

## EVALUATION REPORT OF THE UNIT

Agroécologie

### UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Institut national de recherche pour l'agriculture,  
l'alimentation et l'environnement - INRAE

Institut Agro - Institut national d'enseignement  
supérieur pour l'agriculture, l'alimentation et  
l'environnement

Université de Bourgogne Franche-Comté - UBFC

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### **EVALUATION CAMPAIGN 2022-2023** GROUP C

Report published on July, 20 2023



In the name of the expert committee<sup>1</sup> :

Jean-Luc Chotte, Chairman of the committee

For the Hcéres<sup>2</sup> :

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29th November 2021:

<sup>1</sup> The evaluation reports "are signed by the chairperson of the expert committee". (Article 11, paragraph 2);

<sup>2</sup> The president of the Hcéres "countersigns the evaluation reports established by the expert committee and signed by their chairperson." (Article 8, paragraph 5).

This report is the result of the unit's evaluation by the expert committee, the composition of which is specified below. The appreciations it contains are the expression of the independent and collegial deliberation of this committee. The numbers in this report are the certified exact data extracted from the deposited files by the supervising body on behalf of the unit.

## MEMBERS OF THE EXPERT COMMITTEE

**Chairperson:**

Mr Jean-Luc Chotte, IRD, Montpellier

Mr Guillaume Becard, Université Toulouse 3 (representative of CNU)

Ms Christine Foyer, University of Birmingham, United Kingdom

Ms Christine Granier, INRAE, Montpellier (representative of CSS INRAE)

Mr Thierry Heulin, CNRS, Aix-en-Provence

**Experts:**

Mr Dino Ienco, INRAE, Montpellier

Mr François Laurens, INRAE, Beaucauzé (supporting personnel)

Mr Grégory Mahy, Gembloux Agro-Bio Tech/Université de Liège, Belgique

Mr Jean Roger-Estrade, AgroParisTech (representative of CNECA)

Mr Jérôme Salse, Inrae, Clermont-Ferrand

## HCÉRES REPRESENTATIVE

Mr Steven Ball

## CHARACTERISATION OF THE UNIT

- Name: Agroécologie
- Acronym: Agroécologie
- Label and number: UMR 1347
- Number of teams: 4
- Composition of the executive team: Mr Fabrice Martin-Laurent, since the 1<sup>st</sup> June 2021. Previously Mr Philippe Lemanceau.

## SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement

SVE2 Productions végétales et animales (agronomie), biologie végétale et animale, biotechnologie et ingénierie des biosystèmes

## THEMES OF THE UNIT

The research carried out in the UMR seeks to contribute to the design of sustainable agroecological cropping systems, i.e. cultivation that is respectful of the environment, with less chemical inputs while maintaining a high level of productivity, ensuring good quality as well as quantity. The UMR generates fundamental and applied knowledge concerning the importance of biodiversity and biotic interactions between plants, between plants and microorganisms and between plants and fauna in cultivated fields. The UMR is organized into four teams of researchers with common interests and goals, whose titles reflect the themes of research: BIOMÉ (Biology and Ecosystem Functions of Soils), GEAPSI (Genetic and Environmental Determinants of Plant Adaptation to Innovative Cropping Systems), GESTAD (Sustainable Weed Management) and IPM (Mechanisms and Management of Plant-Microorganism Interactions). The research of these teams is supported by four platforms (Genosol, Microscopy Platform, ERB and 4PMI greenhouse), as well as the CA-SYS experiment at the Epoisses experimental unit (U2E). This organisation reflects the diversity of the objectives and different levels of organization addressed from genes to microorganisms to plants and to cropping systems. The scientific animation of the unit is a unifying force that provides cohesion between the diverse research areas. This consists of four inter-team themes that address the following major topics: innovative cropping systems, design and modelling, ecological engineering and the development of varietal ideotypes.

## HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The UMR Agroécologie was created in 2012 under the administrative supervision of INRAE, the Institut Agro Dijon (ex AgroSup Dijon), the University of Burgundy, CHU, and CNRS. Agroécologie was formed by the merger of four previous UMRs (BGA, LEG, MSE and PME), the SED Experimental unit and several teams from the Institut Agro. The UMR is mainly located in Dijon, where it is housed in four buildings of the INRAE Bourgogne Franche-Comté Centre (9 000 m<sup>2</sup> total) and in one building of the Institut Agro Dijon (1 900 m<sup>2</sup>). It encompasses greenhouse facilities and several experimental plots (5 000 m<sup>2</sup>). The UMR also has access to experimental fields at Epoisses experimental unit (U2E) located 15 km from Dijon.

## RESEARCH ENVIRONMENT OF THE UNIT

The research implemented by the UMR contributes firstly to several of the major scientific orientations (OS) that are defined in the INRAE 2030 document. A particular focus concerns OS1 'Responding to environmental challenges and managing associated risks' and OS2 'Accelerating agro-ecological and food transitions, considering economic and social issues'. In addition, research at the UMR addresses the majority of the major scientific objectives (GOS) of the INRAE's supervisory departments (Agroecosystem, BAP and SPE). Secondly, the UMR adheres to the agenda of the University of Burgundy Franche-Comté (UBFC), particularly to the axis 2 concerning 'Territories, Environment and Food' of the ISITE-BFC (Initiatives Science Innovation Territoire Economie en Bourgogne-Franche-Comté). Moreover, the unit is involved in the management of the Life and Earth Sciences, Territories, Environments, Food (SV2TEA) cluster and the COS Platform of UBFC.

Agroécologie was one of the four units behind the project leading to the TRANSBIO Graduate School (GS) within the framework of UBFC Integrative project within the university research school. This allows greater continuity between the master's and doctoral levels. This initiative is funded by the PIA4 titled "Structuring of Training through Research in Excellence Initiatives (SFRI)". The unit works actively with i) VITAGORA, the agri-food competitiveness cluster of the Bourgogne-Franche-Comté and Île-de-France regions and with Agronov, the agricultural innovation accelerator cluster; ii) with INRAE Transfer and iii) and with the SATT Sayens AgroEnvironment business unit.

## UNIT WORKFORCE: in physical persons at 31/12/2021

| <b>Permanent personnel in active employment</b>  |            |
|--|------------|
| Professors and associate professors  | 12         |
| Lecturer and associate lecturer  | 32         |
| Senior scientist (Directeur de recherche, DR) and associate                                    | 24         |
| Scientist (Chargé de recherche, CR) and associate  | 17         |
| Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées) | 0          |
| Research supporting personnel (PAR)  | 114        |
| <b>Subtotal permanent personnel in active employment</b>                                       | <b>199</b> |
| Non-permanent teacher-researchers, researchers and associates                                  | 0          |
| Non-permanent research supporting personnel (PAR)  | 28         |
| Post-docs  | 21         |
| PhD Students   | 41         |
| <b>Subtotal non-permanent personnel</b>  | <b>90</b>  |
| <b>Total</b>   | <b>289</b> |

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: NON-TUTORSHIP EMPLOYERS ARE GROUPED UNDER THE HEADING "OTHERS".

| <b>Employer</b>         | <b>EC</b> | <b>C</b>  | <b>PAR</b> |
|-------------------------|-----------|-----------|------------|
| INRAE                   | 0         | 40        | 97         |
| Institut Agro           | 22        | 0         | 9          |
| Université de Bourgogne | 22        | 0         | 5          |
| CNRS                    | 0         | 1         | 2          |
| Others                  | 0         | 0         | 1          |
| <b>Total</b>            | <b>44</b> | <b>41</b> | <b>114</b> |

## UNIT BUDGET

|  |        |
|--|--------|
| Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)   | 3 974  |
| Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)                               | 3 648  |
| Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)  | 12 800 |
| Own resources obtained from international call for projects (total over 6 years of sums obtained)  | 2 542  |
| Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.) | 4 282  |

|                            |        |
|----------------------------|--------|
| <b>Total in euros (k€)</b> | 27 246 |
|----------------------------|--------|

## GLOBAL ASSESSMENT

Created in 2012 by the merger of 4 UMRs (Biology and Weed Management/BGA, Genetics and Ecophysiology of Grain Legumes/UR-LEG, Soil and Environmental Microbiology/MSE and Plant-Microbe Environment/PME), the UMR Agroecology undertakes research aimed at gaining a better understanding of the importance of biodiversity and biotic interactions (plant-plant, plant-fauna and plant-microorganisms) in agroecosystems, in order to design and test innovative agroecological cropping systems that are environmentally friendly, less dependent on chemical inputs and that preserve the quality and quantity of crop production. The UMR is located on 2 sites (the INRAE Bourgogne Franche-Comté Centre, the Institut Agro Dijon). The UMR is also co-developing the CA-SYS platform with the Epoisses experimental unit (U2E).

This very large and successful UMR plays a central role in the agroecology research system at the regional and national levels. The UMR has gained a significant international reputation with regard to the success of its four major research areas: soil microbiology, genetics and ecophysiology of legumes, weed management and plant-microorganism interactions. The UMR manages a number of major experimental platforms that are of national and international importance (4PMI, Genosol, ERB, CA-SYS). In particular, Genosol and 4PMI are unique in Europe.

The scientific output is generally excellent, covering a wide range of disciplines (agronomy, ecology, soil biology, biochemistry, ecophysiology, genetics, microbiology and weed dynamics modelling), and spanning multiple levels of complexity from molecular mechanism to cropping systems. The panel notes that some teams have achieved an outstanding scientific output.

