. mollissima* growing in Portugal. IV International Congress on Chestnut. Pequim, China.
- GONÇALVES, B.; SILVA, A.P.; BACELAR, E.; CORREIA, C.; SANTOS, A.; FERREIRA, H. & MOUTINHO-PEREIRA, J. (2008). Effect of training system on hazelnut (*Corylus avellana* L.) physiology. 7th International Congress on Hazelnut – 23-27 June 2008, Viterbo, Italy pp. 42.
- GONÇALVES, M.F.M. & TORRES, L.M. (2008). Effect of Copper Oxychloride on the Olive Infestation by *Bactrocera oleae* in Northeastern Portugal. VI International Symposium on Olive Growing, Évora, Portugal, 9 a 13 de Setembro, pp: 173
- L. BACCHETTA, D. AVANZATO, R. BOTTA, P. DROGOUDI, I. METZIDAKIS, M. ROVIRA, A. P. SILVA, A. SOLAR, D. SPERA, BARBARA DI GIOVANNI. 2008. First results of 'SAFENUT: an european project for the preservation and utilization of hazelnut local genetic resources. 7th International Congress on Hazelnut – 23-27 June 2008, Viterbo, Italy.
- RODRIGUES, M.A.; CORREIA, C.; PAVÃO F.; LOPES, J.; CABANAS, J.E.; MOUTINHO-PEREIRA, J. & ARROBAS, M. (2008). Can olive yields be maintained over time without nitrogen and boron fertilization? Sixth International Symposium on Olive Growing, 9th-13 th September 2008, Évora, Portugal pp. 220
- S. MARTINS, A.P. SILVA, A.A. SANTOS, V. CARNIDE. 2008. Genetic diversity in hazelnut using rapd and issr markers. 7th International Congress on Hazelnut – 23-27 June 2008, Viterbo, Italy.
- SANTOS, A.; SANTOS-RIBEIRO, R.; CORDEIRO, V.; BENTO, A.; LOUZADA, J. (2008): Budding height is slightly effective for reducing sweet cherry growth. V International Cherry Symposium. Acta Hort. (ISHS) 795:567-570, http://www.actahort.org/books/795/795_89.htm.

SILVA, A.P.; ASSUNÇÃO, A.; GONÇALVES, B., CORTÊZ, I. & NAZARÉ-PEREIRA, A.M. (2008). A Preliminary survey of hazelnut (*Corylus avellana* L.) virus in Portugal. A study case. 7th International Congress on Hazelnut – 23-27 June 2008, Viterbo, Italy pp. 158.

TRAVAGLIA, F.; COÏSSON, J.D.; ARLORIO, M.; LOCATELLI, M.; BORDIGA, M.; BENNETT, R.N.; STÉVIGNY, C.; & MARTELLI, A. (2008). Proanthocyanidin content and total antioxidant capacity of Tonda Gentile delle Langhe (TGL) hazelnut seed skin. 7th International Congress on Hazelnut. Viterbo, Italy, 23rd- 27th June.

1.3.3. Master and Ph.D. thesis completed (3000.)

Master thesis completed

ARAÚJO, C.M.R. (2008). Transporte nas plantas: xilema e floema. Mestrado em Biologia e Geologia para o Ensino. Supervisors: Berta Maria Carvalho Gonçalves e Eunice Luís Vieira Areal Bacelar, defendida na UTAD.

SOARES, M.F.M.D. (2008). Contribuição para o desenvolvimento de um programa de protecção contra o bichado-da-castanha, *Cydia splendana* (Hübner). Mestrado em Mestrado em Agricultura Biológica, Universidade de Trás-os-Montes e Alto Douro, Orientadores: Laura Torres e Albino Bento (ESAB/IPB).

TEIXEIRA, C. (2008). A Célula – Unidade na Constituição dos Seres Vivos. Mestrado em Matemática e Ciências da Natureza, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Jorge Ventura Ferreira Cardoso e Dario Loureiro dos Santos (UTAD).

1.3.4. Patents/propotypes (2000.)

1.3.5. Organization of conferences (2000.)

Mini-curso em Fisiologia Integrativa: “Stimulus-secretion coupling in single endocrine cells: From Biophysics to Therapeutics”. UTAD, Vila Real, 27 e 28 de Maio e 3 de Junho de 2008. Com 30 participantes. Orador: Prof. Stanley Mislser (WUSTL, St. Louis, USA). Organization: Amélia M. Silva.

1.3.6. Industry contract research (2000.)

To increase the transfer of knowledge between the university and business environment, the research group have projects with companies, like VALCAST II Project established UTAD (co-promoter) and the company Sortegel-Produtos Congelados, Lda (Sortes-Bragança) (promoter) and MicoProject established between UTAD (co-promoter) and the company MICOLPLANT, Lda (promoter) both financed by the program Ideia from Agência de Inovação (AdI).

1.3.7. Internationalization (2000.)

Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

Among others, IB&Q researchers have active and effective collaborations with:

CEBAS (Spain) – Anchor institute of the IB&Q area: food and nutrition, most recently research on minerals in chestnut fruits.

IFR (UK) – Anchor institute of the IB&Q area: metabolism of polyphenolics and on the bioactives in bergamot fruit peel and *Opuntia cacti* cladodes. A new project is in development on added-value co-products from agro-food wastes.

KNUST (Ghana) – Agronomy, sustainable agriculture and bioactives focused on Ghanaian multi-purpose crops such as *Moringa oleifera* and *Adansonia digitata*.

SGGW (Poland) – Joint research and student exchanges for research on bioactives for human and animal health with the focus on organic crops (as part of the EU QLIF project) and herbal/medicinal teas.

Tech. Uni. Dresden (Germany) - Bioactives in Brassica and related crops focused on clubroot disease, mycorrhizal associations and antifungal phytochemicals.

Uni. Bordeaux (France) - Hydrolysable tannins in chestnuts, other foods and agro-food wastes.
 Uni. Messina (Italy) - Bioactives in Moringa and agro-food wastes.
 Uni. Newcastle (UK) - Studies on organic crops as part of the recently completed EU QLIF project with joint publications in preparation.
 Uni. São Paulo (Brazil) - Phytochemicals and bioactives in bananas and other Brazilian fruits.
 Uni. Sri Jayewardenepura (Sri Lanka) - Joint research on Brassica and related crops in Sri Lanka, and future development of projects on Sri Lankan food/herb/medicinal plants.
 WUR (The Netherlands) – Anchor institute of the IB&Q area: focus on Allium and Brassica crops and specifically organo-selenium compounds.
 The researchers of the group also collaborate with other European research institutions as part of the EU SAFENUT project: UNITO, Italy; CRAB, Italy; CRA, Italy; IRTA, Spain; CITA, Spain; NAGREF - ISPOT, Greece; NAGREF, Greece; INRA, France; Univerza v Ljubljani, Biotehniška Fakulteta, Slovenia.

1.3.8. Other publications National (6000.)

National Books and Chapters

GOMES-LARANJO, J., FERREIRA-CARDOSO, J. & PEIXOTO, F. (2008) Na Rota da Castanha em Trás-os-Montes. Edição Programa AGRO, Código 943 – Na rota da castanha em Trás-os-Montes. Universidade de Trás-os-Montes e Alto Douro, Vila Real, 128 pp

Santos, S.P., Gonçalves, F., Rei, F., Raimundo, A. & Torres, L. (2008) Coccinelídeos associados ao olival português. Importância na protecção contra a cochonilha-negra. Sector Editorial da UTAD. Vila Real, 28pp

Silva, A.P. – Coordenadora científica. Vários autores (2008) Castanha – Um fruto Saudável. ISBN: 978-972-669-850-0, Vila Real, Portugal, 178pp

SOARES, C.; OLIVEIRA-FREITAS, V. & PINTO, T. (2008) Histologia Vegetal – Tecidos Secretores. Série Didáctica – Ciências Aplicadas, N° 352. ISBN: 978-972-669-885-2.

Other Publications on National Scientific Meetings:

Arnaldo, P., Moreira, J., Oliveira, I. & Torres, L. (2008) Fauna odonitológica do Parque Natural do Alvão e sua relação com as características do habitat. XVI Congresso Anual da Sociedade Portuguesa de Estatística. Vila Real, 1 a 4 de Outubro de 2008: pp: 84

Carlos, C. Carvalho, J. Alves, F. Freitas, J. Cortez, I., Arnaldo, P., Pereira, A., Leite, S., Franco, J. e Torres, L. (2008) Actas do I Congresso Nacional de Produção Integrada VIII Encontro Nacional de Protecção Integrada, p. 164-165, Ponte de Lima

Carlos, C.; Ana Aguiar, A.; Alves, F. & Laura Torres, L. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 166-174

Carlos, C.; Carvalho, J.; Alves, F.; Freitas, J.; Cortez, I.; Arnaldo, P.; Ana Maria Nazaré Pereira, A.M.N.; Leite, S.; Franco, J.C. & Torres, L.M. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 164-165

Carlos, C.; Teixeira, B.R.A.; Alves, F. & Laura Torres, L. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 263-271

Cortez, I., Pereira, A. & Peters, D. (2008) Actas do I Congresso Nacional de Produção Integrada VIII Encontro Nacional de Protecção Integrada, p. 147-153, Ponte de Lima

FERREIRA-CARDOSO, J. (2008) Metodologia seguida e resultados obtidos no Projecto AGRO 943 - Na Rota da Castanha em Trás-os-Montes. Encontro da Confraria da Castanha dos "Soutos da Lapa", 28 de Junho, Meda, Portugal

GOMES-LARANJO, J. (2008) Enquadramento do castanheiro na região do Minho. Ciclo de conferências do castanheiro e da castanha, Arcos de Valdevez

GOMES-LARANJO, J. (2008) Refcast. Projecto de investimento para a fileira do castanheiro. VI jornadas do castanheiro, Vinhais

GOMES-LARANJO, J. (2008) Refcast. Projecto de investimento para a fileira do castanheiro. Forum Internacional dos Países Produtores de Castanha, Bragança

GOMES-LARANJO, J. (2008) Refcast. Projecto de investimento para a fileira do castanheiro. VII feira das colheitas, Penela da Beira

Gonçalves, M.F.M. & Torres, L.M. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 280-288

Gonçalves, M.F.M. & Torres, L.M. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 199-200

Gonçalves, M.F.M. & Torres, L.M. (2008) Poderá o incremento da biodiversidade do olival, aumentar a selectividade do espinosade nos tratamentos contra a mosca-da-azeitona? Proceedings 11º Encontro Nacional de Ecologia, Vila Real, Portugal

Gonçalves, M.F.M.; Rodrigues, M.C. & Torres, L.M. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 379-388

Gonzalez, D; Santos, M; Cabral, J & Torres, L. (2008) Contributo para a gestão das populações de traça da oliveira, *Prays oleae* (Bernard): modelo dinâmico de previsão populacional. Proceedings 11º Encontro Nacional de Ecologia, Vila Real, Portugal

Martins, S., Simões, F., Mendonça, D., Matos, J., Silva, A.P., Carnide, V. (2008) Differential screening in long and short fruit hazelnut trees using c-DNA-AFLP analysis. Proceedings of XXXIV Jornadas de Genética, Novembro, UTAD, Vila Real

REI, F. T.; CAMPOS, M. & TORRES, L. M. (2008) Proceedings do XIII Congresso Ibérico de Entomologia, Seia, Portugal. pp: 187

Rodrigues, J.R. & Torres, L.M. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 440-450

Santos, S.P.; Gonçalves, F.; Rei, F.; Raimundo, A. & Torres, L. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 431-440

Soares, F.D.; Garcia, A.J.; Torres, L.M. & Bento, A.A. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 208-216

Soares, F.D.; Garcia, A.J.; Torres, L.M. & Bento, A.A. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 201-207

SOARES, P., CRESPI, A., TORRES, L., ARNALDO, P.S. (2008) 11º Encontro Nacional de Ecologia, Vila Real, p. 31

Torres, L.M. & Rodrigues, J.R. (2008) Actas do I Congresso Nacional de Produção Integrada / VIII Encontro Nacional de Protecção Integrada, Ponte de Lima, Portugal, pp: 75

1.3.9. Government/Organization contract research (2000.)

Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

1.4. Future Research

This section allows you to provide the future objectives for the research group.

