

Evaluation Panel: NATURAL SCIENCES - Agricultural, Agro-food and Veterinary Sciences

Panel Members

Jan Erik Lindberg (Chair)	Swedish University of Agricultural Sciences, Sweden
Chris Atkinson	University of Greenwich, Natural Resources Institute, United Kingdom
Georgios Arsenos	Aristotle University of Thessaloniki, Greece
Giovanna Ferrari	University of Salerno, Italy
Robert Jandl	University of Natural Resources and Applied Life Sciences, Austria
Roque Rodríguez Soalleiro	Universidade de Santiago de Compostela, Spain
Siv Ahrné	Lund University, Dept. of Food Technology, Engineering & Nutrition, Netherlands
Stefaan De Smet	Ghent University, Belgium

R&D Units

Biorecursos para a Sustentabilidade (GREEN-IT)	ITQB NOVA - Instituto de Tecnologia Química e Biológica António Xavier (ITQB NOVA/UNL)
Centro de Biotecnologia dos Açores (CBA)	Universidade dos Açores (UAçores)
Centro de Ciência Animal e Veterinária (CECAV)	Universidade de Trás-os-Montes e Alto Douro (UTAD)
Centro de Estudos de Ciência Animal (CECA)	ICETA - Instituto de Ciências, Tecnologias e Agroambiente da Universidade do Porto (ICETA)
Centro de Estudos de Recursos Naturais, Ambiente e Sociedade (CERNAS)	Instituto Politécnico de Coimbra (IPC)
Centro de Estudos Florestais (CEF)	Instituto Superior de Agronomia (ISA/ULisboa)
Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas (CITAB)	Universidade de Trás-os-Montes e Alto Douro (UTAD)
Centro de Investigação e Desenvolvimento em Sistemas Agroalimentares e Sustentabilidade (CISAS)	Instituto Politécnico de Viana do Castelo (IPVC)
Centro de Investigação em Agronomia, Alimentos, Ambiente e Paisagem (LEAF)	Instituto Superior de Agronomia (ISA/ULisboa)
Centro de investigação em Produção Agroalimentar Sustentável (GreenUPorto)	Faculdade de Ciências da Universidade do Porto (FCUP/UP)
Centro de Investigação Interdisciplinar em Sanidade Animal (CIISA)	Faculdade de Medicina Veterinária (FMV/ULisboa)
Centro de Investigação Vasco da Gama (CIVG)	Associação Cognitória Vasco da Gama
Instituto de Investigação e Tecnologia Agrária e do Ambiente dos Açores (IITAA CITA-A)	Fundação Gaspar Frutuoso, FP (FGF)

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Biorecursos para a Sustentabilidade (GREEN-IT)

Coordinator: Maria Margarida M. Girão Oliveira

Integrated PhD Researchers: 66

Overall Quality Grade: EXCELLENT

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

Base Funding for (2020-2023): 1119 K€

Recommended Programmatic Support

PhD Fellowships: 7

Programmatic Funding: 762 K€, including for 2 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

The RU Green-IT “Bioresources For Sustainability is composed of five collaborating institutes, 4 on the campus at Oeiras (ITQB, iBET, IGC and INIAV) and one in Lisbon (INSA). This grouping brings together expertise in plant development, biotechnology, biotic and abiotic stress biology, integrated pest management, plant nutrition, plant breeding and product quality.

The RU aims are to address the challenges impacting on the delivery of food supply (security) and the appropriate and efficient use of resources to supply population growth. This will be achieved by the study of mechanisms around plant and environmental interactions to direct and innovative plant breeding approaches while protecting the environment through sustainable approaches. The focus is on crops of the Mediterranean region and the challenges of climate change. More specifically the RU studies the impacts of the environment on plant development traits and in relation to the implications for vectors of crop pest and diseases. The efficiency of resource use is considered with respect to the improvement of the crop yields. Basic science is directed at carbon assimilation, stress signalling, wood/cork formation and the impacts of the environment on food quality. Breeding new varieties using molecular markers for agronomic traits along with the release of new plant material is apparent.

The RU is organised into 4 scientific groups, 1 biological processes as influenced by climate change, 2 stress signalling mechanisms and adaptive management to mitigate yield losses, 3 soil fertility and its influence on plant productivity, 4 innovative knowledge to deliver precision management approaches and new crop varieties. The RU also has four organisational groupings to deliver, 1, essential infrastructure (e.g. high throughput technologies for breeding), 2 tools and standards to analyse, collect and store data, the training of good scientists, technicians and farmers and a framework to facilitate the promotion of the RU outputs and creation of value, along with supportive and knowledgeable public perceptions of the RU activities.

The highlighted outputs included international standard work leading the study of nutrient signalling pathways and the regulation of C and N linked to growth and stress modulation. This work is supported by an international science network. A key area is the regulation of photosynthesis and the highly topical concept of understanding and developing the potential for exploitation of C4 biochemistry in C3 crops. This work has an international collaborators flagship network associated with it. Also presented is the RU strength in understanding the mechanisms of the evolution of sexual reproduction with the intentions of exploiting such information to increase yields through the overcoming of hybridisation barriers. Other examples cited include cork oak genomics and understanding abiotic stress (drought and heat) with high throughput sequencing and quantitative genomics tools for plant breeding. The latter is suggested to provide important links/support with commercial exploitation via processing industries. The work is supported by publications in top quality peer-reviewed journals.

The level of internationalisation of the RU is well explained and built around overseas collaborations (CGIAR and CIMMT), EU interactions and an international PhD programme supported outside Portugal. There has been a lot of activity with respect to communication through several important conferences akin to the RU staff expertise. The successes of its breeding initiatives have led to interactions with companies such as Bayer, Dow, and Syngenta in the realm of crop protection.

The quality of the R&D activities is high. During the on-site visit a clear overview of the activities was given. This work is supported by an extensive international science network of collaborators, which includes private industry partners. The RU's strength in developing new understanding and knowledge in basic science mechanisms is rightly 'flag shipped' given its high impact delivery.

The research line has a clear focus. The identified thematic positioning is the application of cutting edge technology in the context of Mediterranean crops. GREEN-IT aims at proof-of-concept of techniques that later can be adopted by industry.

GREEN-IT receives a substantial amount of funding from the European Commission; this is evidence that the research is internationally recognized.

It has established an international education programme with renowned European partner institutions. This programme promotes internationalisation of staff, students and the RU.

GREEN-IT has an excellent infrastructure for different avenues of laboratory analysis.

The output of scientific publications in top journals is high. All of the work highlighted is supported by publications in top quality peer-reviewed quartile one journals.

The advised doctoral students and post-docs expressed that they are well represented by their advisors. During the site visit several cases of students who made international careers were shown.

GREEN-IT emphasized that its strength is the composition of the team. Team members are currently representing a wide variety of backgrounds. Therefore efforts are made to keep the team together.

The RU strength in developing new understanding and knowledge in basic science mechanisms is clear. This expertise will uncover basic mechanisms of how plants interact with their environment and how this information can be exploited to manage crops while protecting the environment. Importantly, it is suggested that technology transfer will be used to leverage further funding from industry. Such an approach is important in establishing an appropriate focused outcome with respect to knowledge an innovation but also support (financial) and direction, for example, with respect to crop breeding, farmer evaluation and research derived knowledge uptake.

GREEN-IT considers itself as a think tank that is increasingly attractive for companies. A co-lab is expected to open lasting new business opportunities for graduates. Planned new activities are a focus on new crops where the researchers see a future potential (e.g. rice research). GREEN-IT sees responsibility for the dissemination of results to different stakeholder groups including the general public. The Panel had doubts whether GREEN-IT is already using its potential in economic terms. Viable networks with the food industry are established, but research results and consultancy for the industry is delivered far below the market price. The Panel sees a potential of generating additional income from the private sectors.

The continuing link with the Gulbenkian Institute appears to add an important dimension to the undertaken fundamental science and its application.

PhD students and post-doctoral scientists expressed similar and valid requests for important pieces of equipment, which would aid their research.