The management of the unit, which is organized into 4 teams and its functions were judged by the panel to be very good to excellent. However, the panel would like to emphasise the following points:

- the absence of collective and appropriate common vision on agroecology may become increasingly problematic. A coherent common vision would serve to unify the different research programs that contribute to the agroecological transition;
- while recognizing that improvements have been made since the creation of the UMR, it may be challenging to make further progress regarding closer collaborations between the teams, while taking advantage of the CA-SYS platform in particular;
- progress in establishing an internal organization is required to meet the challenges posed by the erosion of human resources (particularly in technical support) and the increase in the proportion of non-permanent staff;
- for some teams, further progress is required to establish a coherent strategy for the formation of permanent partnerships with private companies.

## DETAILED EVALUATION OF THE UNIT

### A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The unit has endeavoured to respond to all recommendations of the previous report, which were as follows: For the UMR, the report recommended i) a clarification of its organization, and of the modes of communication (both "horizontally" between the bodies of the UMR, but also vertically bottom-up and top-down), ii) a clarification of the added value of the theme-based workshops, iii) to support actions dedicated to the integration of young researchers, and the follow-up of the future of doctoral students.

For the scientific issues of the UMR as a whole, the previous report recommended: i) to strengthen the collaborations between the teams with the definition of collaborative cross-cutting projects, ii) to ensure that the activities related to the design of innovative cropping systems are really cross-cutting issues, and to take into account the advances of the UMR for this design, iii) the development of collaborations with experts in the Human and Social sciences.

### B – EVALUATION AREAS

#### EVALUATION AREA 1: PROFILE, RESOURCES AND ORGANISATION OF THE UNIT

##### Assessment on the unit's resources

Thanks to its dynamism, the UMR has an excellent range of resources. About 80% of the UMR budget comes from contracts. The UMR also has four platforms, two of which (4PMI, Genesol) are recognised nationally and internationally for their excellence. The UMR pools some of its budget to provide high-quality cross-disciplinary leadership. The requirements of these platforms in terms of human and financial resources that are required for their operation and maintenance may eventually be problematic and pose a potential risk that may weaken the unit. Another area of concern is the number of technical staff per researcher, which is constantly falling. This trend can only worsen with expected retirements in the future.

##### Assessment on the scientific objectives of the unit

The scientific objectives of the different teams of the unit are excellent and in line with the new emphasis on agroecology, mobilising a wide range of scientific skills (e.g. agronomy, ecology, soil biology, biochemistry, physiology and ecophysiology, genetics, microbiology and modelling). The range of topics is essential for the development of future agroecological cropping systems. A shared vision and strategy for Agroecology at the whole unit level would ensure that objectives are correctly prioritised and that programs make an efficient contribution to the overarching aim. More assertive inter-team interactions should be promoted, specifically regarding soil microbiota diversity and microbiological solutions for biocontrol and/or biofertilisation, as well as the integration of the different skill and competences of the different teams in crop system design.

##### Assessment on the functioning of the unit

The functioning of the UMR is very good to excellent, with excellent global management. Managing such a big number (289) of staff from four different institutions (INRAE, Institut Agro Dijon, University of Burgundy, CNRS) that encompass many varied skills and scientific approaches is a significant challenge. The organization of the UMR Agroécologie is based on two management bodies (Codir and Assembly of chief of platform and team), various technical and organisation committees and a scientific advisory board. In addition, this organisational structure is supported by the service council and the annual general assembly. This organisation was designed to allow regular and effective communication. The next challenge will be to improve and harmonize human resources and management practices between the teams, with particular attention paid to non-permanent staff.

*1/ The unit has resources that are suited to its activity profile and research environment.*

Strengths and possibilities linked to the context

Almost three quarters of the activity of the UMR is dedicated to research. The remaining quarter is focussed on Research Administration (8% of the total), 7% to Research supervision, 6% to Valorisation, transfer and innovation with 3% dedicated to Dissemination of research . Only 1% of the activity of the unit is dedicated to research-based innovative teaching. The annual budget of the UMR ranged from 3991 to 5197 k€ with an average of 4540 k€ per year. The contribution of the supervisory bodies to this budget is about 15% (annual average of 662 k€). Eighty percent of the budget (annual average of 3878 k€) is generated by the researchers, i.e. calls for projects). Over the 2016-2021 period, the UMR obtained 278 projects that amounted to a total amount of 31,6 millions euros. These projects came from i) national calls for projects (ADEME, ANR, CASDAR, FUI, PIA, etc. average 2133 k€ p.a.c. 55% of own resources); ii) R&D, transfer and collaboration with industries (av. 713 k€ p.a. c.18%); iii) regional calls for projects (ISITE, CPER, CR BFC, etc. av. 608 k€ p.a. c.15%) and iv) international calls for project (European projects av. 524 k€ p.a. c. 13%). While most of this income comes from national contracts, the UMR has been involved in 34 European projects (including 11 H2020 projects (1x coordination IPM-Works), 3 NTIs (ARISTO, LIST- ADADPT (in coordination) and NORA, 1 IAPP (Love-to-Hate), 1 Marie Curie 'Career Integration Grant' and participation in one ERC , 3 international (beyond EU) projects and numerous European joint calls such as Biodiversa, EraNet, JPI Water and EJP soil.

Some of the resources of the UMR are pooled for: i) the maintenance of common equipment and to support a preventative maintenance program that minimises the risk of emergency servicing, ii) the development of scientific policies via an annual internal scientific call (e.g. over the period 2016-2021, 395 k€ supported 30 scientific projects), iii) the training of students (42 Master 2 internships based on these projects), iv) the organisation of 'Monday scientific seminars'.

The UMR hosts four platforms, some of which are included in the national roadmap of research infrastructures: Genosol (AnaEE France and RARe), 4PMI (Phenome) and Genosol and the ERB (two different RARe pillars). The greenhouse-4PMI and the Genosol platforms are unique in Europe and enable the high-throughput phenotyping of plants and the genotyping of soil microbial communities, respectively. These platforms are not only open to researchers from the BFC campus, but also to national and European levels, as well as to private sector companies.

Weaknesses and risks linked to the context

Over the period from 2016-2021, the UMR lost 45 permanent staff including 32 retirements and 13 voluntary departures. This was balanced in part by an intake of 25 staff. The UMR therefore currently has a negative balance of 20 permanent staff (13 technicians and 5 engineers as well as 2 researchers and lecturer-professors). Thus, the renewal rate is 43% for technicians, 37% for engineers and 85% for researchers and lecturers-professors. The forward-looking succession plan for UMR management with regard to jobs and skills (GPEC, 'Gestion Prévisionnelle des Emplois et des Compétences') indicates that many further retirements are planned within the next contract period of the UMR.

The UMR encompassed important platforms that are of regional, national and international significance. The budget dedicated to the maintenance of these platforms and there continued development will be significant. This may pose a risk to the overall functioning of the UMR, should the overall budget decrease in the future.

*2/ The unit has set itself scientific objectives, including the forward-looking aspect of its policy.*

Strengths and possibilities linked to the context

The UMR houses a wide range of scientific expertise (e.g. agronomy, ecology, soil biology, biochemistry, physiology and ecophysiology, genetics, microbiology and modelling) that is essential to achieve its objectives. UMR research tackles different levels of scientific complexity, from the molecule to the community, and from microcosm, plot and landscape to crop cycle, rotation. The objectives of the unit are well aligned with the scientific policies of its supervisory bodies.

UMR research and development (R&D) policy are formulated by the teams, in a process that involves different levels of decision making, including the platform and team leaders (ARPPE), the scientific council and the management committee (CoDir).



## Weaknesses and risks linked to the context

The global objective of "Agroecology" that is in line with the priorities of the supervisory bodies. However, there is a general lack of specific UMR objectives for the UMR. The panel recommends that greater collaborative participation of the teams is required to generate a coherent joint UMR vision, with clear objectives. This exercise is all the more important as "Agroecology" is an extremely vast field of research, within which the UMR must define its place and its role. It is very important to consolidate efforts in the future, and realise the full excellent potential of the UMR in terms of the diagnosis of soil microbiota biodiversity on a national scale (RMQS) (Team 1) by devising practical solutions for biofertilization and biocontrol (Team 4 and Teams 2 and 3).