1.4.1. Objectives (3000 ca.)

For the future the Integrative Biology & Quality Group will be further rationalized into 3 major sub-groups with individual and common foci. This change will occur because of the integration of two new areas - i. Climate and Atmospheric Modelling (originally a separate CITAB Group) and ii. plant biochemistry/plant molecular biology researchers from the University of Minho.

The new sub-groups will be called

1. Identification and Uses of Secondary Metabolites in the Food Chain
2. Climate, Stress and Sustainable Crop Production
3. Biotechnology & Bioproducts

The new sub-groups will pursue the following common objectives at both national and international levels:

1. Development and application of practical agronomic and biotechnological strategies for sustainable food production (animal and plant foods)
2. Identification of effective plant-derived biopesticides and medicinal compounds and studies of their application
3. The development of practical methods for generating value-added co-products from agro-food wastes as part of our sustainable production strategies

There will also be the following specific objectives:

1. Identification and Uses of Secondary Metabolites in the Food Chain will focus on i. Bioactives in foods and residues from plants and mushrooms (providing fundamental data for stress, quality and health effects); Phytochemical biopesticides (identification of effective natural products to control economically important pathogens and pests of foods and in animals and humans); iii. Agro-food wastes and co-products (developing low cost processing methods to generate valuable co-products for the agro-food and health industries).
2. Climate, Stress and Sustainable Crop Production will focus on i. applications of climate and atmospheric modelling (predictive models for agro-forestry systems) to improve sustainable production; ii. Physiological and biochemical responses to stress in model crops (plant biochemistry, productivity and quality composition); iii. Sustainable food production (overlapping and coordinated studies in agronomy, plant biochemistry, stress biology, and plant pathology of chestnuts, olives, grapes and cherries).
3. Biotechnology & Bioproducts will focus on i. Medicinal & aromatic plants (phytochemistry, bioactivities and biotechnology of medicinal and aromatic plants); ii. Plant functional metabolites and plant genetic engineering (role of plant metabolites related to biotic stress and their potential health benefits for humans); iii. Physiology and biochemistry of plant cell cultures (development of in vitro-based bioplatfroms); iv. Transport of photoassimilates and plant productivity (phloem transport of photoassimilates in herbaceous plants and trees; mechanisms and regulations of transport into sink tissues); v. Ecology and biological activity on constructed wetlands (low technology systems to treat wastewater - "FitoETARs").

1.4.2. Funding, source, dates (1500 ca.)

Indicate in full including amount of current and pending funding

2.1 Group Description – EcoinTEGRITY

Please indicate main sources of funding for the research of your group. Include all types of funding, like FCT projects, FCT Base, as well as funding from other institutions. You should indicate an approximate amount in EUROS, and the source to which the funds apply.

- **Research Group Title:** (RG-AGR-Norte-VilaReal-4033-135) - EcoinTEGRITY
- **Principal Investigator:** Rui Manuel Vitor Cortes
- **Research Area:** N/D
- **Home Institution:** Universidade de Trás-os-Montes e Alto Douro

2.1.1. Funding, source, dates (1000 ca.)

FCT BASE: 32 400,00€

Total Funding of Projects running and concluded on 2008:

FCT Projects: 648 030,00€

Funding from Other Institutions: 2.154.132.93€ (National Industry: 310 529,97€, International Projects: 1.053.529.69 € and National Projects: 790 073,27€)

2.2. Objectives and Achievements

This section allows you to provide the objectives and achievements during the reporting period.

2.2.1. Objectives (2000 ca.)

The scope of this research group is the agro-ecology centred in the monitoring, protection and restoration of natural resources, at various scales of observation, in aquatic and terrestrial ecosystems. The choice of the adequate ecological indicators is crucial in order to make accurate predictions. In this scope, this sub-project represents a useful contribution to give a consistent basis for the holistic assessment of the ecological status in complex changed natural, semi-natural, and artificial ecosystems. The proposed research intends predict how anthropogenic environmental changes will affect the sustainability, resilience and diversity of disturbed natural ecosystems and agro-systems. Therefore the research area of ecoinTEGRITY intends:

1. To set the basis for the holistic assessment of the ecological status in complex natural, semi-natural, and artificialized ecosystems
2. To develop adequate models in order to predict how anthropogenic environmental changes will affect the sustainability, resilience and diversity of disturbed natural ecosystems and agro-forest systems.
3. To look for the selection and validation of the adequate ecological indicators
4. To set efficient techniques for ecosystem rehabilitation.

2.2.2. Main Achievements (2000 ca.)

The group has given a contribution to the progress of the scientific knowledge through the following findings: i) The studies on bio-indicators and monitoring of inland waters produced an important number of biological and physical metrics and assessment tools which were able to detect point and non-point effects of disturbance at different spatial scales independently of the geographic variations; besides, it was possible to extend this contribution to a national level with obvious application under the Water Framework Directive. ii) The development of stochastic-dynamic methodology (StDM) as a new sequential modelling process developed in order to predict the ecological status of changed ecosystems. iii) Development of methods and tools for forest ecosystems monitoring, protection, conservation and restoration, which are focused in the control of biotic (pests and diseases) factors. iv) Research on fire ecology allowed a comprehensive characterisation of the vegetation as a fuel at different scales (particle, complex, and stand) in order to test and validate fire behaviour models and simulators. v) Use of biochemical and physiological indicators of stress and ecotoxicological assessment of xenobiotic compounds. vi) Assessment of microbial diversity, physiology and ecology in unspoiled and polluted environments determined their contribution to ecosystem functioning through decomposition. An important knowledge was obtained on the research of microbial degradation of environmental pollutants, either from natural or xenobiotic origins, for potential use to bioremediation technologies.

2.3. Group Productivity

This section allows you to provide the productivity during the reporting period.

2.3.1. Publication in peer review Journals (6000 ca.)

ISI Articles:

AMARAL, C., LUCAS, M., COUTINHO, J., CRESPI, A., ANJOS, M.R., PAIS, C. (2008). Microbiological and physicochemical characterization of OMW from a continuous olive mill in Northeastern Portugal. *Bioresource Technology*, 99: 7215-7223.

CRUZ, M.G.; ALEXANDER, M.E.; & FERNANDES, P.M. (2008). Development of a model system to predict wildfire behaviour in pine plantations. *Australian Forestry*, 71: 113-121.

CRUZ, M.G.; FERNANDES, P.M. (2008). Development of fuel models for fire behavior prediction in maritime pine (*Pinus pinaster* Ait.) stands. *International Journal of Wildland Fire*, 17: 194-204.

FERNANDES, C.; FONTAÍNHAS-FERNANDES, A.; CABRAL, D.; & SALGADO, M. (2008). Heavy metals in water, sediment and tissues of *Liza saliens* from Esmoriz-Paramos lagoon, Portugal. *Environmental Monitoring and Assessment*, 136: 267-275.

FERNANDES, C.; FONTAÍNHAS-FERNANDES, A.; FERREIRA, M.; & SALGADO, M. (2008). Oxidative stress biomarkers in Mugilidae (*Liza saliens*) from the Esmoriz-Paramos coastal lagoon, Portugal. *Archives of Environmental Contamination and Toxicology*, 55: 262-269.

FERNANDES, C.; FONTAÍNHAS-FERNANDES, A.; ROCHA, E.; & SALGADO, M. (2008). Monitoring pollution in Esmoriz-Paramos lagoon, Portugal: Liver histological and biochemical effects in *Liza saliens*. *Environmental Monitoring and Assessment*, 145: 315-322.

FERNANDES, P.M. (2008). Forest fires in Galicia (Spain): the outcome of unbalanced fire management. *Journal of Forest Economics*, 14: 155-157.

FERNANDES, P.M.; BOTELHO, H.S.; REGO, F.C.; & LOUREIRO, C. (2008). Using fuel and weather variables to predict the sustainability of surface fire spread in maritime pine stands. *Canadian Journal of Forest Research*, 38: 190–201.

FERNANDES, P.M.; VEGA, J.A.; JIMÉNEZ, E.; & RIGOLOT, E. (2008). Fire resistance of European pines. *Forest Ecology and Management*, 256: 246-255.

FONTAÍNHAS-FERNANDES, A.; LUZIO, A.; GARCIA-SANTOS, S.; CARROLA, J.; & MONTEIRO, M. (2008). Gill histopathological alterations in Nile tilapia, *Oreochromis niloticus*, exposed to treatment sewage water. *Brazilian Archives of Biology and Technology*, 51: 1057-1063.

HUGHES, S., CORTES, R.M.V. & FERREIRA, T. (2008). Hierarchical Spatial Patterns and Drivers of Change in Benthic Invertebrate Communities in a Mediterranean River. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18: 742-760.

LUCAS, M.S.; DIAS, A.A.; BEZERRA, R.M.; & PERES, J.A. (2008). Gallic acid photochemical oxidation as a model compound of winery wastewaters. *Journal of Environmental Science and Health, Part A*, 43: 1288-1295.

MARTINS, F., GOMES-LARANJO, J., AMARAL, C., ALMEIDA, J., & PEIXOTO, F. (2008). Evaluation of olive oil mill wastewaters acute toxicity: a study on the mitochondrial bioenergetics. *Ecotoxicology and Environmental Safety*, 69: 480-487.

PEIXOTO, F., MARTINS, F., AMARAL, C., GOMES-LARANJO, J., ALMEIDA, J., & PALMEIRA, C.A. (2008). Evaluation of olive oil mill wastewater toxicity on the mitochondrial bioenergetics after treatment with *Candida oleophila*. *Ecotoxicology and Environmental Safety*, 70: 266-275.

RODRIGUES, M.A.M., PINTO, P., BEZERRA, R.M.F., DIAS, A.A., GUEDES, C.V.M., CARDOSO, V.M.G., CONE, J.W., FERREIRA, L.M.M., COLAÇO, J. & SEQUEIRA C.A. (2008). Effect of enzyme extracts isolated from white-rot fungi on chemical composition and in vitro digestibility of wheat straw, *Animal Feed Science and Technology*, 141: 326–338.

SILVA-SANTOS, P.; PARDAL, M.; LOPES, R.; MÚRIAS, T.; & CABRAL, J.A. (2008) Testing the Stochastic Dynamic Methodology (StDM) as a management tool in a shallow temperate estuary of south Europe (Mondego, Portugal). *Ecological Modelling*, 210: 377-402.

VIEIRA-PINTO, M., OLIVEIRA, M., ARANHA, J., MARTINS, C., BERNANDO, F. (2008). Influence of an enrichment step on *Salmonella* sp. Detection by Fluorescent in Situ Hybridisation on pork samples. *Food Control* 19: 286-290.

ISI Proceedings:

ANDRADE, C.; SANTOS, J.; CORTE-REAL, J. (2008). Climate-mean winter patterns associated with enthalpy, latent heat and linear momentum mean convergence fields due to large-scale transient eddies. *Geophysical Research Abstracts*, 10: EGU2008-A-03343.