Green-IT has expressed the need to hire PIs for different lines of research. The allocation of the two positions to specific types is left to a decision within Green-IT.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased. Green-IT has expressed that the acquisition of a phenotyping unit has priority.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Biotecnologia dos Açores (CBA)

Coordinator: Artur da Câmara Machado

Integrated PhD Researchers: 14

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 188 K€

Recommended Programmatic Support

PhD Fellowships: 3

Programmatic Funding: 490 K€, including for 2 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

The Biotechnology Centre of Açores (CBA) was officially recognized by the FCT in 2003. The Unit was subsequently integrated in the Laboratório Associado – Institute for Biotechnology and Bioengineering (LA-IBB) due to its merit of excellence. The Unit said it was affected by the institutional reorganization of the Portuguese National Lab of Agrarian Research that was decided by the government in 2012 (information received in the in-situ visit). The Biotechnology Centre of Açores is now a small but very active research unit whose main challenge is to increase its size and to retain talented researchers. Even so, and under severe financial constraints, the Unit was able to provide a significant output of research publications; ISI papers, books and book chapters, with a productivity rate very high, considering the reduced number of integrated PhD researchers (14).

The quality, merit and relevance of the activities of CBA in the period 2013-2017 are considered as very good (more than 30 papers, a significant share in Q1 ISI journals), but not excellent and hence criterion A was scored 4. It should be stressed that CBA is the only biofactory in Portugal able to produce parasitoids. During the on-site visit an overview of the activities was given by the Unit Coordinator. The rate for Criterion 2 is 4 because some of the members of the team have not been active in publications for several years. The Criterion 3 was rated with 3 because the strategy for the following years did not prioritize among the current lines of research and the plan of activities covered two very broad fields divided in several lines that could hardly be addressed by a small unit.

The presentation to the Panel would have benefited from a more active participation of the integrated researchers by addressing the questions. The application form, the presentation and the discussions provided useful information for the Panel to allow evaluating the Unit and making recommendations.

The Unit is comprised of a single research group whose organization and procedure for decision-taking for 2018-22 was made clear in the application form. Both PhD students and postdocs students declared during discussion with the Panel that their opinions have always been considered by CBA senior staff.

The Unit is proposing to keep two research topics (plant health and biointeractions and biotechnological exploitation of Azorean Natural resources) with several thematic lines in each of them. It would be needed for this unit to put the focus in a few strategic lines, keeping others within their competences as secondary.

Even so, the Panel detected as a resource of exceptional value the new facilities that the members of the Unit placed at the Terceira Islands can use in the new Technological Park. Also, there are two lines of research that the Panel placed as priority and able to provide exceptional value to the Unit's research results:

1. Maintenance of the genetic library and bank of recombinant toxins. Search and characterization of molecules with immunomodulatory and insecticidal activities through functional genomics to develop biopesticides combinations
2. Maintenance of the collections of organisms (including the extremophile consortiums) and identified molecules (particularly enzymes that are active in extreme conditions and under different substrates). Use of these collections to

study biointeractions and the use of recombinant enzymes and bacterial consortiums in bioremediation and in waste treatment.

The Panel also found possibilities for further collaboration of this unit with others involved in research in the area of the dairy industry, trying to add value to the local products.

3 fellowships for the PhD programs allocated to this unit out of the 8 requested in total. They would be allocated to the programs offered by the university: Agricultural Sciences and Biology. This recommendation derives from the total number of fellowships available for the whole area and the capacity of the RU for PhD supervision.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The two junior researchers to be hired seem to be essential to keep the activities of this unit, which otherwise could face a collapse in their activities. CBA is asking for two researchers with PhD to hire (one to deal with bioinformatics and the second with the functional genomics of the entomopathogenic nematode). The Panel is to skip the need of a bioinformatic and try instead to guarantee the two lines that seem to be more strategic.

Contributing to support the R&D Unit internationalization (20 K€) was not requested, but it seems to be necessary.

Other possible support for specific purposes: In the case of the programmatic funding suggested to be allocated to specific purposes, the Panel recommendation is to use 150 K€ for the maintenance of the microorganisms and genomic libraries collections, as well as the bioassay platform for insects and to allocate the remainder 50 K€ in the funding of renewal of PostDocs fellowships, in order to give continuity to the main lines of research of the Unit.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Ciência Animal e Veterinária (CECAV)

Coordinator: Cristina Vitória de Miranda Guedes

Integrated PhD Researchers: 39

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 573 K€

Recommended Programmatic Support

PhD Fellowships: 6

Programmatic Funding: 355 K€, including for 1 (Junior) New PhD Researcher Contract.

Justification, Comments and Recommendations

The Animal and Veterinary Research Centre (CECAV) is hosted by the University of Trás-os-Montes and Alto Douro at Vila Real. CECAV focused, during the period of 2013-2017 on: i) Animal Production, ii) Food Safety and Public Health, and iii) Animal Health. Following the departure of some members of the Animal Production group, the Unit reorganized itself quickly and is now focusing on two main topics namely: ii) Integrated meat quality – ‘Farm to Fork’ approach and ii) Veterinary public health serving the ‘One Health’ concept.

The CECAV team has performed innovative research of high quality and merit, contributing to the advancement of knowledge in respective disciplines. In particular, they implemented non-invasive techniques for estimating carcass composition and quality as well as the application of FITR-technology for meat quality evaluation paired with the use of natural additives and/or different packaging. CECAV aims to develop low cost strategies for the meat and meat products sector to cater the need of local industries but also to introduce innovation in the sector. This is expected to support the meat industry of Portugal and to increase the marketability of its products. These are the objectives of the integrated meat quality – farm to fork approach. The meat quality subject is a key characteristic of the talent of the integrated researchers and several members of the team are recognized specialists in this discipline at international level.

The Panel discussed in detail with CECAV members their response to the departure of team members that were experts in animal nutrition and antibiotic resistance, considering that these are important aspects of the farm to fork approach. CECAV informed the team that the expertise was still available in the groups since some of the integrated researchers pursue research in that area and maintain collaboration with other research units through common PhD programs; a fact that was also confirmed by PhD students.

During the presentation and the onsite visit, the Panel had the opportunity to discuss with various integrated researchers about R&D activities in Veterinary public health. It was stated by the Coordinator of the Unit and some members that the “one health concept” was a priority of their research following the reorganisation of the Unit. The latter was also confirmed and supported by the University representative that was attending the meeting and informed the Panel about the intentions of the University to distinguish the research activities of the R&D units that were based in that campus. Following the extensive discussion, it became apparent that the focus of the Unit will be comparative medicine and the use of biomaterials for tissue regeneration. A secondary focus was on studies of zoonosis affecting animals and on foodborne pathogens of animal origin and their mitigation. The former subject is relatively new for the Unit but considering the existing expertise and the available resources will become an important and promising area for research, subject to investments in equipment as well as manpower. The latter was communicated by the Unit and the Panel appreciated their explanations and statements considering that zoonotic diseases are very common, as it is estimated that more than 60% of the infectious diseases in people are spread from animals. The Panel also appreciated the fact that several members of CECAV have already made significant contributions and important publications in that area.

Another issue that was raised by the Panel was the creation in 2017, of a spin-off company by a member of CECAV and the anticipated strategies by the Unit to use it as a base to develop a "Centre for Pets". The Panel questioned such approach considering the needs for funding such activities. The Panel suggested that the Unit should focus on the expansion of international collaborations of the team and their abilities to prepare and submit competent research proposals. The existing participation of CECAV members in COST actions was appreciated but has to intensify in the future to increase the option for external funding.

Overall, the Panel agreed that CECAV is a very good unit that has the potential to excel in the near future through more focus on its research activities and the adoption of a more stringent strategy.

The Panel suggests the allocation of 6 PhD fellowships with 2 in Integrated meat quality and 4 in Veterinary public health (2 in Regenerative medicine and 2 in Zoonotic diseases).

The Unit requested 3 post doc researchers, one each for Regenerative medicine, Center for Pets, and Lab for Quality and Food Safety, respectively. The Panel recommends that one post doc position should be approved, working in the area of Regenerative medicine.

Although the Unit did not request a budget for internationalization, the Panel considers that a budget is needed for this item (20 K€).