### *3/ The functioning of the unit complies with the regulations on human resources management, safety, the environment and the protection of scientific assets.*

## Strengths and possibilities linked to the context

The recruitment of staff follows public service procedures regarding the advertisement of positions and candidate selection, taking into account parity and gender balance, as well as including original internal mobility procedures and annual training plans that fully support the career development of the staff. The UMR minimises risk by adhering to dedicated procedures that implement and monitor staff health and safety in accordance with the guidelines of the INRAE BFC Centre (CHSCT). The unit encompasses 13 prevention assistants supervised by the engineer in charge of the prevention and is supported by the INRAE prevention management tool (OPPI) that includes 250 procedures. The radioprotection department of the unit has five radioprotection officers, the unit is supported by the protection system (DATI) and the occupational health and safety register (RSST). The UMR, together with the president of the BFC Centre and ARACT (regional association for the improvement of working conditions) conducted an original study designed to assess job satisfaction during the COVID-19 crisis and to identify avenues for improvement that have been incorporated into a dedicated action plan. The quality management cell of the UMR follows standard procedures that ensure a proper inventory of laboratory notebooks, dedicated channels for all biological, chemical and radioactive wastes, a system for monitoring temperatures and the preventive maintenance of the equipment (air conditioning and -80°C and -40°C freezers). In addition, there are specific procedures in place for handling collections of biological resources (ERB) with plant and soil quarantine samples, as well as gaining the required authorization from the DRAAF (Direction régionale de l'Alimentation, de l'Agriculture et de la Forêt) and ASN (Autorité de sûreté nucléaire) for the possession of radioelements. The UMR follows INRAE's social and environmental responsibility (RSE) policy in relation to Sustainable Development and Social Responsibility (cell of the INRAE BFC Centre to promote biodiversity at the centre, soft mobility, social interactions, low-carbon travel {train, electric vehicles}, energy performance of the buildings and facilities such as the use of an original heating network supported by a biomass boiler {wood and waste} owned by Dijon Metropole and exploited by Dijon Energy).

## Weaknesses and risks linked to the context

The main risk for the future would be the lack of human resources.

## EVALUATION AREA 2: ATTRACTIVENESS

### Assessment on the attractiveness of the unit

The attractiveness of the UMR is excellent at both the international and national/regional levels. The 4 well-equipped technological platforms (Greenhouse-4PMI, Genosol, Microscopy, ERB) facilitate a wide range of national and international collaborations that are unique in the French and European scientific communities. The platforms also offer opportunities for strong interactions between academic and industrial partners, as well as the development of new technologies that are shared with socio-economic partners. Members of the UMR are nationally and internationally recognized for their scientific expertise. They take part in national (French Academy of Agriculture, members of scientific councils) and international bodies (editors-in-chief of international journals e.g. 'Plant Science' and 'Plant, Cell and Tissue Organ', editors of international journals e.g. 'Agriculture Ecosystems & Environment' and 'ISME Journal', members of the editorial board, members of international scientific councils e.g. ZALF, Münchenberg, Germany). The competitiveness of the UMR in fundraising is excellent.

## 1/ The unit has an attractive scientific reputation and contributes to the construction of the European research area.

### Strengths and possibilities linked to the context

Over the period 2016-2021, members of the UMR have been invited to International and European conferences, as well as undertaking visits to European or national academic institutions (255 invited oral presentations: 71 for BIOmE ; 86 for GEAPSI,; 68 for GESTAD and 30 for IPM). In addition the UMR presented a total of 594 poster presentations (60 for BIOmE, 115 for GEAPSI, 86 for GESTAD and 78 for IPM). The doctoral students gave 178 oral presentations (40 for BIOmE, 32 for GEAPSI, 78 for GESTAD and 28 for IPM) with the presentation of 133 scientific posters. The UMR has been involved in the organisation of 17 international symposia, such as the first and second International symposia of the international network on Microbial Ecotoxicology (EcotoxicoMic), the 8th and 9th International Conferences on Legume Genetics and Genomics (Siofok, Hungary and Dijon), the international symposium of the European Society of Agronomy (Geneva, Switzerland) and Landscape (Berlin, Germany, 2021) the 13<sup>th</sup> International Conference on Fungal Genetics of the International Mycological Society (Paris, France). Two members of the UMR are editors-in-chief of international journals ('*Plant Science*' and '*Plant, Cell and Tissue Organ*'). Two members of the unit have been editors of international journals ('*Agriculture Ecosystems & Environment*' and '*ISME Journal*'). Eighteen members of the unit are members of the editorial boards of some thirty international scientific journals, including *Advances in Ecological Research*, *Applied and Environmental Microbiology*, *European Journal of Agronomy*, *FEMS, Microbiology Ecology*, *Frontiers in Agronomy*, *Frontiers in Plant Science*, *Journal of Plant Nutrition and Soil Science*, *New Phytologist*, *Mycorrhiza*, *Soil Biology and Biochemistry*, *Symbiosis*, *Weed Research*, among others. Several researchers (21) of the UMR are members of scientific councils of regional (Institut Agro Dijon), national (INRAE departments) and international institutions (ZALF, Münchenberg, Germany). They are also members of the T95E 'Terrestrial Ecotoxicology' commission of AFNOR (Agence Française de Normalisation). The UMR has two members of the French Academy of Agriculture. Moreover, three members were given the award of 'Chevalier' by the French government for their scientific and managerial work, and two researchers received the 'Lauriers de l'INRAE. Several young researchers from have received awards for their thesis work. In addition a member of the UMR has been ranked for several years in a row among the 6 000 most influential researchers in the world in recent years, according to Clarivate analytics' Highly Cited Researchers.

### Weaknesses and risks linked to the context

The UMR is a very active member of European science community. This success is demonstrated by the organization of several European conferences, numerous invited oral communications and several projects financed by the European Union. However, there is some disparity between the teams regarding these activities and European representation. For example, of the UMR's 35 European projects, 19 concern BIOME, 7 GEAPSI, 6 GESTAD and 3 IPM. In addition, only 6 out of 35 projects were coordinated by UMR teams.

## 2/ The unit is attractive for the quality of its staff hosting policy.

### Strengths and possibilities linked to the context

The UMR has a critical mass of researchers that cover a wide range of scientific expertise, skills and scientific approaches. It has a number of permanent positions and senior visitors. It is therefore attractive to researchers from different disciplines. The UMR is involved in the Sustainable Development and Social Responsibility cell of the INRAE BFC Centre, which promotes biodiversity, soft mobility and social interactions between agents within a shared permaculture garden and a recycling centre. The UMR contributed to the implementation of zero-phyto (zero pesticides) agronomic practices, reduction of ploughing and promotion of biodiversity within the INRAE experimental farm at Bretenière.

### Weaknesses and risks linked to the context

The UMR has a significant staff size and international scientific production. However, the International attractiveness of the UMR is limited in terms of the number of permanent positions availability and the possibility to incorporate senior visitors. The UMR welcomed relatively few invited foreign researchers during the evaluation period. Two international scientists from the UK and two renowned visiting scientists were recruited during the evaluation period. The PhD completion rate could be improved. In total, 56 out of 100 PhD students defended their theses in the evaluation period.

### *3/ The unit is attractive because of the recognition gained through its success in competitive calls for projects.*

#### Strengths and possibilities linked to the context

Thanks to the multiplicity of public donors (regional, national and international) from which the UMR has succeeded in obtaining a range of funding, as well as the numerous industrial contracts, the UMR has been able to ensure the establishment and operation of high-technologies platforms, some of which are unique in France (GENOSOL, 4PMI). The UMR has ensured the conservation of valuable collections of plant and microbial resources that are unique in Europe. These technological and biological resources give the UMR a special significance in the French and international academic landscapes. They greatly contribute to the overall attractiveness of the UMR to French and foreign researchers, as well as to graduate students. The platforms also form the basis for a wide range of academic and industrial collaborations and they represent an important asset in terms of responding to funding calls.

#### Weaknesses and risks linked to the context

A significant portion of this funding is devoted to the functioning of the UMR's platforms and equipment, which are extremely expensive. A significant increase of the cost of these platforms and equipment is likely to occur over the next few years (e.g. increasing energy cost in the greenhouses). This represents a serious risk, as it may place an excessive load on the overall budget of the unit.

### *4/ The unit is attractive for the quality of its major equipment and technological skills.*

#### Strengths and possibilities linked to the context

The UMR members benefit from the proximity of the 3 well-equipped technological platforms that they have developed and maintain for use in their own research as well as offering to national and European scientific communities via EMPHASIS, RARe or ANAee-France. The Greenhouse-4PMI facility is an unique high throughput plant phenotyping platform that allows the characterization of both root and shoot development under controlled conditions with sufficient resolution that allows the analysis of root interactions with soil microorganisms. Genosol allows the characterization of the abundance and diversity of soil microorganisms via the use of molecular techniques. Both platforms are inscribed on the national road maps of research infrastructures. The importance of these platforms has been documented in papers published in international journals and by presentations at international conferences. The microscopy platform is integrated at an interregional level. The partnerships surrounding the platforms incorporates both academic and industrial researchers, from the regional level to the international level. The strong interactions between the academic and industrial partners facilitates innovation that extends far beyond the initial expectations from the UMR members. In particular, 4PMI and Genosol have been key stepping stones for the development of new technologies that are shared with the socio-economic world through declarations of invention and patents. The potential of the 3 platforms is extremely high. In addition to its 3 platforms, the unit has i) a Biological Resources Center that conserves and characterizes microorganisms and plants that are used for the unit projects (with all the collections centralised and characterised for distribution purposes) and ii) a field phenotyping platform, Casys, which is an extremely attractive platform for agroecological analyses in the field.

#### Weaknesses and risks linked to the context

The number of possible retirements in the near future (i.e. during the next contract) with the subsequent loss of technical skills related to the management and the functioning of the platforms is a potential weakness. Difficulties may arise in finding the required human resources with adequate profiles. The potential challenge in recruitment for fill these positions constitutes a serious risk. The renewal rate must be increased as the retiring members of technicians and engineers are to be replaced in order to maintain the staffing levels of the current contract 2016-2021 (43% for technicians and 37% for engineers). While the 4PMI platform has 12 permanent staff, the other 3 platforms (Genosol, microscopy and the biological resources complex) have only a handful of permanent staff members each (4 for DimaCell, 2 for ERB and 3 for Genosol). As noted in the Self-assessment document, the maintenance, updating and upgrading of the platforms is a potential risk, particularly if the provision of state-of-the-art equipment cannot be maintained. The sustainability of the different platforms may have a significant impact on the overall budget of the Agroécologie UMR, due to the rapid obsolescence of some of the instruments used in the different technologies.