FRANCISCO, N.; RODRIGUES, N.; SILVA, E.; CARVALHO, M.; FARIA, S.; SILVA, V.; REIS, M. C. (2008). Multiscale Recurrent Pattern Image Coding With a Flexible Partition Scheme, 2008 IEEE International Conference on Image Processing (ICIP 2008), San Diego, California, USA, 12 a 15 de Outubro.

MARINHO-GONÇALVES, O.; FONTAÍNHAS-FERNANDES, A.; COTA-CASTRO, L.; SMOLKA, A. & WILSON, J (2008). Gastric proton pump expression in teleost fishes: Nongastric sites of expression in gastric versus agastric fishes. *Comparative Biochemistry and Physiology*, 150A (3): S107.

PÁSCOA, I.; FONTAÍNHAS-FERNANDES, A. & WILSON, J (2008). Ammonia tolerance in the zebrafish (*Danio rerio*): Effects of ionic strength and ontogeny. *Comparative Biochemistry and Physiology*, 150A (3): S106-S107.

SANTOS, J.; ANDRADE, C.; CORTE-REAL J. (2008). North Atlantic transient eddies and winter precipitation in Portugal. *Geophysical Research Abstracts*, 10: EGU2008-A-01820.

Articles on other international scientific Journals:

CORTES R.M.V., VARANDAS, S., HUGHES, S.J. & FERREIRA, T. (2008). Combining Habitat and Biological Characterization: Ecological Validation of the River Habitat Survey. *Limnetica*: 27: 39-56.

MARTINS, A., CRESPI, A.L., CASTRO, A., FERNANDES, C.P., ROCHA, J., CASTRO, C., BERNARDOS, S. & AMICH, F.(2008). Contribución para la caracterización bioclimática del Norte de Portugal. La transición florística atlántico-mediterránea. Approach on the climatic characterization for Northern of Portugal. The atlantic-mediterranean floristic transition. *Acta Botanica Malacitana* 33: 289-307

SAMPAIO, A.; RODRÍGUEZ-GONZÁLEZ, P.M.; OLIVEIRA, S.V.; CORTES, R.M.; & FERREIRA, M.T. (2008). Leaf litter decomposition in western Iberian forest wetlands: lentic versus lotic response. *Limnetica*, 27: 93-106.

Articles on other national scientific meetings

CAPELO, M.; ONOFRE, N.; REGO, F.; MONZÓN, A.; FARIA, P. & CORTEZ, P. (2008). Modelação da presença de aves de rapina diurnas em pinhais bravos do Norte e Centro de Portugal. *Silva Lusitana*, 16: 45-62. (* CAB International).

2.3.2. Other publications International (6000.)

International Books and Chapters

CABRAL, J. A.; CABECINHA, E.; SANTOS, M.; TRAVASSOS, P.; & SILVA-SANTOS, P. (2008) In: Alonso M. S. and Rubio I. M. (Eds), *Ecological Management: New Research*. Nova Science Publishers, Inc., New York, ISBN: 978-1-60456-786-1, pp. 123-141

FERNANDES, C.; FONTAÍNHAS-FERNANDES, A.; & SALGADO, M. (2008) *Metabolic Mechanisms of Adaptation to Chronic Metal Exposure - A Case Study*. In: *Heavy Metals Pollution*, Samuel E. Brown and William C. Welton eds. Nova Publishers, ISBN: 978-1-60456-899-8.

Other Publications on International Scientific Meetings:

- CALEJO, M.; MONTEIRO, S.M.; FONTAINHAS-FERNANDES, A.; SOUSA, M. (2008) Copper exposure failed to induce caspase-3 activation in gills of the teleost fish, *Oreochromis niloticus*. International conference on Microscopy and Microanalysis – 43rd Annual Meeting of the Portuguese Society for Microscopy, Porto, Portugal, [Abstract].
- CARROLA, J., FONTAÍNHAS-FERNANDES, A., MATOS, P., ROCHA, E. (2008) Impacts of abandoned Jales Mine of brown trout (*Salmo trutta* F. Fario) of Tinhela river. 7th IberoAmerican congress of Environmental Contamination and Toxicology, Lisboa, March
- CARROLA, J., MATOS, P., FONTAÍNHAS-FERNANDES, A., ROCHA, E. (2008) Frequency of hepatocellular fibrillar inclusions in liver flounders (*Platyichthis flesus*) from Douro River estuary. SETAC Europe 18th Annual Meeting, Warsaw, April
- CORREIA, A.T., OLIVEIRA, A., COIMBRA, A. (2008) Is there any effect of the hydrostatic pressure in the otolith formation of *Tilapia* larvae? 8th Larval Biology Symposia, Lisbon, Portugal
- FERNANDES, C., FONTAÍNHAS-FERNANDES, A., SALGADO, M., CARROLA, J., 2008 SETAC Europe, 18th Annual Meeting. World under stress, 25-29 May, Warsaw, Poland (Poster), TU117; p 129 Abstract Book
- FERNANDES, C., FONTAÍNHAS-FERNANDES, A., SALGADO, M. (2008) Liver histopathological assessment in wild mullet chronically exposed to Cu and Zn. 7th IberoAmerican congress of Environmental Contamination and Toxicology, Lisboa, March
- FERNANDES, P.; LUZ, A.; LOUREIRO, C.; BOTELHO, H. (2008) Workshop Fire Effects and Post-fire Restoration: Lessons Learned from Large Fires, Lisboa, Portugal, p: 15
- FERNANDES, P.M. (2008) Fire, Environment and Society, from Research into Practice – the International Bushfire Conference incorporating the 15th AFAC Conference, 1-3 de Setembro, Adelaide, Austrália, pp: 145-153
- GARCIA-SANTOS S, MANCERA J, FONTAÍNHAS-FERNANDES A, WILSON J. (2008) Metabolic and osmoregulatory alterations and cell proliferation in gilthead sea bream (*Sparus aurata*) exposed to cadmium. The SEB Annual Main Meeting; Marseille, July.
- LOPES, R., CABRAL, J. A., MÚRIAS, T. (2008) Long term spatial distribution and habitat use of waders in the traditional Salinas of Mondego estuary. "International Wader Study Group Conference", Jastrzebia Gora (Poland)
- MARINHO-GONÇALVES, O., FONTAÍNHAS-FERNANDES, A., CASTRO, F., SMOLKA, A., WILSON, J. (2008) Gastric proton pump expression in teleost fishes: nongastric sites of expression in gastric versus agastric fishes. The SEB Annual Main Meeting; Marseille, July.
- MATOS P, CARROLA J, FONTAÍNHAS-FERNANDES A, ROCHA E. (2008) Studying functional consequences of necrosis in fish using *tilapia nilotica* (*Oreochromis niloticus*). SETAC Europe 18th Annual Meeting, Warsaw, April
- MATOS, P.; FONTAÍNHAS-FERNANDES, A.; GALANTE, H.; MONTEIRO, R.; ROCHA, E. (2008) SETAC Europe, 18th Annual Meeting, Warsaw, Poland, pp: 106-107
- MATOS, P.; FONTAÍNHAS-FERNANDES, A.; GALANTE, H.; MONTEIRO, R.; ROCHA, E. (2008) SETAC Europe, 18th Annual Meeting, Warsaw, Poland, pp: 121-122
- MONTEIRO, M., ROCHA, E., FONTAÍNHAS-FERNANDES, A., SOUSA, M. (2008) Correlations between copper-burden and histopathological changes in gill of *Oreochromis niloticus*. 7th IberoAmerican congress of Environmental Contamination and Toxicology, Lisboa, March
- MONTEIRO, S.M.; ROCHA, E.; MANCERA, J.M.; FONTAINHAS-FERNANDES, A.; SOUSA, M. (2008) Proceedings of the International Conference "SETAC Europe 18th Annual Meeting" Warsaw, Poland, 25-29 May [Abstract]
- PÁSCOA, I., FONTAÍNHAS-FERNANDES, A., WILSON, J. (2008) Ammonia tolerance in the zebrafish (*Danio rerio*): Effects of ionic strength and ontogeny. The SEB Annual Main Meeting; Marseille, July.

PINTO A, VARANDAS S, CARROLA J, COIMBRA A, FONTAÍNHAS-FERNANDES A, CORTES R. (2008) Biomonitorização do rio Febros baseada na utilização de macroinvertebrados e peixes. Congresso Ibérico da Água, Vitoria, 20-22 Novembro

RIBEIRO, C., URBATZKA, R. CASTRO, F. ROCHA, E. CARROLA, J. FONTAÍNHAS-FERNANDES, A. TIRITAN M.E. AND ROCHA, M.J. (2008) SETAC Europe, 18th Annual Meeting. World under stress, Warsaw, Poland (Poster). , WE 037; p 156 Abstract Book

RIBEIRO, C., URBATZKA, R. CASTRO, F. ROCHA, E. CARROLA, J. FONTAÍNHAS-FERNANDES, A. TIRITAN M.E. AND ROCHA, M.J. (2008) SETAC Europe, 18th Annual Meeting. World under stress, Warsaw, Poland (Poster). , WE 039; p 156 Abstract Book

RIBEIRO, C., URBATZKA, R., CASTRO, F., ROCHA, E., CARROLA, J. FONTAÍNHAS-FERNANDES, A., TIRITAN M.E. AND ROCHA, M.J. (2008) Changes on the carbonyl/reductase 20 β -hydroxysteroid dehydrogenase expression in the Nile tilapia (*Oreochromis niloticus*) exposed to several endocrine disrupters. SETAC Europe, 18th Annual Meeting. World under stress, 25-29 May, Warsaw, Poland (Poster), WE 038; p 156 Abstract Book

SAMPAIO, A.; DIAS, A.A.; FRAGA, I.; RODRÍGUEZ-GONZÁLEZ, P.M., BEZERRA; Rui, M.F.; CORTES, R.V. (2008) Dynamics of enzymatic activities on leaf litter during decomposition in lentic and lotic systems. 5th International Meeting on Plant Litter Processing in Freshwaters, Coimbra, 23 a 26 Julho [abstract]

SILVA-SANTOS, P., PARDAL, M., LOPES, R., MÚRIAS, T., CABRAL, J. A. (2008) The ecological dynamics in transitional sink environments: A Stochastic Dynamic Methodology (StDM) as a management tool in estuarine eutrophication scenarios. "SEASINK 2008", Universidade Fernando Pessoa, Porto

VARANDAS, S., TEIXEIRA, A. & CORTES, R.M.V. (2008) Avaliação em múltiplas escalas de variação do meio físico e biológico: da bacia ao habitat. XIV Congreso de la Asociación Ibérica de Limnología", Huelva, Espanha, pp: 69

XAVIER, J.; PINTO, J.; JESUS, A.; Morais, J. (2008) Application of stereovision to wood compression tests. 1st Conference on 3D-Imaging of Materials and Systems, Carcans-Maubuisson, France, 8-12 Septembre

2.3.3. Master and Ph.D. thesis completed (3000.)

Ph.D. Thesis Completed:

CABECINHA, E. (2008). Ecological integrity assessment in aquatic ecosystems: A multi-scale approach towards the definition of the ecological status of Mediterranean reservoirs. Universidade de Trás-os-Montes e Alto Douro. Supervisors: João Alexandre Cabral e Miguel Pardal (Universidade de Coimbra)

CARVALHO, L.I.Q.A. (2008). Metodologias para a avaliação integrada dos impactos cumulativos em sistemas fluviais de pequenas bacias sujeitas a elevadas pressões antropogénicas. Co-supervisor: R.M.V. Cortes

Master Thesis Completed:

ALEXANDRE, J. (2008). Impacto das Pedreiras em Cursos de Água. O Caso do Concelho de V. P. Aguiar. Supervisor: R.M.V. Cortes.