Equipment: The Panel proposes the approval of funding for a 3D motion capture analysis system needed for the development of regenerative medicine with sheep as a model (100 K€). This equipment was mentioned by the Unit, at the visit, as priority number one. Another 100 K€ is allocated to the Laboratory of Technology, Quality and Food safety for the accreditation process.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Estudos de Ciência Animal (CECA)

Coordinator: José Manuel Alves Correia da Costa

Integrated PhD Researchers: 29

Overall Quality Grade: EXCELLENT

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 464 K€

Recommended Programmatic Support

Programmatic Funding: 470 K€, including for 2 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

CECA, is a multidisciplinary R&D Unit that focuses on the “One health” concept by activities that integrate Human and Veterinary Medicine. The Unit comprises 29 Integrated PhD Researchers and 24 collaborators. The quality and merit of activities of CECA are high with considerable international links and collaborations in high profile research consortia. There is a strong and coherent team of integrated researchers who have significantly contributed in the advancement of knowledge in the concept of one health, state of the art regenerative medicine methods, innovative biomaterials and natural molecules. During the on-site visit a detailed account of the activities and the achievements of the Unit were presented. Several Principal Investigators provided specific information and metrics regarding their areas of expertise that facilitated the evaluation process of the Panel. Considering the number of integrated scientists, the publication record of the Unit is exceptional. Moreover, the discussions with postdoctoral researchers and PhD students were very explanatory and assisted the Panel to get a global view of the R&D Unit and to make some structural recommendations. CECA produced 3 patents over the last 5 years and has one pending. The latter is indicative of the strength of the group which is also depicted in their ability to secure external funding from industry and services. The research of the Unit has considerable impact in society since a significant effort of R&D activities with three thematic lines is dedicated in that area and CECA has already a set of new diagnostic and therapeutic tools that have been tested in practice.

CECA, as mentioned above, is a relatively small R&D Unit with 29 integrated researchers, allocated in 4 Research Groups and 6 Thematic Lines. The groups are: (i) Biotechnology in Animal Reproduction, (ii) Experimental Surgery and Regenerative Medicine, (iii) Emergent and Zoonotic Infectious Diseases, and (iv) Inherited metabolic diseases in animals/natural models. The main areas of research include animal reproduction, zoonotic infectious diseases, antibiotic resistance, food science, metabolic diseases and regenerative medicine. The scientific merit of the research team is excellent and particularly the Regenerative medicine research group and Emerging and Zoonotic infectious diseases have a pivotal role in relative fields nationally and internationally. The team is well connected with international research consortia which enabled significant and highly ranked publications. The output of publications in peer reviewed journals of the past period is of a very high level both in terms of quantity and quality and impact of the journals (ISI and Scopus indexed journals). The contribution of the R&D Unit to the creation of a successful spin-off company demonstrates the technical skills and the exceptional quality of the team. Further to specialized research activities the Unit has very strong links with the industry adopting a multi-actor approach in its activities but also searching for opportunities for market exploitation of research results and innovative products. During the on-site visit the Panel noted a highly motivated and dedicated group of PhD students and post docs and a good functioning team in terms of collaboration between its members and human interrelationships.

The organization of R&D Unit has 4 research groups and 6 thematic lines which are rather segregated and do not seem to interact closely although there is a considerably high level of sharing resources and information.

The R&D Unit has a high potential to become a dynamic and vibrant team that could easily implement its ambitious future plans. During the on-site visit the Panel members discussed with many integrated researchers their vision and plan of activities and there was an agreement that a more comprehensive strategy and management policies should be implemented. The Panel was impressed by the maturity and the technical expertise of the young researchers (PhD and

post docs) as well as their ambition to undertake a career path in research areas of the R&D Unit. The Panel discussed in detail with senior staff the need to maintain such high level human resources and their policies to achieve it. The employment by the Unit of an innovation broker was greatly acknowledged by the Panel, which fully supports this decision. The notion is that it will create opportunities for commercialization of existing and new patents and will most likely facilitate extroversion of the Unit. However, the Panel questioned the need of creating a subunit to study inherited metabolic diseases in animals/natural models since it was not clear what this new area will add to the Unit considering the limited human resources and budget and the already wide range of activities of CECA researchers. The Panel provided structured advice how the Unit should reassess its strategy considering the “one health” concept in the dimension of comparative medicine but also its growing expertise in innovative bio-materials and diagnostic devices. The Panel acknowledged the willingness of the Unit to allocate significant part of the budget for infrastructures and participation to international networks in 2019-2022. Overall, the Panel considered CECA and excellent unit with a only weak point its strategy, a fact that was recognized by the Unit and thoroughly discussed with the Panel members.

Based on the proposal of the R&D Unit and the discussions during the on-site visit the Panel decision was to allocate two (2) positions for new researchers. Moreover, the Unit is requesting 200k euros for equipment which, following discussion with the Panel, is prioritized to equipment for gene cloning and expression and RT-PCR. The Unit suggested that the amount of 200k euros was sufficient to cover the cost, which the Panel considered appropriate and allocated it to the Unit.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Estudos de Recursos Naturais, Ambiente e Sociedade (CERNAS)

Coordinator: António José Dinis Ferreira

Integrated PhD Researchers: 49

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 728 K€

Recommended Programmatic Support

PhD Fellowships: 4

Programmatic Funding: 167 K€, including for 1 (Junior) New PhD Researcher Contract.

Justification, Comments and Recommendations

The Research Centre in Natural Resources, Environment and Society (CERNAS) is a Research Unit (RU) formed by the combining of three research groups: Agriculture Science, Food Science and Engineering and Environment and Society, made up of 49 integrated researchers (IR). The main aim of CERNAS, as presented in the evaluation documentation, was to perform research to promote the development, competitiveness and preparedness to cope with a changing world of the Portuguese region Centro.

There are 3 host institutions for this RU: the Polytechnic Institute of Coimbra, which is the cradle of the Unit, the Polytechnic Institute of Castelo Branco and the Polytechnic institute of Viseu. During the site visit it was made clear that all the integrated researchers met together to discuss the proposals and planned activities for the future and the functioning of the RU.

The Unit has produced a considerable number of papers during the last 4 years, with a rate of slightly less than 1.5 papers per integrated research per year. The scientific production of this RU covers a broad range of topics, from agricultural science to environment and societal change, and food science and engineering. The RU may at times have difficulty in focussing its expertise.

The activity of the integrated members of CERNAS during 2013-2017 was considered as good on evaluation of the application documentation submitted and this opinion was maintained during the site visit. This Unit has performed innovative R&D of recognized quality and merit, contributing to advancement of knowledge and its application in the three main areas of activities, but in and with a rather local/regional perspective, with limited, or reduced internationalisation.

The merit of the team of integrated researchers is still limited, as most of the CVs included corresponded to initial career stages in their research fields, with a limited number of articles published and very reduced numbers of citations. It was clear after the site visit that several members of the team were recognized as co-supervisors of PhD theses through the collaboration already established with universities both within and outside the region. Also importantly, PhD projects were linked to stakeholders and their expertise, facilities and resources.

The Panel was very much impressed by the meeting with the PhD students and postdocs, who showed a lot of enthusiasm for their work in the RU. There was evidence that the facilities and experimental fields, of the RU, provided clear opportunities for the development of appropriate PhD research activities.

CERNAS has benefited from international sources of funding and from other national sources, however the funding received from FCT has been very limited so far.

The plan of activities of the RU would benefit from a prioritisation of the research themes/lines to be covered, as the proposed plan is suggested to cover too many objectives to be functional at an appropriate depth to develop and

sustain strategic research. In the meeting with the senior researchers, it was made clear that the team are aware that it was necessary for them to discuss the specific areas of expertise that the RU wants to develop in terms of research. The impression was given during question time that most of the RU (some 90%) had been involved in the production of the FCT assessment documentation 2018-2021.