## EVALUATION AREA 3: SCIENTIFIC PRODUCTION

### Assessment on the scientific production of the unit

The overall scientific production of the UMR is excellent. The number of articles per researcher is generally excellent being around 2 articles per researcher, per year, although there is some variation between the teams. The quality and originality of the outputs of the unit is excellent, with publications in very good, specialized journals. However, there are still relatively few publications in more generic journals with a very high ranking. The UMR has implemented a culture of high ethical standards and scientific integrity that forms the basis for all its research activities. The current policies of the UMR concerning open access and open science are excellent.

#### *1/ The scientific production of the team meets quality criteria.*

##### Strengths and possibilities linked to the context

UMR researchers published 807 scientific papers over the period from 2016 to 2021 in international peer-reviewed scientific journals (256 different scientific journals). More than three quarters of the scientific paper were published in high ranking journals focussed on *Plant Sciences*, *Environmental Sciences*, *Microbiology*, *Agronomy and Ecology*. In many cases UMR researchers were either with first or last authors on these publications. Noteworthy examples include *Nature Plants*, *Nature Sustainability*, *PNAS*, *Trends Ecol Evol.*, *Trends Plant Sci.*, *Sci. Adv.*, *Sci Signal.*, *ISME J*, *Glob. Change Biol.* and *Microbiome*. The level of productivity corresponds to 1.86 articles per full-time equivalent researcher (72 FTE comprising 41 researchers 44 lecturers-professors and 6 research engineers).

##### Weaknesses and risks linked to the context

There are some disparities between teams in terms of the number of publications per year and number of publications per FTE, as well as in the quality of the targeted journals.

#### *2/ Scientific production is proportionate to the research potential of the unit and shared out between its personnel.*

##### Strengths and possibilities linked to the context

The production of the unit is very good to excellent, with an average of about two publications in peer reviewed Journals per full-time equivalent researcher. The publication policy of the UMR is a considerable strength. Moreover, the timely and topical nature of the themes and the success of teams in research has facilitated publications in highly ranked journals and in some exceptional ones (e.g. *Nature*, *Ecology letters*, *PNAS*). The UMR has a highly developed network with foreign partners, providing excellent opportunities for the development of co-operative research programs with excellence organisations in different research domains. The high rate of co-publication with foreign partners (co-publications with researchers from 89 countries) is impressive and indicates success collaborations within the international networks, leading to excellent international recognition.

##### Weaknesses and risks linked to the context

As a result of retirements and voluntary departures that exceeded recruitments, the workforce of the UMR decreased slightly (-20 personnel, mainly technicians). A major wave of retirements is expected during the next contract. If a renewal of technical personnel is not achieved, the success of future projects could be threatened leading to a decrease in scientific production. This problem could effect some teams more than others.

### 3/ *The scientific production of the unit complies with the principles of research integrity, ethics and open science.*

#### Strengths and possibilities linked to the context

The UMR has fostered a culture of integrity and respect among staff that ensures scientific integrity. The rigorous nature of the UMR research culture involves: i) a formal system for monitoring scientific integrity including a system for reporting and handling breaches in scientific integrity, ii) hosting delegates in the deontology, scientific integrity and ethics of research projects of INRAE's general management. It is one of the scientific integrity contact points for Institut Agro Dijon and iii) communication with the different governing bodies. The UMR has appointed four staff members as 'data referents' to enable scientists to meet open science objectives following FAIR principles. Researchers publish in open access journals (GOLD) and deposit pre-prints in open access repositories (e.g. bioRxiv and sequence datasets in GenBank, EMBL and INRAE data portals). Moreover the budget of the UMR includes fees dedicated to open access.

#### Weaknesses and risks linked to the context

The UMR has a set of traceability protocols that support research integrity and reproducibility. Although the protocols are well-designed and appear to be effective, they can be onerous because of their complexity and difficult to sustain. For example, policies related to the archiving of notebooks and long term data storage. Little information is available concerning if and when intermediate notebooks and data can be deleted. Current policies for open access and open science largely cover aspects related to scientific publication strategies that support gold open access and open access archives when gold open access is not possible, as well as data management for example storage in public repositories such as GenBank or EMBL. However, little information is available concerning the software and analysis tools that allow the UMR to manage and shares data with the community. In most cases, R and Python programming languages are used, as stated in the SAD, but the produced codes constitute research products that must be managed appropriately and shared to fully comply with current requirements related to reproducible research and open science.

## EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

### Assessment on the inclusion of the unit's research in society

The UMR has an excellent record of achievement in the domain of the non-academic interactions. The UMR collaborates with more than 30 private companies, in programs that provide considerable funding from the non-academic partners. The UMR has organized several events for professionals. Technicians, PhD students and researchers participate in interactions with the general public (communication through different media, reception of young students from secondary schools etc). The UMR has a strong interface with society and is intensely solicited with regard to its skills, knowledge and technical expertise. The communication with stakeholders and the general public is excellent, as are the links with private companies.

### 1/ *The unit stands out by the quality of its non-academic interactions.*

#### Strengths and possibilities linked to the context

The expectations of partners (private companies, producers' associations, technical institutes, public authorities, etc.) are very high because UMR research addresses crucial questions in agroecology (e.g soil microbes, legumes genetics, non-chemical control of weeds, etc). The UMR maintains an excellent image with its partners and makes great efforts to meet expectations, adding considerable strength to the unit. The dynamic interface of the UMR with stakeholders provides numerous opportunities for developing non-academic interactions. The UMR shows a real willingness to develop strong and viable links with the socio-economic world. For example, it has recruited staff dedicated to the development of these relationships.

#### Weaknesses and risks linked to the context

The presentation of the report suggests that unit has no global strategy regarding "non-academic" partnerships. Similarly, there appears to be no general strategy regarding public/private partnerships at the team level since only few projects, patents, partnerships are listed. Some teams (Biome, IPM) have a large number of projects/contracts with different companies and stakeholders but no overarching strategy for the development

of these activities is presented. The panel expected that some decision-making rules were in place at the UMR and team levels to avoid potential problems, but this information was not available.

## *2/ The unit develops products for the socio-economic world.*

### Strengths and possibilities linked to the context

The four teams have developed significant opportunities for interactions with the socio-economic world. The research goals of the 4 teams address crucial questions in agroecology and technology transfer, such as the design and testing of innovative agroecological cropping systems that are climate resilient and less dependent on chemical inputs, while preserving the quality of soils and of crops. These topics have facilitated strong interactions with non-academic partners including private companies, producer associations, technical institutes and public authorities. These interactions have accelerated the development of new products. The UMR has demonstrated considerable strength in combining multi-actor and transdisciplinary approaches to increase the impact of its research and co-developing practical solutions, as well as producing decision-support tools for sustainable agriculture and participation in political decisions. Results are directly transferred to the socio-economic world by the activities of the multi-actor projects, such as interactive events with industrial and/or agricultural sectors, publications and webinars involving industry professionals, the shared expertise in agencies such as ANSES or CTPS and through the production of expert reports. Patents and /or invention statements have been produced by some of the teams.

**BIOME** has 2 patents and 11 invention statements (among those, 6 have been withdrawn). Two start-ups have been created by team members. Novasol (2020, 3 persons) offers innovative solutions for the evaluation of the ecological quality of soils. EpiLAB (2020, 7 persons) commercialize a portable tuberculosis screening test. The team has also developed standards (AFNOR and ISO 11063:2012 standards) and is present in standardization bodies of AFNOR (Agence Française pour la Normalisation) and ISO (International Standard Organization).

**GEAPSI** has 3 patents related to the plant phenotyping (Salon et al, 2018) and imaging (Cointault, 2016 & 2016) facilities. RHIZO and Rhizotube are registered trademarks, with an international distribution to industrial companies and academic institutions (Salon et al., 2017). It also has 2 declarations of invention for the development of pea lines lacking saponins in mature seeds (Thompson, Vernoud, 2018) and a method for accreditation of Genotype X Environment interactions in field trials (Lecomte, 2018).

**GESTAD** has two declarations of invention for tools that help to reduce pesticide use in various cropping systems (combining analyses and modelisation, Colbach, 2019 & 2020). It also has one patent for a method controlling a centrifugal particle spreader (Villette, 2021).

**IPM** has 3 patents and 10 invention statements that include new solutions (molecular tools, bioassays, or molecules) for plant defence against pathogens. The team developed a method for quantifying low density of inoculum of a pea root pathogen that can be used by agricultural service laboratories for preventive diagnosis. Taken together, these achievements of the 4 teams demonstrate successful interactions with the socio-economic world.