CANÁRIO, R. (2008). Influência das características hidrológicas e de enquadramento biofísico do Rio Olo na diversidade associada de vertebrados semi-aquáticos e terrestres. Mestrado em Hidrobiologia, Faculdade de Ciências da Universidade do Porto. Supervisors: Nuno Formigo (Faculdade de Ciências da Universidade do Porto) e João Alexandre Cabral.

CERDEIRA, C. (2008). Análise das metodologias de restauração de áreas ardidas e sua adequação ao Plano Municipal de Defesa da Floresta Contra Incêndios de Valpaços. Dissertação do 2º Ciclo de Eng.º de Recursos Florestais, UTAD. Supervisor: Hermínio Botelho.

EIRA, A.B. (2008). Humidade do combustível morto em tipos florestais contíguos. Mestrado em Gestão de Ecosistemas, UTAD. Supervisor: P.M. P.M. Fernandes.

FREITAS, R. (2008). A invasibilidade da flora exótica para o Norte de Portugal. Supervisor: A. L. Crespi (UTAD)

FREITAS, G.A.S. (2008). Deslenhificação de materiais lenhinoceulósicos para bioconversão. Mestrado em Tecnologias Ambientais, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Albino Alves Dias e Dmitry Evtugin (Universidade de Aveiro).

GONÇALVES, O.M. (2008). Gastric proton pump expression in teleost fishes: non gastric sites of expression in gastric versus agastric fishes. Tese de Mestrado em Biologia Clínica Laboratorial, Universidade de Trás-os-Montes e Alto Douro. Supervisors: António Fontainhas Fernandes e Jonhattan Wilson (Universidade do Porto).

GUEDES, C. (2008). Modelação de sobrevivência da *Quercus pyrenaica* ao fogo. Mestrado em Eng^a de Recursos Florestais, UTAD. Supervisor: P.M. Fernandes.

JESUS, J.B. (2008). Requalificação Integrada dum Curso de Água. O Caso da Ribeira de Odelouca. Supervisor: R.M.V. Cortes.

MARTINHO, A.M.V. (2008). Gestão Sustentável das Populações Nativas de Truta (*Salmo trutta*, L.): O caso do Rio Olo. Supervisor: R.M.V. Cortes.

PINTO, A.L. (2008). Utilização de macroinvertebrados e peixes na monitorização biológica do rio Febros. Mestrado em Gestão de ecossistemas, Universidade de Trás-os-Montes e Alto Douro. Supervisors: António Fontainhas Fernandes e Simone Varandas.

ROCHA, J. (2008). Diversidade morfológica comparativa das plantas vasculares. Supervisor: J. Honrado (Universidade do Porto, Faculdade de Ciências), A. L. Crespi (UTAD).

SILVA, M.C. (2008). Caracterização de combustíveis em sobreirais de Trás-os-Montes e Alto Douro. Mestrado em Gestão de Ecossistemas, UTAD. Supervisor: P.M. P.M. Fernandes.

TEIXEIRA, P.A.N. (2008). Avaliação da histopatologia hepática em barbo (*Barbus bocagei*) e boga (*Chondrostoma polylepis*) capturados no Rio Vizela. Mestrado em Tecnologias Ambientais, Universidade de Trás-os-Montes e Alto Douro. Supervisor: António Fontainhas Fernandes.

2.3.4. Patents/propotypes (2000.)

2.3.5. Organization of conferences (2000.)

2.3.6. Industry contract research (2000.)

2.3.7. Internationalization (2000.)

Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

There was an intensive cooperation with other institutions, particularly on the Iberian Peninsula, related to the research on fire ecology, due to the common problems with fire hazard. It was the case of Centre Tecnològic Forestal de Catalunya, Centro de Investigaciones Forestales de Lourizán, Centro de Investigaciones sobre Desertificación – CSIC, Universidad Complutense of Madrid, Universidad de Salamanca, Universidad de Sevilla and CERTEC in Universitat Politècnica de Catalunya. It involved the exchange of post-graduate students, visits to laboratories and participation in Eu research programs. Such cooperation in this scientific area was extended to the University of Kastamonu (Turkey), University of Rennes (France), Naples University, the CSIRO Sustainable Ecosystems and University of New South Wales (both in Australia). Different collaborative publications were produced under these contacts. Concerning supervision of post-graduate students and research collaboration in the field of ecological indicators and use of ecological models it was established cooperation with the Agència de Ecologia Urbana de Barcelona (Spain) and the University of Fribourg (Swiss).

2.3.8. Other publications National (6000.)

National Books and Chapters:

ALVES, M H et al Tipologia de Rios em Portugal Continental no âmbito da implementação da Directiva Quadro da Água. I – Caracterização abiótica. Ministério do Ambiente, do Ordenamento do Território e do desenvolvimento Regional. Instituto da Água, IP, 32 pp

CORTES, RMV Rio Douro: caracterização ecológica e valores ambientais. Em: As águas do Douro (ED. Gaspar Martins Pereira): 199-230. Águas do Douro e Paiva

FERNANDES, PM Desempenho do sistema de DFCI em Portugal Continental nos períodos de 2001-2005 e 2006-2008. In: JS Silva, E Deus, L Saldanha (Eds.), Incêndios Florestais: 5 Anos Após 2003. LPN/AFN, Coimbra, pp 139-147

MONZÓN, A & TEIXEIRA, R O corço, esse duende ainda por redescobrir. In: Guedes-Pinto, H (Ed): Perspectivas em gestão de fauna selvagem. Minerva Transmontana. 112pp ISBN: 978-972-669-754-1, pp 73-81

MONZÓN, A Cap I: Aves – comportamento. In: Vieira-Pinto et al.: Exame inicial de caça abatida em zonas de caça.UTAD. Vila Real, 233pp ISBN: 978-972-669-889-0 (CDU637.5), pp 29-34

MONZÓN, A Cap II: Lagomorfos – comportamento. In: Vieira-Pinto et al.: Exame inicial de caça abatida em zonas de caça.UTAD. Vila Real, 233pp ISBN: 978-972-669-889-0 (CDU637.5), pp 73-78

MONZÓN, A Cap. III: Ruminantes – comportamento. In: Vieira-Pinto et al.: Exame inicial de caça abatida em zonas de caça. UTAD. Vila Real, 233pp ISBN: 978-972-669-889-0 (CDU637.5), pp 121-127

MONZÓN, A Cap IV: Javali – comportamento. In: Vieira-Pinto et al.: Exame inicial de caça abatida em zonas de caça. UTAD. Vila Real, 233pp ISBN: 978-972-669-889-0 (CDU637.5), pp 163-166

Other Publications on National Scientific Meetings:

AZEVEDO, J et al. Como é que os bosques de azinheira sobrevivem em áreas de fogos frequentes? 11º Encontro Nacional de Ecologia, SPECO, Vila Real

BOAVIDA, I et al. Determinação de caudais ecológicos com recurso à modelação bidimensional: o caso da Ribeira de Odelouca Aplicação do modelo River 2D. 9º Congresso da Água. Published in CD

CABECINHA, E e tal. Assessing environmental quality of European reservoirs under the water framework directive using PRC analysis. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

CABECINHA, E, et al. A stochastic dynamic methodology (StDM) for reservoir's water quality management: validation and scenario testing of a multi-scale approach in a south European basin (Douro, Portugal) 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

CABRAL, JA et al. A metodologia estocástico-dinâmica (StDM) no contexto da monitorização ecológica: 7 anos de aplicações após a sua primeira apresentação no 6º ENE. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

COIMBRA, AM e tal. A Avaliação histopatológica de brânquia e fígado de Barbo (*Barbus bocagei*) do rio Vizela. 11º Encontro Nacional de Ecologia, UTAD, Vila Real, Portugal [Abstract]

COIMBRA, AM e tal. Estudo dos efeitos da exposição crónica a baixas concentrações de 17 α etinilestradiol no desenvolvimento e capacidade reprodutiva do peixe zebra (*Danio rerio*). Encontro Nacional de Ecologia-Sociedade Portuguesa de Ecologia Aplicada, UTAD

CORTES, RMV e tal. Um índice de avaliação do estado de conservação do habitat fluvial aplicado no âmbito da Directiva Quadro da Água. 9º Congresso da Água. Published in CD.

CORTES, RMV & FERREIRA, MT Estado ecológico das massas de água. A situação em Portugal. Actas do 6º Congresso Ibérico sobre Gestão e Planificação da Água. Em CD

COSTA, A; POETA, P; SAMPAIO, A Comparação da flora microbiana em indivíduos com e sem ortodontia fixa. 2ªs Jornadas de Biologia. UTAD. Vila Real. [abstract]

FERNANDES, A e tal. Uma perspectiva ecológica sobre a gestão da complexidade e diversidade urbana. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

FERRÃO, A, MARAU, A, SANTOS, M Abundância e comportamento de uma espécie de passeriforme insectívoro (*Saxicola torquata*) e a sua relação com os usos do solo em agroecossistemas. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

FERREIRA, A et al. Tinea capitis: um problema de saúde pública num bairro suburbano de Lisboa. 2ªs Jornadas de Biologia. UTAD. Vila Real [abstract]

FREITAS, R e tal. A dinâmica florística e os factores antrópicos. A Flora exótica no norte de Portugal. 11º Congresso Nacional de Ecologia, Vila Real

GARCÍA-BARRIUSO, M e tal. *Succisella carvalhoana* (Mariz) Baksay (Dipsacaceae) em Portugal. 11º Congresso Nacional de Ecologia, SPECO, Vila Real

Gonzalez, D et al. Contributo para a gestão das populações de traça da oliveira, *Prays oleae* (Bernard): modelo dinâmico de previsão populacional. Proceedings 11º Encontro Nacional de Ecologia, Vila Real, Portugal

MARAU, A, FERRÃO, A, SANTOS, M Abundância e diversidade de grandes grupos de invertebrados activos da superfície do solo e as características de um agroecossistema em agricultura biológica dinâmicas no espaço e no tempo. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

MEDEIROS, J e tal. A previsão estocástico-dinâmica (StDM) de impacts decorrentes da instalação de parques eólicos sobre as populações de quirópteros. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

MONZÓN, A Conservação, uma responsabilidade compartilhada. Oradora convidada na I Palestra de Medicina Veterinária Forense. UTAD, Vila Real. Portugal

MONZÓN, A e tal. A mamofauna e a paisagem vegetal no concelho de Mogadouro (Nordeste de Portugal). 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

MONZÓN, A e tal. Implementação de modelos de gestão do habitat para o fomento do coelho bravo (*Oryctolagus cuniculus*). Oradora convidada no II Congresso Português de Fauna Selvagem, WAVES, Mogadouro. p 15

PEIXOTO, M e tal. Evolução neogénica da flora duriense. 11º Congresso Nacional de Ecologia, Vila Real

PEREIRA, APE; HAIE, N & FERNANDES LFS Pressões Antropogénicas nas Bacias Hidrográficas dos Rios Sôdo, Pinhão e Ribeira de Vila Chã: Causas, Consequências e Respostas. Proceedings of 9th Portuguese Water Conference, Estoril-Cascais, Portugal

PEREIRA, C e tal. Tecnologias computacionais aplicadas à conservação da Gralha-de-bico-vermelho (*Pyrrhocorax pyrrhocorax*). 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

PEREIRA, C e tal. Estudo da biologia e comportamento da Gralha-de-bico-vermelho (*Pyrrhocorax pyrrhocorax*). 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

Pinto, A et al. Combinação de diferentes níveis de organização biológica (bioindicadores e biomarcadores) na avaliação da integridade ecológica do rio Febros. 11º ENCONTRO NACIONAL DE ECOLOGIA, SPECO, UTAD

ROCHA, J et al. Morfoecologia do género *Baldellia* (L.) Parl na Península Ibérica. 11º Congresso Nacional de Ecologia, SPECO, Vila Real

SANTOS, M et al. Simplifying complexity: applications of stochastic dynamic methodology in terrestrial ecosystems. 11º ENCONTRO NACIONAL DE ECOLOGIA, UTAD, Vila Real

SILVA, C et al. Proposta de classificação da mina de Moimenta como abrigo de importância nacional. II Congresso de Fauna Selvagem da WAVES, Mogadouro

SOARES, P et al. The relationship between *Maculinea alcon* (Den. & Schiif.) and the selected variables: a multivariate approach. 11º Encontro Nacional de Ecologia, Vila Real, p 31

2.3.9. Government/Organization contract research (2000.)

Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

2.4. Future Research

This section allows you to provide the future objectives for the research group.