Taking into account the application form, the strategy presented a wealth of dissemination goals and importantly utilised their very extensive interface with industry partners and spin-offs which they have created. This can be of considerable benefit in the development of entrepreneurship in the area. It is a little less clear how the RU is planning to achieve excellence in terms of more basic scientific research. Some serious consideration and planning is required for discussions with associated universities on how the space away from a high teaching load can be created for more strategic research. The Panel has considered issues of employment of PhDs and post-doctoral scientists at all of the RU visited, however there was an important difference with this RU. Given their extensive interactions with SMEs and the support they provided to R&D and innovation, this appear like a very effective way to train, develop and subsequently employ researchers to be used by industry.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

Considering the application form and the on-site visit, it was made clear that this unit has the capacity and the facilities to supervise PhD students. It is the opinion of the Panel that, instead of starting a new PhD program, the research group of CERNAS continue to strengthen the collaboration with universities and participate in already existing PhD programs. The members of Portuguese Polytechnics should ask for formal procedures authorizing them to be recognized as main supervisors when involved in supervising doctoral activities, getting the recognition they deserve.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Estudos Florestais (CEF)

Coordinator: Maria Margarida Branco de Brito Tavares Tomé

Integrated PhD Researchers: 75

Overall Quality Grade: EXCELLENT

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

Base Funding for (2020-2023): 1065 K€

Recommended Programmatic Support

PhD Fellowships: 9

Programmatic Funding: 515 K€, including for 1 (Junior) New PhD Researcher Contract.

Justification, Comments and Recommendations

The Forest Research Centre (CEF) is a consolidated Research Unit that performs high quality multidisciplinary research covered by four research groups in specific fields: a) forest ecology and ecophysiology, b) forest protection and rehabilitation, c) forest ecosystems management and d) forest products and biorefineries. This unit has been able to deal with the financial constraints for research in Portugal by increasing significantly its funding from international sources, that accounted for 34% of the budget 2013-2017, mainly the H2020 EU program. Being a large group of 75 integrated researchers, the scientific productivity of the Unit is important both in terms of quantity (around 2 papers per integrated research and year for 2013-2017) and quality, as high impact journals in very different fields (ecology, Interdisciplinary sciences, material sciences) published their results.

The quality, merit and relevance of the activities of the Unit in the period 2013-2017 were excellent and also very relevant for increasing the knowledge of the structure, dynamics, function and management of forest and natural range systems at a global scale. The Unit provided a description of a broad and effective range of outreach activities, and these provided good media marketing opportunities for the RU. The team of integrated researchers is strong, with a large majority of them being very active in research over a period of time. The RU staff dynamics and support (academic, scientific and personal) from students, post-docs to researchers was presented as positive one in which support was actively available. Considering the report and the on-site visit, the Panel identified that their presented strategy Plan for the Unit was not as well developed as might have been, particularly in relation to the forest products research group. The presentation made by the Coordinator of CEF clarified the submitted proposal by stressing the research lines they consider for the plan of activities and the transversal areas that the Unit can cover. The importance of structure and flexibility of CEF's staff, with respect to research, was noted.

The Panel was impressed by the network of long-term experimental forest plots that the Unit is maintaining across Portugal along with the participation in the REINFORCE network of plots aiming to assess the effects of climate change in different forest species and provenances. Another important strength of the Unit was the participation in the Copernicus program related to the sentinel satellite that led to the development of algorithms for detecting burned areas across Europe.

The Panel expressed concerns about the research plan of activities for 2018-2022 that included too many specific objectives for each of the 4 RGs of this unit. The Panel suggestion was that additional effort to rationalise/prioritise the research objectives should be envisaged by the Unit.

Overall, CEF activities cover an extensive area of forest sciences that are currently relevant for Portugal but also at global level. The Panel recognized and appreciated the fact that CEF deals with global challenges resulting from increased biotic and abiotic threats to the forests and other wooded lands.

The Panel would like to provide some structural recommendations to be carefully considered by CEF when updating its research plan:

1. An additional effort could be made to develop process-based models of forest development, which provide a better understanding of the actual ecological processes that shape the structure of forest. This would be superior to the empirical models, which despite being very precise are unable to unravel how these forest processes are acting.
2. The field of non-timber forest products, bio-products derived from lignocellulosic biomass and biorefineries are very relevant and connected to the necessary development of the bio-economy and circular economy. Forest industries have great opportunities in this area for innovation and this unit could have a more definitive strategy on these topics, with opportunities for increase private funding.
3. The involvement of work related to fresh water fisheries was questioned with respect to mission of the Research Unit. The RU suggested that there were historical reasons behind the links with game and fisheries. The relevance of this work needs to be considered when the Plan is up-dated.

Overall, CEF should seek to expand its external advisory committee with experts outside Portugal and this could be achieved through exploitation of some of their international project research collaborators. Students would benefit from more administrative support and/or a reduction in bureaucratic paper associated with doing their research.

This is an excellent unit able to obtain a considerable amount of funding for research projects. The number of researchers requested as programmatic funding and the short description of the type of researchers to hire provided in the section 14.2 of the application show some incongruences. The position for hiring a researcher with PhD would be allocated with preference to a very relevant area of expertise, in opinion of the Panel: the analysis of satellite images to track forest disturbances, particularly wild fires. Instead of placing more positions in this section, the Panel has considered that this group would benefit from an allocation of budget in section iv of programmatic funding, because it can cover co-funding of hiring costs of researchers.

Contribution to support the R&D Unit internationalization: 40K€ allocated, which is the total requested. This unit is participating actively in several international infrastructures/networks already approved.

Other possible support for specific purposes: In the case of the programmatic funding suggested to be allocated to specific purposes, the Panel recommendation is to use 70k€ for the maintenance of long-term forest experiments and field infrastructures, along with 270k€ for co-funding of researchers. This amount would serve to 2/3 co-fund of 3 PhD researchers allocated to the RGs that seem to have clearer objectives for the contracts they are proposing: ForEco, ForProtect and ForChange.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Investigação e de Tecnologias Agro-Ambientais e Biológicas (CITAB)

Coordinator: Ana Isabel Ramos Novo Amorim de Barros

Integrated PhD Researchers: 102

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 4

Base Funding for (2020-2023): 1481 K€

Recommended Programmatic Support

PhD Fellowships: 6

Programmatic Funding: 385 K€, including for 1 (Junior) New PhD Researcher Contract.

Justification, Comments and Recommendations

CITAB internationalisation strategy involves a strong participation in EU programmes and networks. Examples of this are given and include the reuse of wastes and legume breeding and sustainable management. The details of the latter project are presented and show evidence of CITAB staff contributing and managing a large international research programme consortium, and running an international conference on the subject. International funding has come from the EC at a reasonable rate and considerably more than that provided by FCT for project support. Five contributions are covered in the assessment documentation and include understanding mechanisms of climate change to improve resilience in viticulture. This is a relevant and well-structured project which links aspect of crop performance (water and plant physiology) with modelling to identify climate impacts. Machine learning is also utilised via hyperspectral imaging to predict fruit production quality and validate against current chemometric methods. Such approaches are key to addressing major issues in resource use (i.e. labour etc.) and costs in agricultural production systems. The importance of sustainable land management is also cited with work from the Fluvial Ecology Laboratory and its work on forested catchments linked to hydrology, river chemistry and fish biology. Work with kaolin in vineyards is also highlighted with citation of the benefits of foliar applications of this substance on crop physiology and crop quality. It was perhaps a little surprising that this work is highlighted here as the apple production industry in the USA and New Zealand where evaluating (and publishing) this orchard management approach and its effects over 10 years ago. This matter was discussed during the site visit. The importance of being able to reduce GHG emission from animal production systems is a major global issue and work on reducing these emissions using various treatments including biochar is of significant importance. Again, this work was highlighted during the visit. Examples of product valorisation were provided and included pharmaceuticals, cosmetics, and other health based innovative products. The highlighted contributions were generally in good quality Q1 journals.

Integrated researchers with PhDs has risen from 81 in 2013 to 112 in 2017 and this increase, at least in part, is suggested to be reflected in the institute's output growth and increased productivity. A good number (but not all) of the staff presented have CVs which show they are active in publishing. This output may well be influenced by other time consuming activities such as teaching; this issue was discussed during the site visit. Over the 5-year assessment period the Unit has been responsible for 822 peer-reviewed papers (around 1.7 per annum per staff), what is good. Of these publications some 273 have been in international journals, while 140 have been books. Looking at the peer-reviewed journal type publications these are not all in international journals, with a good number of the staff records showing publication in mixed quality journals. However, publications in quartile-one journals have increased from 30 to 58% over the 5-year assessment period. Encouragement to publish more in international journals would be expected with this level of intellectual capacity. The staff within the food science publishing sector appears to be the most consistently productive with respect to PR outputs in good journals. Staff have supervised, or co-supervised the completion of some 241 MSc students and 50 PhDs. The Doctoral Programme in Agricultural Chains (Farm to Fork) is cited with its 39 students. The R&D Unit is supported by an advisory Panel which, very importantly, is made up of international experts outside of Portugal (i.e. UK, Spain and France). The amount of effort which has gone into securing R&D funds from stakeholders (43%) was seen as highly appropriate and advantageous. The outreach activities presented were varied

and encompassing with respect to different sectors of society. Both PhD students and post docs commented very positively on interactions and support from RU staff.