### Weaknesses and risks linked to the context

The proportion of human resources that are specifically dedicated to research valuation is low (estimated at only 6%), compared to the important number of R&D projects obtained by the UMR. The socio-economic valuation of research production is essentially driven by team-specific activities. There appear to be few inter-team or for global valuation activities, for example there are no inter team valuations of the 40 patent-licences, or of inter-team contracts for industrial research although there are 81 contracts. Similarly, there is little research valuation with regard the interactions that involve inter-team scientific expertise (24 out of 127; mainly for team 2 and 3) or the 6 inter-team activities with professional organisations (total 239).

## *3/ The unit shares its knowledge with the general public and takes part in debates in society.*

### Strengths and possibilities linked to the context

The teams are actively engaged in social debate through dissemination and public outreach activities. Team members regularly participate in such activities, and also organize public events and exhibitions (Salon International de l'Agriculture, Festival of Nature and Biodiversity (VIVO), Fête de la science, Journées Portes Ouvertes ...). They communicate research findings using traditional routes (oral communications, large audience magazine articles) as well as digital media (press, TV and radio broadcasts, Youtube, twitter, etc.). They also organize various activities for young people (schoolchildren, college students, high school students...).

#### *BIOmE*

BIOmE researchers regularly engage in dissemination and public outreach activities ('Salon International de l'Agriculture, SIA', the night of researchers, the night of agro-ecology, the Festival of Nature and Biodiversity

(VIVO), Nature Incognito, la face cachée des villes) or co-organizer (symposium on the "Microbiology of French soils" at the 'Grande Galerie de l'Évolution' in the Paris Natural History Museum, or the scientific symposium on "soil ecology engineering for a sustainable society". BIOMÉ disseminates its research findings and communicates on traditional (more than 20 communications) digital media (press, TV and radio broadcasts, twitter, etc.). Permanent staff and PhD students are involved in these activities.

#### GEAPSI

The team attends the 'Salon International de l'Agriculture, SIA'. GEAPSI has provided material and participated in several exhibitions such as "Elles sont parmi nous, Graines : découvrez leur vraie nature" (Jardin des Sciences-Muséum d'Histoire), "Fabuleuses légumineuses" (Bibliothèque Universitaire, Dijon). Team members engage in media activities and are active on the Internet and on social networks. They organize awareness-raising activities for young people (schoolchildren, college students, high school students

#### GESTAD

GESTAD has contributed to media broadcasts (TV, radio and press interviews) and communicates through social media (e.g. Youtube) and to Science-Society debates. Team members have published magazine articles, book chapters, syntheses, and specialist journal articles (Innovations Agronomiques). The recruitment of a social scientist (DR) has strengthened the global impact of the GESTAD team.

#### IPM

IPM regularly participates in communication events for the general public (40 events). About forty interactions with society were listed (e.g. "Fungi under the microscope of forensic methods". Spore Festival; Workshop "mycorrhiza" in the stand "La ferme Côte d'Or" Dijon gastronomic fair; "Vine decline and stimulation of its innate immunity" - debates science and society). PhD students regularly participate in these actions (e.g. Experimentarium, participation in Salon de l'Agriculture, Salon Jardin-Jardin in Paris, Fête de la science, Journées Portes Ouvertes). The team members are also active in regional and national audiovisual and written media activities (2 TV, 3 radio, 15 press articles). Team members are active on the internet and on social networks. IPM researchers participate in and organize awareness-raising activities for young people.

### Weaknesses and risks linked to the context

No significant weaknesses were identified. The lack of a common and well-defined vision for the UMR in the field of agroecology may jeopardize future communication within the unit and also towards the general public and well as the perception of stakeholders. The absence of a well defined global strategy may ultimately undermine the networking capacity and overall attractiveness of the unit.

## C – RECOMMENDATIONS TO THE UNIT

### *Recommendations regarding the Evaluation Area 1: Profile, Resources and Organisation of the Unit*

The panel considers that there are excellent opportunities to reinforce the interactions between the teams and the groups within the teams. An increase in synergy may open new opportunities for collaborations and optimise human resources allowing an improved exploitation of knowledge, expertise, facilities and tools. The panel encourages the unit to build a stronger strategic scientific project at the level of the UMR. The more precise positioning of the UMR, provided by a unified strategy, within the recognized frameworks of agroecology will allow better orientation of the teams and enhance opportunities for collaboration between the teams. The strategy should reinforce or initiate scientific questions, as well as improving the development of methods, tools, models and expertise around the common plant species investigated.

The panel recommends that mechanistic research questions could be better defined in terms of the key challenges identified at the scale of cropping systems. This would increase the capacity of the UMR for technology transfer.

The UMR should anticipate a possible erosion of technical skills. Some re-organization and better definition of the core skills within the teams and platforms may be required in line with scientific perspectives. Practices regarding human resources must be more homogenous between the teams.

The panel suggests setting up a new economic model for the experimental platforms in order to ensure their autonomous long-term functioning.

### *Recommendations regarding the Evaluation Area 2: Attractiveness*

The UMR could further improve its visibility and reputation by publishing more complete studies, with more generic results published in journals with larger audiences. This goal might be achieved by welcoming more postdocs and visiting researchers into the unit.

### *Recommendations regarding Evaluation Area 3: Scientific Production*

The UMR could seek to publish more articles in journals with a large audience. Better collaborations between the teams is also recommended in order to broaden research opportunities and interdisciplinary approaches to corroborate data and findings. Inter-teams collaborations may also resolve disparities in the scientific production of the teams.

### *Recommendations regarding Evaluation Area 4: Contribution of Research Activities to Society*

The links with the different partners tends to be both short-lived, as noted in the self-evaluation report. An improved strategy for attracting and retaining companies and other organizations is required to create long term and sustainable links with a wide range of partners.



## TEAM-BY-TEAM ASSESSMENT

**Team 1:** BIOmE (Biology and Ecosystem Ecosystem Functions of Soils)  
 Name of the supervisor: Mr Laurent Philippot

### THEMES OF THE TEAM

This team works on soil microbiology. The main objective is to understand the links between soil biodiversity with a particular focus on microorganisms involved in the nitrogen cycle and biotic interactions, particularly with regard to the provision of ecosystem functions and services. The team implements state-of-the-art methods for the analysis of soil microbial DNA (GENOSOL platform). The functional ecology approaches used in these studies take the spatial distribution of microorganism communities into account. The team also studies the impact of agricultural activities on microbiological functions in soils, particularly disturbance ecology. Finally, the team develops ecological engineering approaches to promote the beneficial actions of microorganisms on soil functions and develop indicators of improved soil biological activity.

### CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous BIOmE evaluation recommended changes that were designed to address two key scientific challenges: i) to take into consideration the soil microbial processes and functions in the design of innovative cropping systems, and ii) to study the spread and fate of soil pathogens, particularly with regard to the determinants of antibiotic resistance.

To address the first point, BIOmE developed several projects in the field of ecological engineering. For example, methods for the inoculation of soils with beneficial microorganisms were developed, as were pertinent indicators of soil biological activity.

To address the second recommendation, BIOmE coordinated the ANR project called "ANTIBIOTOX - Fate of antibiotics and associated resistance genes in agroecosystems: ecotoxicological risk for functional microbial communities of receiving river systems". Therefore, the team has fully considered the recommendations of the previous evaluation.

### WORKFORCE OF THE TEAM

|  |           |
|--|-----------|
| <b>Permanent personnel in active employment</b>  |           |
| Professors and associate professors  | 3         |
| Lecturer and associate lecturer  | 9         |
| Senior scientist (Directeur de recherche, DR) and associate                                    | 5         |
| Scientist (Chargé de recherche, CR) and associate  | 3         |
| Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées) | 0         |
| Research supporting personnel (PAR)  | 18        |
| <b>Subtotal permanent personnel in active employment</b>                                       | <b>38</b> |
| Non-permanent teacher-researchers, researchers and associates                                  | 0         |
| Non-permanent research supporting personnel (PAR)  | 11        |
| Post-docs  | 12        |
| PhD Students   | 15        |
| <b>Subtotal non-permanent personnel</b>  | <b>38</b> |

|              |           |
|--------------|-----------|
| <b>Total</b> | <b>76</b> |
|--------------|-----------|

## EVALUATION

### Overall assessment of the team

**BIOmE is an excellent team with some outstanding achievements. The scientific production of the team is excellent to outstanding. Success in grant applications, contributions to society and the overall attractiveness of the team are also excellent.**

### Strengths and possibilities linked to the context

#### Strengths related to success in obtaining grants

BIOmE has been very successful in obtaining funding. The team has been awarded more than one hundred grants, of which 54% are coordinated by team members. Of these, 18 European projects including 3 as co-ordinator (Diggigng Dipper on Agrosystem diversification, *Listeria*/antibiotics, Marie-Curie grant), 39 national projects. Of the team acted as co-ordinator of 17 projects (including 3 ANR projects) and 44 regional projects (35 coordinated by the team). The total budget obtained through these grants for the period 2026-2021 was 9 M€.

#### Strengths related to scientific production

The publications of the BIoME team address the following topics: i) understanding the role of soil biodiversity and biotic interactions in supporting soil functions and services, ii) evaluation and monitoring of the impact of agricultural practices on microbial community diversity and biotic interactions in relation to the services provided by agro-ecosystems, and iii) the development of ecological engineering approaches to promote soil ecosystem functions and provide bioindicators of performance and sustainability of agro-ecosystems.