2.4.1. Objectives (3000 ca.)

The main future objective of research of Eointegrity group is to predict how the changes of anthropogenic origin affect sustainability, resilience and naturalness on disturbed ecosystems. So the studies to be undertaken in 2009 designed to develop technological tools that try to understand the dynamics and structure of systems affected by human activity, promoting the planning of programs for measuring and monitoring the environmental conditions where the search form to explain past and present situations and the ability to predict the future of ecological processes. It is more appropriate integration of the areas most relevant played by this line and are the ecotoxicology, environmental chemistry and biotechnology, microbiology, environmental impact studies, ecological modeling and environmental management, among others.

This integration also aims to meet the CITAB's Activities Report, which tries that research is conducted in team work. This will be a priority to be performed. In addition should be extended not only to scientific areas mentioned, but should also take into account the remaining Groups of the Unit and involve socio-economic aspects. The internationalization of research and support from the liaison with business groups and state bodies must be also an important aspect, especially the first point, also raised in the Report. This should be a review of the most appropriate strategy for the members of the Group, is a priority item to be discussed shortly. Another aspect concerns the connection with the designated key institutions, should be promoted effective collaboration that must overcome the current stagnation, in addition to search beyond the current range.

2.4.2. Funding, source, dates (1500 ca.)

Indicate in full including amount of current and pending funding

3.1 Group Description – Biosystems Engineering

Please indicate main sources of funding for the research of your group. Include all types of funding, like FCT projects, FCT Base, as well as funding from other institutions. You should indicate an approximate amount in EUROS, and the source to which the funds apply.

- **Research Group Title:** (RG-AGR-Norte-VilaReal-4033-136) - Biosystems Engineering
- **Principal Investigator:** Pedro José de Melo Teixeira Pinto
- **Research Area:** N/D
- **Home Institution:** Universidade de Trás-os-Montes e Alto Douro

3.1.1. Funding, source, dates (1000 ca.)

FCT BASE: 43 200.00 €

Total Funding of Projects running and concluded on 2008:

FCT Projects: 334 299.00€

Funding from Other Institutions: 1 661 378.27 € (International Projects: 47 000.00€ and National Projects: 1 614 378,27€)

3.2. Objectives and Achievements

This section allows you to provide the objectives and achievements during the reporting period.

3.2.1. Objectives (2000 ca.)

The research activities of this Group, previously concentrated in CETAV, were directed to the development of engineering technologies applied to agri-forestry systems, environment and life towards a more sustainable development and better quality of life. To accomplish the development of these activities 3 main themes were created with specific objectives each:

1) Characterization and Exploitation of Biomaterials which purpose is the experimental identification and analytical modelling of mechanical and fracture behaviour of biological materials, in order to improve the value of agroforestry resources; the evaluation of the quality and technological applications of wood; and the characterization and exploitation of agro-forestry biomass as primary energy source.

2) Digital Image Processing within agri-forestry, environmental and biological contexts aims to the use of computer vision techniques focused on biological images and precision viticulture, including novel ones using fuzzy logic and to perform movement analysis in animal models, to study functional assessment after spinal cord injury (SCI) and in dogs with hip dysplasia.

3) Signal Processing and Biotelemetry. In this area the objectives are related with the development of embedded systems for remote sensing, environmental and physiological parameters monitoring and data processing with the purpose to take management decisions in the crops with less and more economical inputs, including to perform comprehensive studies about remote sensing needs in precision farming of viticulture in order to develop specific sensing devices and to develop high flexible acquisition devices within a wireless sensor network deployed in vineyards.

3.2.2. Main Achievements (2000 ca.)

Concerning the characterization of wood mechanical properties, a new data reduction scheme for mode I wood fracture characterization using the DCB test and the development of an inverse identification procedure of fracture properties of wood through cohesive crack simulations were developed.

Concerning the area of digital image processing the tracking based movement analysis methodology has been improved with the incorporation of novel multi-thresholding and edge detection techniques.

Studies were carried out on the evaluation of functional recovery in animal model using a new treatment protocol where the former analysis model of the animal movement was extended including now a 3D bi-lateral analysis.

In the area of signal and data processing in biological and ecological contexts the Wireless Farm concept is under development, including the development of embedded systems for remote sensing, environmental and physiological parameters monitoring and data processing.

Within the development of specific sensing devices and high flexible acquisition devices, both a multipowered small stationary data acquisition device and a soil-moisture laboratorial prototype sensing device were developed.

3.3. Group Productivity

This section allows you to provide the productivity during the reporting period.

3.3.1. Publication in peer review Journals (6000 ca.)

ISI Articles

AMADO S et al Biomaterials, 29: 4409-4419

CAMPILHO RDSG et al J of Adhesion Sci. and Techn., 22(13): 1565-1591

COUTO PA et al J of Neuroscience Methods, 173: 193-200

DOURADO N et al Composites Part A: Applied Sci. and Manufact. 39(2): 415 – 427

GABRIE R et al Physical Therapy in Sport, 9(1): 16-24

GASPAR M ET AL Annals of Forest Sci. 65: 703

GASPAR M ET AL Canadian J Forest Research 38: 1470-1477

GEUNA S; VAREJÃO ASP J of Neurosurgery 109: 360-362

GINJA MMD et al J of Small Animal Practice 49: 641-646

GINJA MMD et al Acta Vet. Hung. 56: 303-312

KNAPIC S ET AL Forestry 81(4): 465-473

LUÍS AL et al Microsurgery 28: 458-470

LUÍS AL et al Tissue Eng. Part A 14: 979-993

MARINHO DA et al J of Sports Sciences 26(S1): 3–21

MONTEIRO E, MOREIRA NA, FERREIRA S Applied Energy 86(3): 290-298

MONTEIRO M et al J of Fish Biology 73: 1376-1392

MORAIS R et al Computers and Electronics in Agric. 62(2): 94-106

MORAIS R et al Computers and Electronics in Agric. 64: 120-132

MOURA MFSF; MORAIS J JL & DOURADO NMM Eng. Fracture Mechanics 75(13): 3852 - 3865

PIRES LCM, CARVALHO J, MOREIRA NA Int. J. of Production Research 46(4): 1163-1185

REIS MJCS; SANTOS GMMC; FERREIRA PJSG Aslib Proceedings, 60(2): 111-129

ROUBOA A, MONTEIRO E J of Materials Processing Technology 204, Issues 1-3: 451-458

SALGADO P Applied Math. Modelling 32 (7): 1159-1178

SILVA A et al J OF SPORTS SCI. AND MEDICINE Vol 7 Issue: 1 : 60-66

VAREJÃO ASP, PRADA J; RODRIGUES PA J of Small Animal Practice 49: 371

ISI Proceedings

BUSTINCE H et al 8th Int. FLINS Conf. on Computational Intelligence in Decision and Control 259-264

BUSTINCE, H et al 8th Int. FLINS Conf. on Computational Intelligence in Decision and Control 1099-1104

Conde T; Marcelino L; Fonseca B CRIWG 08 Omaha 14-18 Sept ISBN 978-3-540-92830-0 17-24

COUTO P et al IEEE World Congress on Computational Intelligence 330-335

Esteves M et al CRIWG 2008 Omaha 14-18 Sept ISBN 978-3-540-92830-0 99-106

Esteves M et al 38th ASEE/IEEE Frontiers in Education Conf. Saratoga Springs ISBN 978-1-4244-1970-8 17-22

FERREIRA C et al In Proceedings of the conf. EUROSENSORS XXII 22nd European Conference on Solid-State Transducers Dresden, Germany 07-10 Sep 1395 - 1398

FRANCISCO NC et al In: SIGMAP – Int. Conf. on Signal Processing and Multimedia Applications, Porto Proceedings of the International Conf. on Signal Processing and Multimedia Applications Vol 0 162-167

FRANCISCO N et al Multiscale Recurrent Pattern Image Coding With a Flexible Partition Scheme, IEEE International Conference on Image Processing (ICIP 08) San Diego, California, USA

Guerra A et al CRIWG 08 Omaha 14-18 Sep ISBN 978-3-540-92830-0 164-170

Marinho D et al In: J Boaventura, P Oliveira (eds) Book of Abstracts of Controlo 08 – 8th Portuguese Conference on Automatic Control, p 44 Minho, Vila Real

MARINHO DA et al Medicine and Sci. in Sports and Exercise, 40 (5 Suppl): S49 (abstract)

Marinho DA; Silva AJ; Rouboa A, 1st ECCOMAS Thematic Conference on Computational, Vision and Medical Image Processing OCT 17-19, 07 Oporto Source: COMPUTATIONAL VISION AND MEDICAL IMAGING PROCESSING 101-103

Monteiro E; Moreira NA, Ferreira S Planning of micro-combined heat and power systems in the Portuguese scenario Applied Energy, Vol 86 Issue 3 Mar 09 290-298

MORAIS R et al In Proceedings of the conference EUROSENSORS XXII, 22nd European Conference on Solid-State Transducers, Dresden, Germany 07-10 Sep 449 - 452

MOREIRA H et al "Functional Fitness, Obesity and Sarcopenia in Postmenopausal Women" Climacteric 11 (suppl 2): S120

MOURA MFSF et al Mode II fracture characterization of Pinus pinaster wood. Materials Science Forum 587-588: 594-598

NEVES F et al Voice Reconstruction Under a Minimum Interpolation Algorithm. In 12th Annual IEEE International Symposium on Consumer Electronics (ISCE 08), 14 a 16 de Abr Algarve, Portugal. CD-ROM. ISBN 978-1-4244-2422-1

Rouboa A et al Heat transfer in nanofluid using cfd, International conference on numerical analysis and applied mathematics, AIP conference proceeding 819-822

ROUBOA A et al NUMERICAL ANALYSIS AND APPLIED MATHEMATICS: Int. Conf. on Numerical Analysis and Applied Mathematics 08

Salvado, N; Filipe V; Pereira A In 3rd Int. Conf. on Systems and Networks Communications - ICSNC 08, IEEE Computer Society 38:43

Santos F et al CRIWG 08 Omaha. 14-18 Sept08. ISBN 978-3-540-92830-0 281-288

Santos F et al 6th Int. Conf. on Creating, Connecting and Collaborating through Computing (C5 08). Poitiers, França, 14-16 Jan08. IEEE Computer Society. Volume 00, ISBN 978-0-7695-3115-1 73-76

Santos F et al 6th Int. Conf. on Creating, Connecting and Collaborating through Computing (C5 2008). Poitiers, França, 14-16 Jan 08. IEEE Computer Society. Volume 00, ISBN 978-0-7695-3115-1 73-76