The Plan emphasises the need for more internationalisation and it is suggested that this will occur with an increase in the submission of proposal from the EU H2020, INTERREG and COST. They (CITAB) have been signing (in 2018) protocols with INESC-TEC and CIIMAR and indicate a strong intention to boost their critical mass in areas of technology. Importantly they are looking for a good number ISO accreditation with respect to lab analyses, field protocols and sampling methods, these are rightly important with respect to EU grant applications. The Plan described does not appear to introduce radical change in the research programme structure from the previous years. There is an intention to carryout "streamlining". It states it will be taking into account, national, international, regional, EU policy frameworks as would be expected from a forward looking organisation. More detail was provided during the visit. The plan, in general, is solid in its content, with a 'more of the same approach'. A lot of detail about outreach in various forms was shown and is planned, which is good. A major new element is the range of ISO accreditation applications and further explanation of the Unit's interactive management with respect to interactions between the two themes. The site visit discussed the needs for this accreditation. There is a request for four new researchers in appropriate areas of research which include climate change impacts and the valorisation of bio-based products. The concept of the linking of research and development through collaborating stakeholder laboratories was seen as positive. An important aim of the RU was expressed as being 'different' with respect to the offer to stakeholders with financial inputs being the primary limitation in achieving this goal. Accreditation, in key areas, along with up to date equipment was suggested as a major component in achieving this goal. Patents are part of the future plan and they have expertise to support this activity.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Investigação e Desenvolvimento em Sistemas Agroalimentares e Sustentabilidade (CISAS)

Coordinator: Alexandre Nuno Vaz Baptista de Vieira e Brito

Integrated PhD Researchers: 17

Overall Quality Grade: GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 3
- (B) Merit of the team of Integrated Researchers: 3
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 198 K€

Recommended Programmatic Support

Programmatic Funding: 355 K€, including for 1 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

CISAS RU members belong to the Polytechnic Institute of Viana do Castelo and they have competences in different areas from agriculture and plant development, biotechnology, biotic and abiotic stress biology, integrated pest management, plant breeding, food processing and product quality. The RU carries out services and applied research activities to respond to the needs of local SMEs and regional governmental Institutions for the valorisation of local products through analyses for traceability, recognition of origin of the products etc. The RU also works with local governmental Institutions to set up strategic plans to increase the income of local farmers and food producers helping them to obtain certifications for Protected Designation of Origin and Protected Geographical Indications. The RU recently started more ambitious and broader research activities and invested funds for improving their laboratory facilities and instrumentations. The RU has identified two thematic lines in which their research activities are grouped, namely Agri-food Systems and Resource Management and Sustainability. The activities have the following goals: protection of biodiversity, innovation of agrarian system and adaptation to climate changes through the efficient use of water, the protection of soil and plants, valorisation of local productions and endogenous resources, certification of origin of products, development of new products and processes and of functional ingredients. The RU consists of 17 integrated researchers and 17 collaborators and has attracted considerable funds in the last 5 years, mainly from national projects.

The projects awarded to the RU were in the area of food processing and sustainability as well as in crop protection. One of the projects aimed at developing technological solutions to increase the shelf life of meat based products. Two other projects, still ongoing, are focused on the development of innovative and sustainable technologies for the extraction of high added-value natural compounds from agro-industrial and forest wastes to be used as food ingredients. Thanks to the multidisciplinary competences of the team, antimicrobial compounds to increase food safety were investigated, and scale-up tests were carried out in collaboration with an industrial partner. The cooperation with industrial partners was also strengthened through the presentation of a collaborative project with three companies to study the valorisation of pork boar's meat production. In the field of crop protection, the RU studied and implemented an innovative strategy for crop protection based on the combined effects of biological control, activation of natural plant defence mechanisms and control of rootstocks nematodes. The Research Unit has initiated international collaborations through Erasmus+, a COST Action and a European project in the frame of the Horizon 2020 Agenda. The efforts made for internationalisation of the RU are well described as well as the actions to be implemented to start new activities in collaboration with international research groups. The RU receives funds from local SMEs providing to them services such as chemical and microbiological analyses. Moreover, they developed food products, a ready to heat fish meat based product served in schools and hospitals and hold a patent. The RU promoted the visibility of the group and its research potential, as well as that of IPVC students, through the organization of Workshops and Seminars, some of them open to the general public.

CISAS R&D activities are mainly in applied research and can be ranked as good. During the on-site visit, a very ambitious program for the next 5 years was presented, but there was a lack of focus on common research activities that could be implemented to increase the "quality" and the scientific recognition of the RU and strengthen the collaboration between researchers with different competencies.

The impact of the applied research outcomes on the valorisation of productions of local farmers and food processors was clearly presented and it can be considered very relevant for the revitalization of the rural areas of the North of

Portugal. However, there was a lack in developing cutting edge scientific activities, possibly due to the lack of funds in fundamental research. The identified research thematic lines and research goals are too broad for a RU consisting of 34 researchers.

CISAS receives only a marginal amount of funding from the European Commission and International companies, but the group has started internationalization activities in the frame of a COST action and an Erasmus+ Programme, the latter involving both students and staff members.

The research infrastructure for different activities is sound and was reinforced by recent investments.

The results of the research activities have been published in peer-reviewed journals with a good impact in terms of quantity and quality of the output. The number of scientific publications in top journals is low.

In the CISAS RU there are no PhD students, the Polytechnic Schools in Portugal so far having not been authorized to start their own PhD program. Some PhD students will be hosted in the group and their activities will be started in collaboration with RU of other Universities in the Country. Some of the research collaborators hold a Master Degree and some of them hold a PhD. During the interview it did not appear that they are deeply integrated in the RU activities, and their motivation for carrying out research work was not clear. It appeared that these collaborators acted merely as technicians conducting services for the outreach activities of the RU.

The RU strength in developing and carrying out applied research clearly appeared, while the contribution to advancement of knowledge in basic science is limited, due to the different core business of IPVC up to now. However, the different competences in the RU should be valorised setting up more ambitious research programs to be carried out with national and international universities and research centres.

The vocation to technology transfer activities should be considered as a flywheel to prepare new research projects in collaboration with industrial partners, also in the frame of European calls, and to attract more funds from industry. However, more integrated research programs could allow the RU to focus on cutting-edge research lines, strengthen the collaboration between the researchers with different background and increase the scientific visibility of the group.

CISAS is already in strong contact with the stakeholders, including the local governmental institutions, to disseminate the outcomes of their activities and promote the growth of the internal rural areas of the North of Portugal. These dissemination activities are also meant to inform and involve the general public.

The Panel had doubts whether CISAS has the strength to carry out the research activities planned for the next five years, being this activities spanning from agriculture, plant conservation and valorisation, food processing and food products development, valorisation of forest and agrifood residues, as well as services to industrial partners with a small number of researchers working within the RU. A more focused plan could allow them to increase the visibility of the research results also in term of number of publications in journals of good impact among the researchers in the field of agriculture, forestry and food science and technology. The Panel also recommends that the RU should develop a strategy to allow postgraduate researchers and future PhD students to acquire more scientific skills.

It is the opinion of the Panel that CISAS has merits for having assigned one position for a researcher holding a PhD. The group still has to decide, through an internal decision procedure, the specific area of research in which the new researcher will be involved, possible interdisciplinary. This person would be in charge of the collaboration with the PhD programs with universities, which could really benefit of the facilities of the Polytechnic Institutes and of the knowledge of the RU members.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Investigação em Agronomia, Alimentos, Ambiente e Paisagem (LEAF)

Coordinator: Maria Helena Mendes da Costa Ferreira Correia de Oliveira

Integrated PhD Researchers: 128

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 3
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 1712 K€

Recommended Programmatic Support

PhD Fellowships: 8

Programmatic Funding: 385 K€, including for 1 (Junior) New PhD Researcher Contract.