The BIoME team published 237 publications, 2.29 papers/FTER.year, in high ranking journals: *Microbiome*, *Science Advance*. Eight papers are highly cited: Moreau et al. 2019 *Funct. Ecol.* (nitrogen cycling), Djemiel et al. 2022 *Gigasciences* (soil microbiota), Hallin et al. 2018 *Trends Microbiol* (nitrogen cycling). The average publications for PhD students is 3.3, while that of post-doctoral fellows is of 4.6.

The team has also published two new AFNOR and ISO standards, two patents and 33 methodological or standardization-related articles.

#### Strengths related to contributions to the society

The team has established important links with the non-academic world. As a result, a number of remarkable successes have been achieved. Projects have been developed and financed with more than 20 companies (large groups and also start-ups) at the local, national and European levels. Important links have been established (30 projects over the period covered by this evaluation) with several organizations (French Agency for Biodiversity, Burgundy wine interprofession, ADEME etc). Two start-ups have been founded to exploit licenses resulting from the team's research. The dissemination of team results is excellent. This includes articles published in appropriate journals (23 papers published during the six-year period), the organization of events for professionals in the agricultural sector and regular updates for stakeholders on the progress of projects.

### Weaknesses and risks linked to the context

#### Weaknesses concerning grant applications

There are no significant weaknesses nor risks regarding grant funding. The team is highly successful in obtaining funding. This team works on very attractive themes (for the different partners) and there is therefore little risk that this will change.

#### Weaknesses concerning scientific production

The scientific production of the team relies mainly on three historical themes. There is no specific strategy leading to the emergence of innovative themes.

#### Weaknesses concerning contributions to the society

The rich and diverse set of collaborations of the BIoME research team with non-academic and socio-economic actors is a major asset. However, it can also lead to fragmentation of research effort and dissipate the energy of team members. The team has collaborations with national and international companies, several public policies actors (i.e. ADEME, AFB, Chambres d'agriculture) and international NGOs, in a total of 30 projects with non-academic partners. On one hand, this large number of diverse collaborators highlights the attractiveness

of the BIOME team. On the other hand, these data suggest that collaborations are mainly based on a varying set of partners. Hence, each collaboration requires time and effort to establish and build a project consortium. A more general strategy is required that serves to consolidate stable and long-lasting partnerships with non-academic actors involving recurrent funding.

## RECOMMENDATIONS TO THE TEAM

Recommendations concerning success to grant applications.

The team should consider the development of i) scientific collaborations (and associated papers) with the other teams in the Unit and ii) a partnership policy that serves avoid dissipation of effort. The team should concentrate on large-scale project applications and tenders.

The team should avoid duplication of effort regarding partnerships and maximise skills and competences in longer term projects. The team should also target larger scale projects (EU) on central themes, in relation to the objectives of the team and the unit.

Recommendations concerning scientific production.

The team should endeavour to publish more papers in collaboration with the other teams in the Unit and focus on well-respected journals.

Recommendations concerning contribution to society.

The links with different partners remain short-lived. Many appear to be instigated by companies or organizations that solicit the unit. A pro-active policy is required to identify potential partners. A "partnership policy" may also help to create more permanent links with partners.

**Team 2:** GEAPSI (Genetic and Environmental Determinants of Plant Adaptation to Innovative Cropping Systems)

Name of the supervisor: Ms Judith Burstin

## THEMES OF THE TEAM

The GEAPSI team studies the genetic and environmental determinants of plant adaptation to innovative culture systems. The multidisciplinary team of scientists covers disciplines spanning ecophysiology, genomics, genetics, molecular biology and phenotyping. There is a particular focus on the adaptation of legumes to environmental constraints and also plant interactions with soil microorganisms.

The GEAPSI team conducts a multidisciplinary research program spanning 'from the cell to the field' in emerging issues concerning the genetics, genomics and ecophysiology of grain legumes in the context of climate change, agro-ecological and food production. Team research has four objectives devoted to understanding grain legume functions, particularly the nodulated root system, seed size and nutritional quality and the exploitation of legume genetic resources for pre-breeding.

GEAPSI has developed cutting-edge projects designed to investigate the impact of multiple stresses (winter or late frost, water stress) on plant functions, including the interactions between plants and non-symbiotic soil microorganisms. The aim is to maintain key traits (production and quality, protein composition and associated quality and health values) in a changing environment and in different cropping systems. GEAPSI participates in the characterization and exploitation (at a wide scale) of genetic diversity in collections. The team participates in and coordinates seminal initiatives, such as the international pea genome sequencing project. GEAPSI activities benefit from unique resources including the legume genetic resources center and the high-throughput root phenotyping platform (RhizoTubes and RhizoCabs).

GEAPSI has developed strong public-private collaborations and interactions with the socio-economic sector (Terres Inovia, Roullier Group Limagrain, Biogemma, RAGT etc) in the frame of ambitious projects at the regional (Burgundy-Franche-Comté) and national (PIA PeaMUST, FIU, ANR...) levels.

## CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous evaluation recommended that priorities should be defined regarding the mechanisms and processes studied. This recommendation has not been fully addressed since the last report. Despite its small size in terms of number of researchers and lecturers (12 in total), the team still studies a large range of plant traits and mechanisms in response to diverse biotic and abiotic constraints.

However the following 3 recommendations of the previous report have been addressed:

- (1) GEAPSI has reinforced its activities in inter-disciplinary projects within the team (collaborations have strengthened links between the 3 groups of GEAPSI as shown by co-authored publications and PhD co-supervision)
- (2) GEAPSI has also reinforced its links with the 3 other teams in the unit, BIOME, IPM and GESTAD thereby reinforcing the agroecology component in its projects (by collaborative projects).
- (3) GEAPSI has developed new pea genomic resources. Most studies are now focussed on this species, which has agronomic interest. The model plant *Medicago trunculata* is now only used for functional validation.

It was previously recommended that GEAPSI increase its attractiveness and train more PhD students. The panel noted that the team now has 2 new HDR. However, 3 HDR left the team since the last report. Regardless, the number of PhD students is still low (15) over the whole evaluated period, compared to the number of HDR within the team (9). The PhD/HDR ratio could be improved.

GEAPSI had been asked to improve its publication strategy. However, the publication strategy was not described.

## WORKFORCE OF THE TEAM

| Permanent personnel in active employment |   |
|--|---|
| Professors and associate professors      | 0 |
| Lecturer and associate lecturer          | 3 |

|  |           |
|--|-----------|
| Senior scientist (Directeur de recherche, DR) and associate                                    | 5         |
| Scientist (Chargé de recherche, CR) and associate  | 5         |
| Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées) | 0         |
| Research supporting personnel (PAR)  | 28        |
| <b>Subtotal permanent personnel in active employment</b>                                       | <b>41</b> |
| Non-permanent teacher-researchers, researchers and associates                                  | 0         |
| Non-permanent research supporting personnel (PAR)  | 4         |
| Post-docs  | 1         |
| PhD Students   | 3         |
| <b>Subtotal non-permanent personnel</b>  | <b>8</b>  |
| <b>Total</b>   | <b>49</b> |

## EVALUATION

### Overall assessment of the team

**GEAPSI is an excellent team with excellent integration of interdisciplinary fundamental and applied research dedicated to agroecology. The scientific outputs of GEAPSI are very good with some outstanding elements. The national and international recognition of the team is excellent. The team makes an excellent contribution to society including outreach activities and interactions with socio-economic stakeholders.**

### Strengths and possibilities linked to the context

#### Strengths regarding grant funding

The GEAPSI team has an excellent level in grant funding. Overall the team participated in 43 projects from various funding sources: 7 from EU, 11 from national grants (ANR, Casdar...) and 19 from local and regional communities (FUI, PSDR). The team has been particularly active in PIA calls (especially with the coordination of PeaMUST). It is noteworthy that the team has coordinated 24 on the 43 projects. This highlights the leadership capacity of the team at both the national and international levels. In addition, GEAPSI participated in 20 industrial R&D contracts. Of these, 8 are linked to genetic and breeding in collaboration with private seed companies and technical institutes.

#### Strengths concerning scientific production

The production of the GEAPSI team is very good to excellent. The team published 120 publications, 1,59 papers/FTER.year, in high-ranking journals: *Nature Genetics* (pea genome), *Plant Cell Environment* (Legume microbiota). One paper is highly cited: Kreplak et al., 2019). Most papers are published in peer-reviewed journals (111) with high reputation. There are also several review articles (8). The team also publishes articles in professional or technical journals (48). The team has achieved an appropriate balance between co-authorship and leadership (as first, last and corresponding authors), as well as between academic and private (stakeholders) collaborators. The scientific production illustrates the international leaderships of the GEAPSI team in the genetics, genomics, phenotyping and ecophysiology of grain legumes. The team also disseminates its results within the framework of public-private projects. Geapsi members regularly present their results at national and international conferences, workshops and events with stakeholders.

#### Strengths concerning contributions to the society

The GEAPSI team participated to broad audience events either locally at the "Museum d'Histoire Naturelle" and the "Bibliothèque Universitaire de Dijon", but also nationally at "Salon International de l'Agriculture" in Paris and various other events. The team communicates on social medias on three main topics: the pea genome, legumes for plant proteins and high-throughput phenotyping. The high throughput phenotyping facility "4PMI" developed by team staff plays an important role in terms of unit's visibility. It has allowed the development of new methods and tools to characterize a variety of shoot and root traits, and this has led to two licensed

products (Rhizotubes and RhizoCabs) for a wide range of clients worldwide representing national and international companies and academic institutions.