Santos A et al V Int. Cherry Symposium. Acta Hort. (ISHS) 795:567-570, http://www.actahort.org/books/795/795_89.htm

Santos A et al V Int. Cherry Symposium. Acta Hort. (ISHS) 795:267-271, http://www.actahort.org/books/795/795_36.htm

Saraiva G et al CRIWG 08 Omaha 14-18 Sep 08. ISBN 978-3-540-92830-0 318-323

Saraiva G et al CDVE 08 Palma de Maiorca 21-25 Sep 08. ISBN 978-3-540-88010-3 295-298

SHANNON A et al 4th IEEE Int. Conf. on Intelligent Systems 16-25

SILVA AJ et al Medicine and Sci. in Sports and Exercise 40 (5 Suppl): S212 (abstract)

Silva F; Filipe V; Pereira A 3rd Int. Conf. on Systems and Networks Communications - ICSNC 2008, IEEE Computer Society 384:389

SILVA, PMMA, SERÓDIO, CMJA; MONTEIRO, JL Proceedings of The 2008 IEEE Int. Symposium on Industrial Electronics 1855-1860

SOLTEIRO PIRES E J et al GECCO '08 – Proceedings of the 10th annual conf. on Genetic and evolutionary computation, New York, USA, ACM 765–766

SOUSA C et al CDVE08 Palma de Maiorca 21-25 Sep 08. ISBN 978-3-540-88010-3 84-88

SOUSA A et al Computational Vision and Medical Image Processing 69-73

VENTURA P et al In IEEE Sensors 08 Conf. Lecce, Itália 1210-1213

VILAS-BOAS J. ET AL. AS APLICAÇÕES DA TECNOLOGIA COMPUTACIONAL E BIOMECÂNICA AO DESENV. CONHECIMENTO EM NATAÇÃO. Mesa Redonda Biomecânica do Esporte XII Cong. de Ciências do Desporto e Educação Física dos PALOP Porto Alegre Brasil 17 a 20 Set08

Articles on other international scientific journals

Antunes R et al Managing 3D Virtual Classrooms, Learning Technology, http://ltf.ieee.org/learn_tech/issues/january2008/lt_january2008.pdf. 2008

GABRIEL R et al Acta of Bioengineering and Biomechanics 10 (3): 53-59

Jesus I; Tenreiro JAM & Boaventura Cunha, J J of Vibration and Control 14 (9-10): 1389-1402

Louzada J et al Acta Hort. (ISHS) 784:147-150, http://www.actahort.org/books/784/784_22.htm

Santos A et al J Acta Hort. (ISHS) 795:567-570, http://www.actahort.org/books/795/795_89.htm

Santos A et al Acta Hort. (ISHS) 795:267-271, http://www.actahort.org/books/795/795_36.htm

Articles on other national scientific journals

CARDOSO JC Comando, Controlo e Comunicações no Espaço. Mensagem – Revista da Escola Prática de Transmissões 1: 23-25

SANTOS CL et al Ciência & Tecnologia dos Materiais 20 (1/2): 45 – 51

3.3.2. Other publications International (6000.)

International Books and Chapters

Saraiva G et al In Groupware: Design, Implementation and Use (LNCS 5411) Springer-Verlag Heidelberg Germany 318-323

SHANNON A et al In Developments in Fuzzy Sets, Intuitionistic Fuzzy Sets, Generalized Nets and Related Topics Applications Vol II Academic Publishing House Exit, Warsaw 249-256

SILVA AJ et al The effect of swimmers Interaction in drag coefficient and force reduction. In Book of Abst of 6th Int Conf. on Strength Training S Fleck; W Kraemer; L Brown; J António; J Weir; W Ebben & J Stou (eds) Edited by NSCA and ISSN pp 241

Sousa C et al In Cooperative Design, Visualization, and Engineering (LNCS 5220) Springer-Verlag Heidelberg Germany 84-88

Vilas-Boas JP et al AS APLICAÇÕES DA TECNOLOGIA COMPUTACIONAL E BIOMECÂNICA AO DESENV. DO CONHECIMENTO EM NATAÇÃO Mesa Redonda Biomecânica do Esporte XII Cong de Ciências do Desporto e EF dos PALOP Porto Alegre Brasil 17-20 de Set08

Other Publications on International Scientific Meetings:

Barbosa L et al Leitura automática de presenças em sala de aula: Integração com o sistema de informação de apoio ao ensino In 3er Simposio Iberoamericano en Comunicación del Conocimiento y Conf CCC-08 Orlando EUA

CAMPILHO RDSG et al Reparações em materiais compósitos 5º Cong. Luso-Moçambicano de Eng Maputo

CAMPILHO RDSG et al Buckling behaviour of carbon-epoxy of adhesively-bonded scarf repairs Adv Computational Eng. and Experimenting ACE-X 08 Barcelona

COELHO J et al Application of fractional algorithms in the control of a twin rotor multiple input-multiple output system 6th EUROMECH Conf ENOC 08 Saint Petersburg Russia

COELHO JP et al Proceedings of the 8th Portuguese Conf on Automatic Control 21-23 Jul08 Vila Real 82-87

CONDE T et al CRIWG 08 Omaha 14-18Sep08 17-24

COUTO P et al Colour image segmentation using A-IFSs IWIFSGN'2008 - 7th Int Workshop on Intuitionistic Fuzzy Sets and Generalized Nets 17 Oct08 Warsaw

COUTO P et al IPMU'08 12th International Conference on Information Processing and Manag of Uncertainty in Knowledge-Based Systems 22-27 Jun08 Malaga Spain 1620-1627

De Moura Oliveira P B et al 8th Portuguese Conference on Automatic Control 20-23 Jul Vila Real pp 23-28

GEUNA S et al 58th Meeting of the Italian Society of Anatomy Chieti Itália 189-194

GEUNA S et al 62nd Meeting of the Italian Society of Anatomy and Histology 14-16 Sep08 Verona Italy pp135

GEUNA S et al Negative results in bridging nerve defects using grafts constructed by tissue engineering Present State of Peripheral Nerve Surgery and How to Achieve Further Improvement Organiser: Millesi Center General Hospital Vienna Áustria pp 12

LOUZADA J et al II Iberian Congress on Chestnut Acta Hort. (ISHS) 784:147-150

OLIVEIRA PBM et al Proceedings of the 8th Portuguese Conf on Automatic Control 21-23Jul08 Vila Real 23-28

Pereira J et al MAXIMIN 9th International PhD Workshop on Systems and Control: a young generation viewpoint Izola Eslovénia pp 6

PEREIRA J et al IX Int. Symp on Experimental Techniques 3-4 Oct 08 Vila Real pp 60

Puga JR et al Proceedings of the 8th Portuguese Conf. on Automatic Control 21-23Jul08 Vila Real Portugal 178-183

REIS MJCS et al Helping Portuguese Informatics and ICT curricula students at the UTAD University making the transition to the Bologna paradigm In 10th Int. Conf. on Education Athens Institute for Education and Research Atenas

Salgado P et al Proceedings of the 8th Portuguese Conf. on Automatic Control 21-23Jul08 Vila Real 954-960

Santos A et al V Int. Cherry Symposium Acta Hort. (ISHS) 795:567-570

Santos et al V Int. Cherry Symposium Acta Hort. (ISHS) 795:267-271

Santos F et al CRIWG 08 Omaha 14-18 Sep08 281-288

SOLTEIRO PIRES EJ et al 8th Portuguese Conference on Automatic Control Vila Real 88-92

Sousa A et al Sub-pixel level displacement using optical flow In Int conf on full-field measurement techniques and their applications in experimental solid mechanics Loughborough UK

Teixeira R et al Instrumentos para a sistematização da identificação de requisitos em projectos de implementação de ERP em pequenas empresas. Cong. Int. de Administração - ADM 2008 Ponta Grossa Brasil

Tos P et al 9th Cong of the European Federation of Societies for Microsurgery Turku Finlândia pp45

Varejão ASP I Cong IBRO/LARC de Neurociências da América Latina, Caribe e Península Ibérica Búzios Brasil pp27

VAREJÃO ASP et al IX Int. Symposium on Experimental Techniques 3-4 Oct 08 Vila Real pp46

Varejão ASP et al 21st Annual Meeting European Society of Vet. Neurology (ESVN)/ European College of Vet. Neurology (ECVN) Peripheral Nerve, Neuromuscular and Muscle Disease Rodes Grécia pp104

XAVIER J et al Parameter identification by the virtual fields method: application to the stiffness radial variability of P. pinaster within the stem. 4th Int Conf on Composites Testing and Model Identification Dayton Ohio USA 20-22 Oct

XAVIER J et al Application of stereovision to wood compression tests 1st Conf on 3D-Imaging of Materials and Systems Carcans-Maubuisson France 8-12 Sep

3.3.3. Master and Ph.D. thesis completed (3000.)

Master Thesis Completed:

ALVES, V.F.L. (2008). Recursos multimédia no apoio ao ensino à distância. Mestrado em Comunicação e Multimédia, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Pedro Mestre e Carlos Seródio.

CAMPANIÇO A.T. (2008). Genetic Programming in Graphical Applications for Games: Simulation and Visualization of Plants using Flash Actionscript. Mestrado em Informática da Universidade de Trás-os-Montes e Alto Douro. Supervisors: Benjamim Fonseca e José Paulo Moura Oliveira.

FRANCISCO, N.C. (2008). SCODE – Estudo da Utilização de Recorrência de Padrões Multi-escala na Codificação de Documentos Compostos. Mestrado em Engenharia Electrotécnica e de Computadores, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Manuel José Cabral dos Santos Reis e Sérgio Manuel Maciel de Faria (Instituto Politécnico de Leiria).

FREITAS, R. (2008). A invasibilidade da flora exótica para o Norte de Portugal. Supervisor: A. L. Crespi (UTAD)

FREITAS, G.A.S. (2008). Deslenhificação de materiais lenhinoceulósicos para bioconversão. Mestrado em Tecnologias Ambientais, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Albino Alves Dias e Dmitry Evtugin (Universidade de Aveiro).

JERÓNIMO, J.C. (2008). Biomecânica do Apoio Plantar na Subida a $\frac{3}{4}$ de Ponta em Dança. Mestrado em Educação Física e Desporto – Observação e Análise do Movimento. Supervisor: Ronaldo Gabriel (Universidade de Trás-os-Montes e Alto Douro).

PERDIGOTO, F.S. (2008). Terminal remoto para medição de qualidade DVB-T. Mestrado em Engenharia Electrotécnica e de Computadores, Universidade de Trás-os-Montes e Alto Douro. Supervisors: Manuel José Cabral dos Santos Reis e Sérgio Manuel Maciel de Faria (Instituto Politécnico de Leiria).

PEREIRA J.J.P. (2008). Sintonia do controlador PID, com Algoritmo de Optimização por Enxame de Partículas. Mestrado em Engenharia Electrotécnica e de Computadores da Universidade de Trás-os-Montes e Alto Douro. Supervisors: José Paulo Moura Oliveira e José Boaventura Cunha.

Ph.D. Thesis Completed:

DOURADO, N. (2008). R-Curve behaviour and size effect of a quasibrittle material: Wood. Universidade de Trás-os-Montes e Alto Douro In Cotutorship with l'Univerversité de Bordeaux 1. Supervisors: de Moura, MFSF (University of Porto, FEUP, Portugal) and Valentin G (Université de Bordeaux 1, France).