Justification, Comments and Recommendations

Under a scenario of global climate change, the main objectives envisaged by LEAF research are to design and plan SMART landscapes; to apply conservation strategies, anticipating shifts on both critical and endangered species and habitats; to improve sustainable crop production, with emphasis on yield and quality and the best management of natural resources (soil, water, waste, energy), aiming at a circular economy; to develop new processes to obtain healthy, safe, economic, and sensory acceptable novel and functional foods (and feeds), and products.

LEAF includes more than 40 labs, organized currently in four research groups after a re-organisation and dealing with five research lines. The quality of the R&D activities within several groups is high. However, the Panel gained the impression that the activities of the involved institutes and laboratories along the chosen thematic lines are not well connected.

Several services such as product development in collaboration with the industry and the supply of a webGIS are created with considerable effort, are offered to the scientific community and the general public, but are not well exploited in commercial terms.

The interaction with industry is based on the functional infrastructure of LEAF. On a regional and national scale the work of LEAF is relevant. The international relevance is considerably smaller. EU funding has doubled in recent years and currently comprises 30% of the budget.

The output of scientific publications in top journals is moderate. Many journal articles appear in technical journals with medium or low impact factors. Several team members have a low publication record. The provided explanation was that demands from industry interactions and teaching are given priority over publishing. Moreover, publications are in some cases difficult due to IPR issues with the food industry

The involvement in teaching is demanding and team members expressed that collaborative work with the industry often has priority over the preparation of scientific papers. During the site visit the Panel questioned why the team of researchers even plans to expand the teaching programme instead of streamlining it.

The involved doctoral students and post-docs are benefitting from an efficient technical exchange, but would welcome an even stronger thematic interaction between the involved groups.

The involved institutions and working groups have working objectives and strategies that are not well integrated in a coherent objective. There is a lot of mutual support among researchers and students between institutes. However, a consistent common objective is missing.

The working direction is not necessarily pro-active but is customer driven. Industry (e.g. Food Portugal) approaches the institute, rather than LEAF defining a consistent research agenda.

The compensation paid by the industry is sometimes low. Establishing a better business model for the interaction with the industry is recommended.

The hiring plan for new researchers is apparently based on flexible criteria. A more rigid structure of criteria is recommended in order to increase the transparency of the management process.

LEAF has earlier received several recommendations from its Advisory Board and has so far only partly implemented the advice:

- Stronger thematic focus (thematic lines have been reduced from five to four)
- The profile of LEAF should be better defined and the collaboration between groups should be increased (the panel has the impression this request has not been fulfilled yet)
- Better definition of long-term priorities (also not implemented yet)

In the Panel discussion there was agreement that these recommendations are still valid.

With hindsight to a balanced distribution of the available positions within the funding programme the Panel suggests toward 8 PhD fellowships. The allocation of these fellowships is best made in a decision process within LEAF.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

During the site visit the Coordinator of LEAF expressed the urgent need for two pieces of equipment, i.e. a photoacoustic gas monitor and a GC-MS. The recommended allocation enables funding to contribute to the acquisition of these instruments.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de investigação em Produção Agroalimentar Sustentável (GreenUPorto)

Coordinator: Ruth Maria de Oliveira Pereira

Integrated PhD Researchers: 23

Overall Quality Grade: EXCELLENT

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 5
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 5

Base Funding for (2020-2023): 373 K€

Recommended Programmatic Support

PhD Fellowships: 8

Programmatic Funding: 570 K€, including for 2 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

The Research Centre in Sustainable Agri-Food Production (GreenUPorto) is a small RU with some 23 Integrated Researchers (IR). It is a fledgling organisation which has received considerable investment from the University of Porto with excellent refurbished facilities (at Vairão), and has additional capacity to develop and expand further. It is located in a primary horticultural region/area which is appropriate for its mission. Its mission is to contribute to science and technology in agronomy, food science and environmental science in the context of “smart specialisation”. The RU prides itself on being the first Portuguese RU to focus on the horticultural value chain; with its emphasis on fruits, vegetables, ornamentals, viticulture, field crops and plant protection. This is what would be expected from a mixed horticulturally-based RU. The RU conducted its research in a multidisciplinary manner over 3 themes, 1- plant breeding, protection and post-harvest, 2- processing, valorisation and human nutrition and 3- consumption and environmental quality and risk assessment, with a biotechnology (omics etc.) element included. This provides good coverage of the horticultural supply chain from farmer to consumer. Current IRs are dispersed over two locations which are linked academically and research-wise to the University of Porto Campuses at Vairão and Alegre.

The RU is presented in a positive, effective and progressive manner and seeks to exploit the lack any similar RU in the horticulture sector. This RU wants to develop and acquire a position of national recognition. This is the primary reason for seeking accreditation through FCT recognition and funds. The science focus is clearly defined within a strategic framework to provide applied R&D for stakeholders. Despite many of its members having outputs which are industry linked this is seen as positive, given the aims and aspirations of this RU. The RU has plans and understands the need to ensure further IRs enhance their publication profiles with more strategic research outputs. They are self-motivating and are mentoring those members with traditionally more applied outputs to enhance the science impact of their work. Over the review period there have been increases in the number of research proposal submitted, an increase in IR with PhDs and a 40% increase in publication number. The five contributions highlighted include good examples of international consortium run projects with the inclusion of major EU countries with well-established agricultural research capacity. There is evidence of a level of project leadership coming from this RU in these research programmes. One highlighted project reflects the RU strategic base in its provision of networks of ‘producers’ organisations’ within Portugal. This is a good example of the RU strategic strength in supporting industry/business and entire supply chains. Work from these research activities is finding its way into Q1 PR journals. The RU is supported by an external international advisory board. Importantly the RU is rightly proud of its achievements.

There are some 23 IR in the RU and they have produced 221 papers over the last 5 years, averaging around just under 2 per IR per year. Over the review period there have been increases in the number of research proposal submitted, an increase in IR with PhDs (by 30%) and a 40% increase in the number of publications. They are self-motivating and are mentoring those members with applied outputs to enhance the science impact of their work. There is wide variation in output productivity with publications in a mix of journals of different quality. There are however several staff listed which show no publications at all and a number that have not published since 2015. It was suggested, when this was discussed, that this was at least in part due to a failure to update ORCID records. There is evidence of participation in national and international R&D, which was suggested to be frequent in the RU site presentation. It is on the basis of

these projects that the RU has created synergisms with outside RUs which has strengthened its success. This has included researchers (some 23) joining GreenUPorto as collaborators. Despite some limitations in access to resources, human and technological the RU is presented as an institute with a strong ethos of collaborating with the university, other academics (national and international) and importantly industry. For example, there was a strong connection presented, through posters of joint research work with biological sciences at the University of Porto. The RU invests time in interacting with stakeholders through an array of technology transfer activities which are appropriate and specific for each stakeholder output. The deliverables from these interactions with stakeholders was clearly evident in the financial contribution that industry makes to fund its R&D with this RU. Positive and supportive comments were received from PhD students and post-doctoral researchers. Many have strong connections of their own with industry partners. Students and post-doctoral workers had, or supported, their supervisor's strong functional international research connections (e.g. Australia, Japan, the Netherlands), with respect to their on-going research programmes. This is a RU in which people want to work and want to make it a success.