## Weaknesses and risks linked to the context

### Weaknesses concerning grant applications

The team has been successful in obtaining grants but needs to maintain this high level of success. The table listing the research projects shows that only six will carry on from 2023 and only two after 2024. In addition, there are no EU projects planned for the next term. The team must refocus its efforts on grant applications.

### Weaknesses concerning scientific production

The scientific production of the team is very good to excellent, with some outstanding elements. Given the excellent reputation of the team within the international community, GEAPSI should be able to maintain a strong publication record in high-cited journals, as well as journals with a large audience such as *Trends*, *Annual Review*, or *New Phytologist*.

### Weaknesses concerning contributions to the society

This team makes an important contribution to agroindustry and to society. There are no particular weaknesses to be noted in this area.

## RECOMMENDATIONS TO THE TEAM

### Recommendations concerning success in grant funding

The team is well positioned to take the lead in international consortia. It could be further involved in the coordination of EU projects, particularly those focussed on the team's flagship topics while also remaining active on national projects. It could also be proactive in seeking ERC funding. The ratio between PhD students or post docs and permanent staffs is low despite the large number of contracts and grants obtained. GEAPSI could therefore increase the number of PhD students or post docs.

### Recommendations concerning scientific production

The team should continue its excellent record of publication by targeting journals with greater visibility.

### Recommendations concerning contributions to society

The team has the potential to maintain its world-leading position in legume research and microbiome interactions. This strength could be used further to disseminate information to the general public.

**Team 3:** GESTAD (Sustainable Weed Management)

Name of the supervisor: Mr Adam Vanbergen

## THEMES OF THE TEAM

The GESTAD team combines a high level of expertise in ecology, weed biology and genetics, entomology, agronomy, social sciences and landscape ecology. The research of the team seeks to understand weed biology and to sustainably manage weeds. The aim is to limit negative aspects and maximise positive interactions with other organisms in relation to ecosystem services. Team activities cover three main aspects: i) the evaluation, adaptation and structure of weed populations/communities and their effects of cropping systems and their organisation in landscapes; ii) gain new knowledge concerning interactions between weeds and other organisms in the agroecosystem and iii) co-develop and evaluate innovative agricultural systems for sustainable agriculture and understand the obstacles to successful implementation.

## CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

One scientific recommendation was made in the previous evaluation report regarding the continued focus on ecology and consideration of higher trophic levels for trait approaches and services in the design of sustainable systems. The team has developed crop systems activity to address this point.

GESTAD has published 19 ISI publications (including 2 'highly cited' WoS papers in *PNAS* and *Functional Ecology*) on natural biocontrol, 7 publications addressing ecological network, 9 publications on weed traits, and 9 on pollinators. Moreover, GESTAD has coordinated projects focusing on i) natural biocontrol (H2020 IPMWorks; FACCE C-IPM BioAWARE; AFB PREPARE), ii) pollinators (H2020 Safeguard; Biodiversa VOODOO), and on multi-trophic and trait-based interactions focused on weeds (Region ESREA).

Two recommendations were made concerning the contribution of the team to the functioning of the Unit (transverse workshop, connections with other team, communication). The team now plays a more integrative role at the unit level.

## WORKFORCE OF THE TEAM

|  |           |
|--|-----------|
| <b>Permanent personnel in active employment</b>  |           |
| Professors and associate professors  | 3         |
| Lecturer and associate lecturer  | 9         |
| Senior scientist (Directeur de recherche, DR) and associate                                    | 7         |
| Scientist (Chargé de recherche, CR) and associate  | 7         |
| Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées) | 0         |
| Research supporting personnel (PAR)  | 16        |
| <b>Subtotal permanent personnel in active employment</b>                                       | <b>42</b> |
| Non-permanent teacher-researchers, researchers and associates                                  | 0         |
| Non-permanent research supporting personnel (PAR)  | 11        |
| Post-docs  | 6         |
| PhD Students   | 13        |
| <b>Subtotal non-permanent personnel</b>  | <b>30</b> |
| <b>Total</b>   | <b>72</b> |

## EVALUATION

### Overall assessment of the team

**GESTAD is an excellent team that uses a diverse range of scientific approaches. The scientific production of GESTAD is excellent. The external recognition of the team is very good to excellent. The contribution of the team to society is excellent. Team research has a strong impact on the professional world.**

### Strengths and possibilities linked to the context

#### Strengths regarding grant funding

The team is successful in obtaining funding of various types. It has an excellent record with several AFB, H2020 and Biodiversa projects coordinated or led during the period under evaluation.

The main strength of the team resides in the original nature of the themes addressed.

#### Strengths concerning scientific production

GESTAD publishes studies addressing the sustainable management of weeds, with a particular focus on agro-ecosystem innovation. The team has published 249 peer reviewed publications with an average citation rate of 16.23 per article. Some of these articles have appeared in well-respected multi-disciplinary journals such as *Springer Nature Plants*, *Springer Nature Sustainability* and *PNAS*. There are some highly cited papers (Lechenet et al. 2017), (Adeux et al. 2019), (Le Corre et al. 2020), (Bohan et al. 2016). Of the 249 articles, 51% were published as full open-access papers

GESTAD has published 20.62 articles/FTE with an annual rate of 2.19 per FTE. PhD students and Post-doctoral researchers have contributed to this record with 61 and 36 articles, respectively. The GESTAD team has an excellent record of joint publication with collaborators, with 117 articles produced with 67 foreign countries. The GESTAD team collaborated with 314 foreign research organisations.

#### Strengths concerning contributions to the society

The team has had a strong impact on the professional world. The members of the team are also frequently solicited regarding their expertise by public authorities. The research topic of the team is extremely attractive to many actors working in biocontrol, crop system modelling, and alternatives to herbicide weed control, GHG emissions, etc. The team has also established strong links with industry and is involved in national (ecophyto) and European (IPM demonstration network reaching more than 10 000 farmers) networks. The CA-SYS experimental platform is an excellent tool for participatory experimentation on innovative cropping systems.

### Weaknesses and risks linked to the context

#### Weaknesses concerning success to grant applications

There is neither significant weakness nor risk.

The team is very successful in this field and the committee does not really see any short-term risk regarding this aspect. This team works on very attractive themes.

Nevertheless, concerning the success in national calls, one member of the team alone has obtained almost one third of the projects funding.

#### Weaknesses concerning scientific production of the team

The main risk is a potential loss of expertise, notably botanical and statistical, with retirements and insufficient success at recruitment or retention which may represent a structural risk to sustaining and improving the current scientific production into the future.

#### Weaknesses concerning contributions to the society.

There is still room to strengthen knowledge transfer in connection with private partners.



## RECOMMENDATIONS TO THE TEAM

### Recommendations regarding success in grant funding

The team must improve its success rate in European calls. The team is encouraged to increase its efforts regarding leadership of European projects. The gap between team members, in terms of funding success, should be tackled by the development of team strategies and collaborations.

### Recommendations concerning scientific production

GESTAD should maintain a strong focus on interdisciplinary approaches. This is required to maintain high quality research standards.

### Recommendations concerning contributions to society

The team should increase its communication activities with the general public. Attention should be paid to pesticide reduction. Team members could improve their participation in public debates.

**Team 4:** IPM (Mechanisms and Management of Plant Microorganism Interactions)  
 Name of the supervisor: Mr Sylvain Jeandroz

## THEMES OF THE TEAM

The IPM team seeks to gain original fundamental knowledge on the functioning of plant-microorganism interactions. It actively participates in the transfer of this knowledge in order to develop tools and methods related to innovative cropping systems. The scientific questions are organized into three main themes: 1. Cellular and molecular mechanisms of plant-microbe interactions, 2. Analysis of the biodiversity (taxonomic and functional) and ecology of soil borne fungi that establish interactions (parasitic or mutualistic) with plants, and 3. Contribution to the development of new strategies aiming at reducing chemical inputs through biocontrol and bio-stimulation approaches, and evaluation of the services provided by beneficial microorganisms. The work of this team focuses on biological models that have been adapted to address key scientific questions. The team undertakes research that is organised at different scales from growth chambers and greenhouses to experimental platforms and agricultural/vineyard plots. The work of this team also includes applications for approval and compliance with regulations regarding biological safety risks.

## CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Some progress has been made with regard to intra-team communication and cross-cutting projects between the IPM groups and different teams in the UMR. This has been facilitated by the recruitment of a Professor and an Associate Professor working in the cross-cutting theme of plant-microbe interactions and by pooling financial resources within the team. The team has been able to maintain a strong, high-level research, on fundamental scientific questions and increase its national and international visibility. However, this aspect could have been improved by recruiting more postdocs. IPM activities are now appropriately focused on UMR key objectives. An appropriate balance has now been achieved regarding basic and applied research.