NOGUEIRA, T.A.F. (2008). Localização de unidades de fornecimento de gás natural na rede primária de gasodutos. Doutoramento em Engenharia Electrotécnica, Universidade de Trás-os-Montes e Alto Douro. Supervisores: José Carlos Silva Cardoso e Zita Maria Almeida do Vale (ISEP).

3.3.4. Patents/propotypes (2000.)

3.3.5. Organization of conferences (2000.)

3.3.6. Industry contract research (2000.)

3.3.7. Internationalization (2000.)

Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

International Collaborators (Most Relevant with Active Collaborations):

Universidade de S. Paulo; Université Bordeaux 1; École Nationale des Arts et Métiers; Universidade Politécnica de Madrid; Universidade Federal de Lavras; Universidade Federal do Paraná; Universidade Federal Rural do Rio de Janeiro; Institute of Polymer Mechanics, Universidade de Riga; Technical University of Vienna; Universidad Publica de Navarra; Università di Torino; Systems Research Institute Warsaw; Universidad Complutense Madrid; Universidad Léon; Thessalonik University; University Waterloo; City University New York; University California.

Anchor Institutes:

Universidade de S. Paulo ; Université de Bordeaux 1 ; Ecole Nationale Supérieure d'Arts et Métiers ; Universidad Publica de Navarra ; Università di Torino ; University California.

3.3.8. Other publications National (6000.)

National Books and Chapters:

BOAVENTURA CUNHA, J. & OLIVEIRA P. M. (EDS) (2008). CONTROLO 2008 Book of Abstracts, Universidade de Trás-os-Montes e Alto Douro, Portugal, ISBN: 978-972-669-878-4.

BOAVENTURA CUNHA, J.; BORGES, A.; PIRES, E.J.S.; GONÇALVES, L.; OLIVEIRA, P.M.; SALGADO, P. & PERDICOULIS, T.P.,(EDS) (2008). Proceedings of the CONTROLO 2008 Conference, Universidade de Trás-os-Montes e Alto Douro, Portugal, ISBN: 978-972-669-877-7.

GABRIEL, R; MOREIRA, H.; MAIA, M; SERÓDIO, A; QUARESMA, L (2008). Modelos Biomecânicos de Análise de Percursos Pedestres e Desenvolvimento de Cooperação Transfronteiriça: Pistas de Acção para os Agentes Regionais e Locais Ligados às Áreas da Agricultura, Ambiente, Saúde, Turismo e Património, in Rosa, E. & Valentin, C. (eds), Aproveitamento e Valorização dos Recursos - Projecto Dourinov. UTAD. Vila Real. Portugal. No prelo

GINJA, M. M. D.; JESUS, S. S. & FERREIRA. A. J. (2008). Radiologia Clínica – Fundamentos da Técnica Radiográfica. Série Didáctica. Ciências Aplicadas Nº 347. ISBN: 978-972-669-876-0.

MARINHO D.; VICTOR REIS, LUCIANO SOUSA, LUÍS LEAL, FRANCISCO ALVES, JOÃO VILAS-BOAS, LEANDRO MACHADO, ABEL ROUBOA, ANTÓNIO SILVA. (2008). The analysis of pressure drag and skin friction drag during the gliding in swimming. In Book of Abstracts of the 13th Annual Congresso f the European College of Sport Science. Cabri, J., Alves, F., Araújo, D., Barreiros, J., Diniz, J., Veloso, A. (eds). Pp. 16. ISBN: 978-972-735-156-5: DL 278583/08. Editorial Do Ministério da Educação. Lisboa.

MARINHO, D.; SILVA, A.; ROUBOA, A.; ALVES, F.; VILAS-BOAS, J.P.; MACHADO, L.; REIS, V. (2008). Modelling the hand propulsion in swimming. In: J. Boaventura, P. Oliveira (eds.) Book of Abstracts of Controlo 2008 – 8th Portuguese Conference on Automatic Control, p. 44. Minfo, Vila Real

SILVA, A., MARINHO, D., REIS, V., ALVES, F., BOAS, J., MACHADO, L., ROUBOA, A. (2008). Computational Fluid Dynamics: A Fundamental tool for swimming Research. In Book of Abstracts of the 13th Annual Congresso f the European College of Sport Science. Cabri, J., Alves, F., Araújo, D., Barreiros, J., Diniz, J., Veloso, A. (eds). Pp. 13/257. ISBN: 978-972-735-156-5: DL 278583/08. Editorial Do Ministério da Educação. Lisboa.

Other Publications on National Scientific Meetings:

BATISTA JF, MORAIS JL, DOURADO NM, MOURA MF, DIAS MI, AZEVEDO JT (2008). Caracterização do comportamento à fractura em modo I do tecido ósseo cortical. 7º Congresso Nacional de Mecânica Experimental. Vila Real.

CUSTÓDIO, P.; TRANCHETE, T.; MORAIS, J.; GUEDES, M.; XAVIER, J. (2008): Influência da humidade e do envelhecimento físico no comportamento elástico de um époxico. 7º Encontro Nacional de Análise Experimental de Tensões e Mecânica Experimental, APAET, Universidade de Trás-os-Montes e Alto Douro, 23 a 25 de Janeiro.

MACHADO, J.P.; PRADA, J.; RODRIGUES, P.A.; PEREIRA, J.E.; COSTA, L.M.; FARIA, S.M.; VAREJÃO, A.S.P. (2008). Hemorragia intracraniana espontânea num cão associada a hipertensão. 17º Congresso Nacional da Associação Portuguesa de Médicos Veterinários Especialistas em Animais de Companhia (APMVEAC). Estoril, pp: 132.

MOURA MFSF, MORAIS JLL, DOURADO N (2008). Novo método de tratamento de resultados aplicado ao ensaio DCB na madeira. 7º Congresso Nacional de Mecânica Experimental. Vila Real.

PEREIRA, J.E.; CABRITA, A.M.; FILIPE, V.M.; MAGALHÃES, L.G.; BULAS-CRUZ, J.; COUTO, P.A.; MELO-PINTO, P.; MORAIS, R.; COSTA, L.M.; GEUNA, S.; MAURÍCIO, A.C.; VAREJÃO, A.S.P. (2008). A comparison of 2D and 3D analysis for the determination of hindlimb kinematics during treadmill locomotion in normal rats and following spinal cord injury. IX International Symposium on Experimental Techniques. Portuguese Experimental Pathology Association. Vila Real, Portugal, pp: 60

PEREIRA, J.E.; CABRITA, A.M.; VAREJÃO, A.S.P. (2008). The effect of the skin movement artefact on the calculation of hindlimb joint kinematics during treadmill locomotion in rats. IX International Symposium on Experimental Techniques. Portuguese Experimental Pathology Association. Vila Real, Portugal, pp: 59.

PINTO JMT, JESUS AMP, PINTO JTQS, MORAIS JLL, LOUZADA JLPC (2008). Modelação por elementos finitos de vigas de madeira reforçadas com lâminas de carbono. 7º Congresso Nacional de Mecânica Experimental. Vila Real.

SANTOS CL, JESUS AMP, MORAIS JLL, LOUZADA JLPC (2008). Bearing properties of portuguese pine wood beneath a laterally loaded dowel. 11th Portuguese Conference on Fracture. Universidade Nova de Lisboa.

SANTOS CL, JESUS AMP, MORAIS JLL, LOUZADA JLPC (2008). Desenvolvimento de uma técnica de reforço para ligações do tipo cavilha para estruturas de madeira. 7º Congresso Nacional de Mecânica Experimental. Vila Real.

VAREJÃO, A.S.P.; PEREIRA, J.E.; CABRITA, A.M.; FILIPE, V.M.; MAGALHÃES, L.G.; COUTO, P.A.; MELO-PINTO, P.; MORAIS, R.; COSTA, L.M.; GEUNA, S.; MAURÍCIO, A.C.; BULAS-CRUZ J. (2008). Assessment of locomotor function in rats following spinal cord injury. IX International Symposium on Experimental Techniques. Portuguese Experimental Pathology Association. Vila Real, Portugal, pp: 46.

XAVIER, J.; AVRIL, S.; PIERRON, F.; MORAIS, J. (2008): Characterisation of the radial variability of stiffness parameters of *P. pinaster* by the virtual fields method. 7º Encontro Nacional de Análise Experimental de Tensões e Mecânica Experimental, APAET, Universidade de Trás-os-Montes e Alto Douro, 23 a 25 de Janeiro.

3.3.9. Government/Organization contract research (2000.)

Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

3.4. Future Research

This section allows you to provide the future objectives for the research group.

3.4.1. Objectives (3000 ca.)

The future objectives are:

To strengthen the main research areas within the research group, developing the undergoing interactions with other research groups and promoting new ones, both in Portugal and internationally, based on an active research agenda, trying to reach a correct balance between fundamental and applied research.

To give a more society-industry relevant bias to the research through the increase in the participation in R&D projects with industry partnerships.

To increase international visibility through the mobility to and from international research partner groups or institutions (namely the ones we designate by anchor institutions), the participation in international relevant scientific conferences and the participation in international R&D projects.

As a result of the above mentioned tasks an increase in the scientific productivity is expected.

3.4.2. Funding, source, dates (1500 ca.)

Indicate in full including amount of current and pending funding

4.1 Group Description – Climate and Atmospheric Modelling

Please indicate mains sources of funding for the research of your group. Include all types of funding, like FCT projects, FCT Base, as well as funding from other institutions. You should indicate an approximate amount in EUROS, and the source to which the funds apply.

- **Research Group Title:** (RG-AGR-Norte-VilaReal-4033-137) - Climate and Atmospheric Modelling
- **Principal Investigator:** Maria Solange Mendonça Leite
- **Research Area:** N/D
- **Home Institution:** Universidade de Trás-os-Montes e Alto Douro

4.1.1. Funding, source, dates (1000 ca.)

FCT BASE: 8 100, 00€

Total Funding of Projects running and concluded on 2008:

FCT Projects: 46 487.00€

Funding from Other Institutions: 339 020.00 € (International Projects: 57 500,00€ and National Projects: 281 520.00€)

4.2. Objectives and Achievements

This section allows you to provide the objectives and achievements during the reporting period.

4.2.1. Objectives (2000 ca.)

The main objective of this group is the assessment of the role of climate processes and their impacts on the environmental subsystems, namely at the following levels:

- Mechanisms of climate variability
- Climate variability and planetary forcing
- Climatic extremes in Europe (droughts, floods and heat waves)
- Climatic description and classification
- Climate variability, air quality and human health impacts
- Air quality and atmospheric pollution
- Air quality impacts on human health
- Atmospheric modeling and agro-forestral impacts
- Forest and agricultural productivity in Europe and Portugal
- European and regional food production
- Crop growth and farming decisions

4.2.2. Main Achievements (2000 ca.)

- The increase of extreme events during the last decades and the sharply increase in the future
- Evidence for a strong relationship between the increase in agriculture and forest losses and the frequency of occurrence of climate extremes
- A parametric model was developed and applied for modeling wine productivity using temperature and precipitation parameters in the Douro Region
- A forest fire forecasting model and the modulation of lightning activity

4.3. Group Productivity

This section allows you to provide the productivity during the reporting period.

4.3.1. Publication in peer review Journals (6000 ca.)

ISI Proceedings:

ANDRADE, C.; SANTOS, J.; CORTE-REAL, J. (2008). Climate-mean winter patterns associated with enthalpy, latent heat and linear momentum mean convergence fields due to large-scale transient eddies. Geophysical Research Abstracts, 10: EGU2008-A-03343.

SANTOS, J.; ANDRADE, C.; CORTE-REAL J. (2008). North Atlantic transient eddies and winter precipitation in Portugal. *Geophysical Research Abstracts*, 10: EGU2008-A-01820.