The Plan emphasises the need for a greater production of food that should be produced in a sustainable way. The importance of the RU as a strategic horticultural centre for R&D is rightly emphasised with respect to this sector's importance and economic value, both in Portugal and globally. The concept of smart specialisation is frequently mentioned in the submission and appears to be their approach to delivering social change through interactions with a broad range of stakeholders. Importantly, the plan shows 3 overriding areas of activity with milestones, these include to investing Government funds into developing the two campuses (this is presented as complete and was seen during the site visit tour), the restructuring of the teaching programmes and creating a core RU which is multidisciplinary for the agri-food sector. On the latter point they have interacted with Wageningen on this matter which makes good sense. They rightly seek inputs, advice and research interactions with one of Europe's leading universities in the horticultural R&D sector. The Plan objectives are clearly presented, in a simple and logical manner as would be expected from a horticultural strategic RU. Importantly, the Plan includes priorities and how these are linked to the thematic lines presented in a sensible and logical manner. They include production development, increasing productivity and quality, looking for downstream horticultural value and to rightly achieve sustainable goals through the linkage of the environment with adaptation, protection, biodiversity, sustainability and risk assessment. A need was expressed to increase financial funding but how this compares with past funding is difficult to determine in the absence of financial budgets recorded over the last 5 years.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RUs. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Investigação Interdisciplinar em Sanidade Animal (CIISA)

Coordinator: Luís Filipe Lopes da Costa

Integrated PhD Researchers: 97

Overall Quality Grade: EXCELLENT

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 5
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 5

Base Funding for (2020-2023): 1663 K€

Recommended Programmatic Support

PhD Fellowships: 12

Programmatic Funding: 648 K€

Justification, Comments and Recommendations

The Centre for Interdisciplinary Research in Animal Health (CIISA), coordinated by the Faculty of Veterinary Medicine (FMV) of the University of Lisboa, was established in 1992 to conduct and to coordinate fundamental and applied research in the field of animal, veterinary and biomedical sciences. In the application form, the history of this R&D Unit, the objectives, the major achievements, the competences of the team of Integrated Researchers, the organisation of the Unit, the strategy and future plan of activities and the budget were clearly described. During the on-site visit, a very clear presentation was given about the strategy of the Unit. Additional metrics were presented that clarified several aspects. The application form, the presentation and the discussions with the principal investigators, postdoc researchers and PhD students provided useful information for the Panel to help evaluating the RU and making recommendations. Overall, the Unit seems to be well organized and made a clear impression to the Panel.

CIISA is one of the larger R&D Units encompassing 97 Integrated Researchers from 14 laboratories, organized in two major research groups: "Animal Science and Food Safety" and "Animal Health and Veterinary Medicine", both are pursuing high level research under the concepts of "Sustainable Animal Production" and "One Health", respectively. The Sustainable Animal Production objective conducts relevant research in nutritional biotechnology, quality and safety of animal products, biodiversity conservation and animal welfare. The "One Health" concept mainly covers research in emerging infectious diseases and zoonoses, translational medicine and antimicrobial resistance. The output of publications in peer reviewed journals of the assessment period is of a high level in terms of quantity and quality and impact of the journals. Some of the top achievements have yielded papers in highly ranked journals. A high proportion of these publications have resulted from international collaboration. Because of the size of the RU and the diversity in research topics, the publications cover many different scientific areas. In addition to specialised research in several areas, there are also examples of a significant level of multi-disciplinarity. Overall, the Panel considers that CIISA has developed an internationally appropriate multi-institutional research area in line with national and international research agendas. The Panel recommends the Unit to continue on these lines of research, but also to better explore the opportunities for multidisciplinary collaboration within the RU because of the unique combination of expertise in animal science and veterinary medicine within the one RU.

The majority of the team of Integrated Researchers are experts in their field at an international, or at least national, level. The Principal Investigators have, in general, a steady production of high quality publications in peer reviewed journals and are involved in national and international research projects and consortia. However, a concern of the Panel, shared by the Unit during the on-site visit, was that the number of PhD students was relatively low compared to the number of Integrated Researchers, which was explained by the RU to be due to changes in national funding policy. Apart from this, the RU has a good distribution of young and experienced researchers, and effective and supportive interrelationships.

The Panel was impressed by the very clear and motivated strategic 2019-2022 plan for the Unit consisting of 8 master pillars. The Panel fully supports the views expressed in the RU's presentation. The RU has a clear intention develop further its international excellence in a number of domains, but not all, whilst not losing general expertise in the broader

field of animal science and veterinary medicine. The Unit has also a continued mission in national R&D network coordination in the field of animal and veterinary science. Although it is not entirely clear to the Panel what this mission specifically involves and what resources and budget are allocated to it, it is an important task that should be developed and continued to the benefit of all partners. The Panel noted and appreciated the selectivity of the RU to support PhD and young researchers through fellowships and (working and mobility) grants. Following the discussion with the group of post-doctoral researchers and PhD students, the Panel recorded agreement on the strategy of RU and their active involvement in the decision making process. The major concern of these groups is the insecure career perspectives, which was understood and noted by the Panel and is considered a priority for action. This group further expressed the need for support in biostatistics and bioinformatics, and extension and renewal of equipment because no investments in equipment have been made over a number of years. Despite these difficulties, the post-doctoral and PhD researchers seemed to be very enthusiastic and committed. Overall, the Panel judged that the RU has an excellent plan and that the proposed budget was justified and balanced. The financial co-responsibility of the Faculty of Veterinary Medicine was also appreciated.

The RU requested FCT funding for 12 PhD fellowships. Allocation of all requested PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision.

The RU gave priority to funding for PhD fellowships and did not request FCT funding for hiring new postdoctoral researchers.

The requested funding of 48 K€ for internationalisation is justified and necessary according to the Panel.

The RU requested a total budget of 840 K€ for equipment (5 items). The Panel considers that all these requests fit in the scope of the RU and are justified given that there have not been any investments for equipment over the last years. The Panel recommends the support for purchase of equipment for a total amount of 600 K€. The Panel has made funds available following FCT guidelines to support purchases of critical importance and provide resources which can be shared within and between RU. The allocation provided has also been considered in a manner which addresses the requests made by the RU so that any prioritised item could be purchased.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Centro de Investigação Vasco da Gama (CIVG)

Coordinator: Maria Eduarda Moreno da Silveira

Integrated PhD Researchers: 12

Overall Quality Grade: WEAK

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 2
- (B) Merit of the team of Integrated Researchers: 2
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 2

Justification, Comments and Recommendations

CIVG (Centro de Investigação Vasco da Gama/Center for Investigation Vasco da Gama) is a non-profit R&D unit that was created in 2016 but started operating in 2018, as was stated in the presentation during the onsite visit. CIVG has 12 Integrated researchers and 5 collaborators. The overall majority of them were present during the visit and hence the Panel had the opportunity to discuss the objectives, strategy, plan of activities and overall management of the R&D Unit.

The presentation of the Unit, during the onsite visit, helped the assessment Panel to get a clear view of the available human and infrastructure resources. It became evident that CIVG was not a coherent team, although it has some good integrated researchers with national and international links. Synergies and common research activities are necessary to help the scientific bonding of the team, a fact that was clearly communicated by the Panel as a key component for future strategy of the Unit. The statement that CIVG is the only veterinary group engaged in scientific activities in the central region of Portugal was appreciated by the Panel. However, the Panel questioned the flaws in the proposal regarding the 5 contributions the R&D Unit considers as most important for the period 2013-2017 as well as the lack of focus in research lines and the diffusion of the Unit in four different research groups that did not have complementary backgrounds. Such comments were well received by the members of CIVG that accepted the fact that the proposal was not well prepared and should have been more focused in every section. The Panel had a structural discussion about what should have been the core themes of research of CIVG considering the number of existing Integrated Researchers and the absence of any previous collaborations between most of the team members. Being a newly established unit, CIVG incorporated researchers with quite diverse research interests and background of scientific achievements. The Panel questioned the claims of 5 significant contributions of the team since numbers 2 and 3 were about the foundation of a Biotech company of one member of CIVG but without the company having any direct link with the R&D Unit and at the same time raising concerns about conflicts of interest.

The Panel also discussed with CIVG members specific information and metrics regarding their areas of expertise and their publication records. Considering the number of integrated scientists, the publication record of the Unit was very poor; relative information was missing from ORCID records in the proposal, a fact that was acknowledged by CIVG members. The Panel questioned also the fact that the Unit did not request any funding for PhD fellowships or new researchers. Moreover, the Panel raised some issues about the existing facilities and the requested equipment that were rather basic equipment that were not related to the projected R&D activities for the five-year period 2018-2022.