Articles in National Scientific Journals:

SILVESTRE, J., FERREIRA, I., observatorio de Ávila. Cuadernos Abulenses. Diputación de Ávila, Ávila, Espanha. ISSN: 0213-047, Vol PACHECO, C.A. & MALHEIRO, A. (2008). Gestão da rega em vinha. Uma ferramenta para a optimização da qualidade e controle do crescimento vegetativo. *Enologia*, 49/50: 8-12. Revista da Associação Portuguesa de Enologia.

4.3.2. Other publications International (6000.)

International Books and Chapters:

DÁVILA, F. P.; SÁNCHEZ, C. T.; SORIANO, L. R. (2008). Olas de frío y de calor durante el cambio de siglo en el 35, pp. 243-258.

EVTYUGINA, M.; NUNES, T.; ALVES, C.; MARQUES, M. C. (2007): Atmospheric volatile organic compounds in a Portuguese mountain region. Brebbia, C.A. (Ed.) *Air Pollution XV. WIT Transactions on Ecology and the Environment*, Vol. 101, UK, pp. 455-463. ISBN 978-1-84564-067-5

MARTÍN, D.; PIERNA, S.; C.; DIEZ E. G. (2008). Fire as a Meteorological Problem. *Medio Ambiente en Iberoamérica*, Espanha. ISBN: 978-84-611-0352-2, Vol 1, pp. 79-85.

PIERNA, S.; MARTÍN, D.; C.; DIEZ E. G. Mesoscale and Forest Fires. *Medio Ambiente en Iberoamérica*, Espanha. ISBN: 978-84-611-0352-2, Vol 1, pp. 79-85

SÁNCHEZ, C. T.; DÁVILA, F. P.; SORIANO, L. R. (2008). Estudio de las heladas registradas en el observatorio de Zamora (1931-2003). Instituto de Estudios Zamoranos Florián de Ocampo (CSIC). Diputación de Zamora, Zamora, Espanha. ISSN: 0213-82-12, Vol 22, pp. 301-312.

Other Publications on International Scientific Meetings:

MADUREIRA, L.; MARQUES, M. C.; COSTA, S. (2008). Challenging conventional definitions and scales of innovation analysis and policies: the case of territory-based environment management. DIME International Conference "Innovation, sustainability and policy", University Montesquieu Bordeaux IV, France.

LEITE S.; SANTOS J.; CORTE-REAL J. (2008). Contribuição para a identificação da variabilidade climática em Portugal. Workshop Internacional sobre Clima e Recursos Naturais nos países de língua portuguesa: Parcerias na área do Clima e Ambiente (WSCRA08). Ilha do Sal, Cabo Verde.

MALHEIRO, A.N.C., FERREIRA, T.C., MATTHEWS, R.B. & FERNANDES-SILVA, A.A. (2008). Water use and soil water depletion from a vineyard in the Portuguese Region of Douro. *Proceedings of the Second International Congress on Mountain and steep slope viticulture*, 9p, Spain.

MENEZES, I. C.; GANDU, A. W.; CORTE-REAL J. (2008). Simulation of the Atmospheric Conditions During a Front Fire Episode in Tapada the Mafra using BRAMS. Workshop Internacional sobre Clima e Recursos Naturais nos países de língua portuguesa: Parcerias na área do Clima e Ambiente (WSCRA08). Ilha do Sal, Cabo Verde.

MOREIRA, M.; MOURATO, S.; MENEZES, I.; CORTE-REAL, J. (2008). Previsão do escoamento com base num modelo atmosférico de alta resolução e num modelo hidrológico fisicamente baseado. 5º Congresso Luso-Moçambicano de Engenharia. Maputo, Moçambique.

MOURATO, S.; DEEPTI, R.; MOREIRA, M.; CORTE-REAL, J. (2008). A exploração dos recursos hídricos no sistema Alvíto-Odivelas para um cenário de alteração climática. Workshop Internacional sobre Clima e

Recursos Naturais nos países de língua portuguesa: Parcerias na área do Clima e Ambiente (WSCRA08). Ilha do Sal, Cabo Verde.

SANTOS J.; ANDRADE C.; CORTE-REAL J. (2008). The dynamical development of the North Atlantic ridge and its implications in the occurrence of precipitation extremes in Portugal. NCCR Summer School. Universidade de Zurique, Suíça.

SANTOS J.; LEITE S. M.; MENDES A.; SOUSA C. (2008). Relação entre as excedências de ozono no Norte de Portugal e a circulação atmosférica. Workshop Internacional sobre Clima e Recursos Naturais nos países de língua portuguesa: Parcerias na área do Clima e Ambiente (WSCRA08). Ilha do Sal, Cabo Verde.

4.3.3. Master and Ph.D. thesis completed (3000.)

Master thesis completed:

MENDES, S. M. (2008). O Transporte Vertical de Momento Linear Num Caso de Convecção Profunda”. Mestrado em Meteorologia e Oceanografia Física Tese de Mestrado, Universidade de Aveiro. Supervisor: Prof. João Corte-Real.

PEREIRA, S. C. (2008). As Ciências da Atmosféricas e o Meio Ambiente nas Escolas: Implementação de um Projecto. Mestrado em Meteorologia e Oceanografia Física, Universidade de Aveiro. Supervisor: Prof. João Corte-Real e Dr. Sérgio Ferreira.

4.3.4. Patents/propotypes (2000.)

4.3.5. Organization of conferences (2000.)

4.3.6. Industry contract research (2000.)

4.3.7. Internationalization (2000.)

Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

At the international level, we have been developing strong research collaboration with the Free University of Berlin and the University of Cologne, which reinforces our connection with these two anchor-institutions of the CliMA Group. This collaboration was initialized under a CRUP-DAAD project, untitled “Connections between Precipitation Extremes in Southern Europe and Large-Scale Climate Variability”. As a result, we are preparing two papers for submission to peer review journals, as well as several communications to International Conferences with ISI Proceedings. One of the members of the Portuguese team stayed for one week in Berlin in 2008, where he was invited to present a seminar about Multivariate Statistical Analysis in Climatology. During the same year, a member of the German team stayed at UTAD for one week. In view of this strong collaboration we achieved an improvement of scientific knowledge of the large-scale atmospheric mechanisms that affect the precipitation regimes throughout SW Europe, which is essential to assess the impacts of observed precipitation extremes, e.g., on agriculture, forestry, water management, hydroelectric power generation and tourism. The establishment of a more comprehensive scientific basis both for present day and future climate is of utmost relevance for a better planning and management of the natural resources throughout the Mediterranean Basin

For a long time, we have been developing a strong collaboration with the Atmospheric Physics group at the University of Salamanca. During 2008, we have participated in Spanish Research Projects of outmost importance, dealing mainly with spatial and temporal distribution of atmospheric lightning in Iberia, impact of climate change in agriculture in the Duero Basin and the impact on human health.

During 2008 we continued the development of fruitful collaboration with the Academy of Sciences of the Czech Republic, throughout the FCT funded project “Reconstruction of the past climate in Portugal from borehole temperatures”. Within this project, temperature-depth profiles are used to infer climate change over the past two centuries and to document how effectively the solid earth records secular changes in surface air temperature.

4.3.8. Other publications National (6000.)

National Books and Chapters:

LEITE, S. M.; SANTOS, J. (2008). Termodinâmica Generalizada: uma formulação alternativa. Extra-Série. Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal. ISBN: 978-972-669-881-4.

MARQUES, M. C.; VASCONCELOS, L.; GABRIEL, L. (2008) Sensibilização Ambiental e Cidadania Activa. In: Rosa, E.; Cristóvão, A.; Preto, E.; Macieirinha, L. (Ed.): Dourinov – Projecto Transfronteiriço de Valorização e Promoção de Recursos. Vila Real: INTERREG IIIA Dourinov, pp. 139-148.

Other Publications on National Scientific Meetings:

ANDRADE C.; CORTE-REAL J.; SANTOS J. (2008). A climatologia de referência para a divergência diferencial dos transportes horizontais perturbados de entalpia e de momento linear. 6ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Instituto Politécnico de Tomar, Tomar. Livro de Resumos, 1, 111-112.

MARQUES, M. C. (2008). Entulhos e sucatas: as novas lixeiras. 2.ª Conferência de Resíduos: Novas políticas, novos negócios, Lisboa, Portugal.

MARQUES, M. C.; MAGALHÃES, R. (2008). DOURO LIMPO – o “passo” indispensável para a Sustentabilidade. Colóquio Dourinov. INTERREG IIIA “Dourinov – Projecto Transfronteiriço de Valorização e Promoção de Recursos”, Mogadouro, Portugal

ANDRADE C.; CORTE-REAL J.; SANTOS J. (2008). A divergência diferencial dos transportes horizontais perturbados de entalpia e de momento linear. 6ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Instituto Politécnico de Tomar, Tomar. Livro de Resumos, 1, 31-32.

ANDRADE C.; SANTOS J.; CORTE-REAL J. (2008). Application of PCA in Atmospheric Sciences. 17º International Workshop on Matrices and Statistics. Instituto Politécnico de Tomar, Tomar. Livro de Resumos, ISBN: 978-972-9473-37-1, 89.

LEITE S.; SANTOS J. (2008). Alterações Climáticas em Portugal. Física e Química para o Ambiente. Universidade de Trás-os-Montes e Alto Douro, Vila Real.

LEITE S.; SANTOS J. (2008). Aquecimento Global: realidade ou mito? Semana Florestal 2008. Universidade de Trás-os-Montes e Alto Douro, Vila Real.

LEITE S.; SANTOS J. (2008). As alterações climáticas são uma ameaça à vida selvagem? 2º Congresso Português de Fauna Selvagem, Mogadouro.

MALHEIRO, A.N.C.; FERREIRA, T.C. (2008). Desenvolvimento vegetativo e produção da vinha: um caso de estudo na sub-região do ‘Cima-Corgo’. InfoWine Forum - Congresso Técnico e Científico, Vila Real.

MOURATO, S.; MOREIRA, M.; CORTE-REAL, J. (2008). Correção de viés em modelos regionais de clima e impactes na modelação dos recursos hídricos. 9º Congresso da Água. Cascais.

SANTOS J. (2008). Matemática_meteorologia n@ utad.pt. Escola de Verão de Matemática. Universidade de Trás-os-Montes e Alto Douro, Vila Real.

SANTOS J.; CASTRO A.; RODOLFO M. (2008). Influência da variabilidade climática na produtividade da vinha na região de Trás-os-Montes e Alto Douro. InfoWine Forum- Congresso Técnico e Científico, Vila Real.

SANTOS J.; LEITE S.; DIAS S. (2008). Análise de séries longas da temperatura do ar: estudo de caso. 16ª Congresso Anual da Sociedade Portuguesa de Estatística. Universidade de Trás-os-Montes e Alto Douro, Vila Real. Livro de Resumos, ISBN: 978-972-8890-19-3, 50.

SANTOS J.; SOUSA C.; MENDES A. (2008). Relação entre as excedências de ozono no Norte de Portugal e a Circulação Atmosférica. 16ª Conferência Nacional de Física da Sociedade Portuguesa de Física. Universidade Nova, Monte da Caparica. Livro de Resumos, 1, 20.

4.3.9. Government/Organization contract research (2000.)

Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

4.4. Future Research

This section allows you to provide the future objectives for the research group.

4.4.1. Objectives (3000 ca.)

Due to the integration of the CLIMA group into the IB&Q group, future research objectives are already incorporated in the report of the latter group.

4.4.2. Funding, source, dates (1500 ca.)

Indicate in full including amount of current and pending funding