Overall, the Panel following a comprehensive discussion about the proposal, the information provided during the onsite visit and the performance of CIVG decided that the Unit is weak at this moment and very few of its members had performed R&D of national and international quality and merit. There were serious flaws regarding objectives, strategy, plan of activities and organization of the Unit for 2018-2022 as stated above. Hence the Panel advised the Unit to undertake an internal evaluation and provided the following specific suggestions:

1. CIVG should foster the collaboration between its team members in research activities and common publications. Their research should have a clear goal and should be focused in the areas that a critical mass of researchers can be formed. The Panel acknowledged the fact that the Unit suggested regenerative medicine in connection with oncology as their priority and supported the idea subject to securing the required infrastructure and the competent personnel to cater the needs of such specialised techniques.
2. CIVG should intensify its efforts to secure funds from external resources and should seek advice and consultancy for project writing and preparation for all its members.

3. CIVG should support Sort Term Scientific Missions of its members to other research institutes and laboratories to enhance their internationalization but also to improve their capabilities to prepare successful research proposals.

CIVG, as mentioned above, is a very recent and small R&D Unit with 12 integrated researchers that joined forces for the first time without any significant collaboration prior to the submission of the proposal. The main areas of research of those members include Biochemistry, Regenerative medicine, antimicrobial and anti-parasitic drugs resistance, Oncology and Molecular Biology and Analytical Methods. Based on the information available in the proposal the output of publications in peer reviewed journals of the past period was very poor. The Panel noticed that relative information was missing for several members. Few members of the team are well connected with international research consortia. The latter issue was discussed in detail with the Panel that suggested that those members should have a pivotal role in guiding the rest of the team and encourage research that could lead to highly ranked publications. During the on-site visit the Panel noted a good motivation by some members of the team and good human interrelationships, but overall, CIVG was not a well-functioning team due the lack of previous collaborations and very diverse scientific interests. The Panel suggested that the group should try to keep the existing team together and should seek further collaborations of complementary expertise that will strengthen the team in the near future.

CIVG as R&D Unit is addressing four scientific areas: (i) regenerative medicine, (ii) antimicrobial and anti-parasitic drugs resistance, (iii) environmental safety and (iv) biocompounds. As stated in the proposal the main goal of CIVG is to be recognized as a research entity under the "One-Health" concept, promoting the innovation, transfer of knowledge, internationalization and communication/education in science. The latter was prioritised as the main goal of CIVG in the description and objectives and strategy of the R&D Unit for 2018-2022. Another focus for the five-year period 2018-2022, of R&D activities is regenerative medicine. CIVG made explicit in the proposal that monitoring the antimicrobial and antiparasitic resistance will also become a research priority. The Panel questioned the ability of CIVG to deliver its aims with its current resources and the members of the Unit agreed that their objectives were too broad. The Panel suggested that any planned activities should focus on areas that the researchers have cumulative expertise following a series of discussion between them. Also, the Panel expressed doubts whether CIVG had thought objectively for the requested equipment and was surprised that there was not a request for new researchers since this category is important in the strategic planning of an R&D Unit. Following the discussion during the on-site visit it became apparent that the main concern of the R&D Unit at this stage was its acquisition of FCT approved status. The Panel discussed in detail with CIVG staff the steps and actions needed in their activities and objectives to achieve it. The Panel provided structured advices how the Unit should fine tune its activities to perform innovative and high quality research as a team in a national and international perspective. Overall, the consensus of the Panel was that CIVG, at this stage is a weak unit.

Evaluation Panel: NATURAL SCIENCES – Agricultural, Agro-food and Veterinary Sciences

R&D Unit: Instituto de Investigação e Tecnologia Agrária e do Ambiente dos Açores (IITAA CITA-A)

Coordinator: Alfredo Emílio Silveira de Borba

Integrated PhD Researchers: 17

Overall Quality Grade: VERY GOOD

Evaluation Criteria Ratings

- (A) Quality, merit, relevance and internationalization of the R&D activities of the Integrated Researchers in the R&D Unit Application: 4
- (B) Merit of the team of Integrated Researchers: 4
- (C) Appropriateness of objectives, strategy, plan of activities and organization: 3

Base Funding for (2020-2023): 248 K€

Recommended Programmatic Support

PhD Fellowships: 3

Programmatic Funding: 398 K€, including for 2 (Junior) New PhD Researchers Contracts.

Justification, Comments and Recommendations

The Institute of Agricultural and Environmental Research and Technology (IITAA CITA-A) is an organic unit within the University of the Azores, conducting research in agricultural and environmental sciences. In the application form, the composition of this R&D Unit, the objectives and activities, the major achievements, the competences of the team of Integrated Researchers, the future plan of activities and the budget were appropriately and clearly described. During the on-site visit, an informative presentation was given about the activities and the specificities of the Unit. The application form, the presentation and the discussions with the principal investigators, postdoc researchers and PhD students provided useful information for the assessment Panel to allow evaluating the Unit and making recommendations. The overall picture of the Unit and its motivation was good and was helpful for the Panel. Nevertheless, the Panel has some concerns regarding the strategy of the Unit.

CITA-A is a small RU encompassing 17 Integrated Researchers and is organised in three groups: (i) Agricultural and Animal Science, (ii) Food Science and Health, and (iii) Climate, Environment and Landscape. The Agricultural and Animal Science group conducts research in various areas such as animal reproduction, nutrition and soil and aquatic nutrient cycles, with the aim of contributing to sustainable and added-value production modes. The Food Science and Health group also deals with various topics, such as bioactivities of Azorean plants and microorganisms from extreme environments, thereby contributing to food safety and adding value to traditional Azorean foods, a major outcome for the RU. The Climate, Environment and Landscape group is specialised in weather forecasting, documenting climate and meteorological data from the unique geostrategic position of Azores, and in studying the effects of climate change on island ecosystems. The diversity in topics that are dealt with is considerable given the size of the group. The output of international peer reviewed publications is good in terms of quantity and quality. The research fits in national and regional priorities and provides relevant services to the Azorean government. In addition, there is significant international collaboration. Overall, the quality, relevance and (inter)national visibility of the R&D activities is good.

The team of Integrated Researchers can be considered experts in their field. Despite the limited resources and challenges in managing a small RU, the Panel observed strong motivation among the researchers and a constructive interaction between young and more experienced researchers within and between the three groups. The ratio of number of PhD students to number of Integrated Researchers was good, and the Unit appears to have a good distribution of young and experienced researchers. A concern of the Panel, shared by the group of young researchers during the on-site visit, was their insecure career perspectives. This, together with the small size of the RU impacts on the maintenance of a stable, effective and critical mass of researchers. The Panel's recommendation to the RU Unit is to develop a strategy to maintain critical expertise in the most important disciplines of their activities.

The plan of the Unit for the 2019-2022 period consists of continuation of research activities in the area covered for this assessment and developed to deliver the concept of 'islands as laboratories for a sustainable world'. A list of specific topics to be addressed by present and future PhD students and postdoc researchers was provided. Although these topics are relevant and sufficiently novel, an overarching strategy and organisation of the research activities including prioritisation was missing and should be encouraged as the next stage. The Unit indicated that there was good mutual

understanding and collaboration among the three groups, however this was not effectively reflected in the application form and became only clear during the on-site visit. The Panel considers that the collaboration among the three groups could be further strengthened through the establishment of integrated projects. The Panel understands the current approach to maintain a broad spectrum of research activities as a 'survival strategy' for a small RU, but would nevertheless suggest that the unit should reflect and focus more on specific topics that are of particular relevance for the Azores. The Panel strongly suggests to exploit, maximally, the specific and unique characteristics of the Azorean ecosystems. Since this cannot be achieved in isolation, research has to be collaborative. For example, the potential added value of the plant biodiversity of original grassland ecosystems on milk quality and nutritional value and its transformation to dairy products for niche markets could be investigated. It is suggested that all members of the RU are involved in such strategic discussions and that research topics are prioritized for the benefit of a long-term and more stable development of the RU. Given the coherence in the Unit, the Panel is convinced that developing an overarching strategy and organisational structure would benefit the outputs and success of its future work.

Allocation of PhD fellowships has been undertaken with the intention of the Panel providing the most appropriate support for the RU requesting and benefiting most from this provision. The Panel strongly recommends that when allocating the PhD fellowships to research topics, the Unit takes into account the general recommendations: 1/ to focus increasingly on research areas that address the specificities of the Azorean ecosystems and not to diffuse into activities (e.g. reproduction) that are addressed in depth in several other institutes worldwide, and 2/ to consider the establishment of integrated projects among the different groups of the RU.