## WORKFORCE OF THE TEAM

|  |           |
|--|-----------|
| <b>Permanent personnel in active employment</b>  |           |
| Professors and associate professors  | 6         |
| Lecturer and associate lecturer  | 10        |
| Senior scientist (Directeur de recherche, DR) and associate                                    | 3         |
| Scientist (Chargé de recherche, CR) and associate  | 3         |
| Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées) | 0         |
| Research supporting personnel (PAR)  | 26        |
| <b>Subtotal permanent personnel in active employment</b>                                       | <b>48</b> |
| Non-permanent teacher-researchers, researchers and associates                                  | 0         |
| Non-permanent research supporting personnel (PAR)  | 14        |
| Post-docs  | 2         |
| PhD Students   | 10        |
| <b>Subtotal non-permanent personnel</b>  | <b>26</b> |
| <b>Total</b>   | <b>74</b> |

## EVALUATION

### Overall assessment of the team

**IPM is a very good team with a high level of scientific production. The team has established strong relationships with the socio-economic world. The translation of science is very good, as is the active dissemination of knowledge. Collaboration with the other UMR teams is very good.**

### Strengths and possibilities linked to the context

#### Strengths regarding success in grant funding

The IPM team participates in 48 projects {3 funded by Europe (BIOVINE, Plant-KBBE PATRIC, NO-PIMS)}, 18 national grants (ANR, Casdar, FUI, PIA). More than half (27) of these have been funded directly or indirectly by the Bourgogne/Franche Comte region.

#### Strengths concerning scientific production

IPM has published 184 publications (1.6 paper/FTER/yr) in high ranking international journals (*Plant Biotechnology Journal*, *Plant Physiology*, *Plant immunity*, *plant pathology*). Nine papers are highly cited (e.g. Bettenfeld et al. 2020 *Trends in Plant Science*, Wipf et al. 2019 *New Phytol*). The team has also filed 3 international patents and declared 9 invention statements.

#### Strengths concerning contributions to society

The IPM team has an excellent record in terms of dissemination of scientific knowledge to the general public (40 participations). These interactions were largely focused on the diversity and role of mutualistic mycorrhizal fungi. Team members contributed to workshops and open days, gave oral presentations, participated in booths at various events and fairs in Dijon. They were also involved in the Salon International de l'Agriculture in Paris. The team is also active on social media, as well activities directed to young people and women.

### Weaknesses and risks linked to the context

#### Weaknesses concerning success in grant applications

There has been of very good level of success in obtaining grant funding to address the numerous demands of private companies. However, participation in EU and/or ANR projects could be improved, particularly with team members acting as the coordinator.

#### Weaknesses concerning scientific production

The level of scientific production is uneven within the team. There is a general lack of innovative research articles published in highly visible multidisciplinary journals. The team has recruited very few postdocs despite the many contracts and grants obtained.

#### Weaknesses concerning contributions to society

There are no significant weaknesses with regard to interactions with private companies and communications with the general public.

## RECOMMENDATIONS TO THE TEAM

#### Recommendations concerning success in grant applications

Local and regional funding opportunities are important but such successes should not limit exploitation of other opportunities. It is strongly recommended that the IPM team diversifies its funding streams and becomes more involved in national, European and international networks. It should seek consortia with complementary skills in order to apply to EU calls.

#### Recommendations concerning scientific production

The international recognition of the team should be increased. This could be achieved by joint publications in collaboration with internationally recognized collaborators. Funding should be sought at the European level in order to recruit more post-docs, who can contribute to publications in the most highly visible international journals.

#### Recommendations concerning contributions to society

The team has very good links with private companies, but this could be improved. A new partnership strategy (e.g. Labcom) is required to achieve longer term and more sustainable relationships with industry. The team is encouraged to continue its activities in knowledge dissemination.

## CONDUCT OF THE INTERVIEWS

### Dates

**Start:** 18 January 2023 at 09:00

**End:** 20 January 2023 at 17:00

**Interview conducted: online**

### INTERVIEW SCHEDULE

#### 18 janvier 2023

|       |   |
|-------|---|
| 8h45  | Connexion des participants  |
| 9h00  | Présentation du processus d'évaluation et du comité Hcéres à l'unité    |
| 9h15  | Présentation générale de l'unité  |
| 10h15 | Présentation des plateformes de l'unité : 4 PMI, DimaCell, ERB, GenoSol |
| 10h45 | Pause café  |
| 11h00 | Questions-Réponses avec le comité                                       |
| 11h45 | Discussion confidentielle du comité                                     |
| 12h15 | Pause déjeuner  |
| 13h20 | Connexion   |
| 13h30 | Présentation générale du Pôle BIOMe                                     |
| 13h40 | Présentation scientifique du pôle BIOMe                                 |
| 14h10 | Questions-Réponse avec le comité de visite Hcéres                       |
| 14h30 | Discussion confidentielle du comité de visite Hcéres                    |
| 15h15 | Pause   |
| 15h30 | Connexion   |
| 15h40 | Présentation générale du pôle GEAPSI                                    |
| 15h50 | Présentation scientifique du pôle GEAPSI                                |
| 16h20 | Questions-Réponse avec le comité de visite Hcéres                       |
| 16h40 | Discussion confidentielle du comité de visite Hcéres                    |
| 17h25 | fin de la 1 <sup>ère</sup> journée                                      |

#### 19 Janvier

|       |  |
|-------|--|
| 8h30  | connexion  |
| 8h40  | Présentation générale du Pôle GESTAD   |
| 8h50  | Présentation scientifique du pôle GESTAD   |
| 9h20  | Questions-Réponse avec le comité de visite Hcéres  |
| 9h40  | Discussion confidentielle du comité de visite Hcéres   |
| 10h25 | Pause café   |
| 10h40 | connexion  |
| 10h50 | Présentation générale du Pôle IPM  |
| 11h00 | Présentation scientifique du pôle IPM  |
| 11h30 | Questions-Réponse avec le comité de visite Hcéres  |
| 11h50 | Discussion confidentielle du comité de visite Hcéres   |
| 12h30 | Pause déjeuner   |
| 13h30 | connexion  |
| 13h40 | Rencontre du comité Hcéres avec les personnels administratifs et techniques statutaires          |
| 14h10 | connexion  |
| 14h20 | Rencontre du comité Hcéres avec les chercheurs et assimilés (C/EC/IR et IE)                      |
| 14h50 | connexion  |
| 15h00 | Rencontre du comité Hcéres avec les personnels non permanents : contractuels, thésards, postdocs |

|       |  |
|-------|--|
| 15h30 | Pause café   |
| 15h45 | connexion  |
| 15h55 | Rencontre du comité Hcéres avec les chefs de pôles et leurs adjoints |
| 16h25 | connexion  |
| 16h35 | Rencontre du comité Hcéres avec les tutelles de l'unité              |
| 17h35 | Discussion confidentielle du comité de visite Hcéres                 |
| 18h20 | Fin de la 2 <sup>ème</sup> journée                                   |

**20 janvier 2023**

|              |   |
|--------------|---|
| 8h50         | connexion   |
| 9h00         | Rencontre du comité Hcéres avec la direction de l'unité |
| 9h30 à 17h30 | Réunion de debriefing du comité Hcéres                  |
|              | Fin de la 3 <sup>ème</sup> journée                      |

## GENERAL OBSERVATIONS OF THE SUPERVISORS

Le Directeur de l'UMR Agroécologie

à

Monsieur Eric Saint Aman  
HCERES  
Directeur du Département d'évaluation  
de la recherche  
2 rue Albert Einstein  
75013 Paris

Objet : Evaluation HCERES DER-PUR230022961 - Agroécologie

Dijon, le 14 juin 2023

Monsieur le Directeur,

Je vous remercie pour l'envoi du rapport d'évaluation de l'UMR Agroécologie. Par la présente, je souhaiterais remercier le comité de visite pour la qualité des échanges que nous avons eus et pour l'analyse produite qui va nous aider à avancer dans le prochain contrat quinquennal.

Je vous transmets également un courrier de l'une de nos tutelles (Université de Bourgogne) qui tient à remercier le comité de visite pour l'analyse produite et qui réaffirme le soutien de l'Université de Bourgogne à notre unité.

Je vous prie d'agréer, Monsieur le Directeur, l'expression de mes sentiments les meilleurs.



Fabrice Martin-Laurent

**la science pour la vie, l'humain, la terre**



Le Président

à

Monsieur Éric Saint Aman  
HCERES  
Directeur du Département d'évaluation  
de la recherche  
2 rue Albert Einstein  
75013 Paris

*Dossier suivi par :*  
Colette SCHMITT  
Directrice du Pôle Recherche  
[colette.schmitt@u-bourgogne.fr](mailto:colette.schmitt@u-bourgogne.fr)

Dijon, le 8 juin 2023

**Objet : Evaluation HCERES DER-PUR230022961 – Agroécologie**

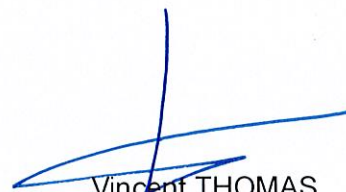
Monsieur le Directeur,

Je vous remercie pour l'envoi du rapport d'évaluation comportant un avis globalement très positif sur le laboratoire Agroécologie.

Son Directeur, Fabrice Martin-Laurent, souligne la qualité de l'analyse et remercie les membres du comité de visite pour leurs propositions.

Je tiens enfin à réaffirmer le soutien de l'université de Bourgogne à cette unité de recherche.

Je vous prie d'agréer, Monsieur le Directeur, l'expression de toute ma considération.



Vincent THOMAS  
Président de l'université de Bourgogne



The Hcéres' evaluation reports are available online:  
[www.hceres.fr](http://www.hceres.fr)

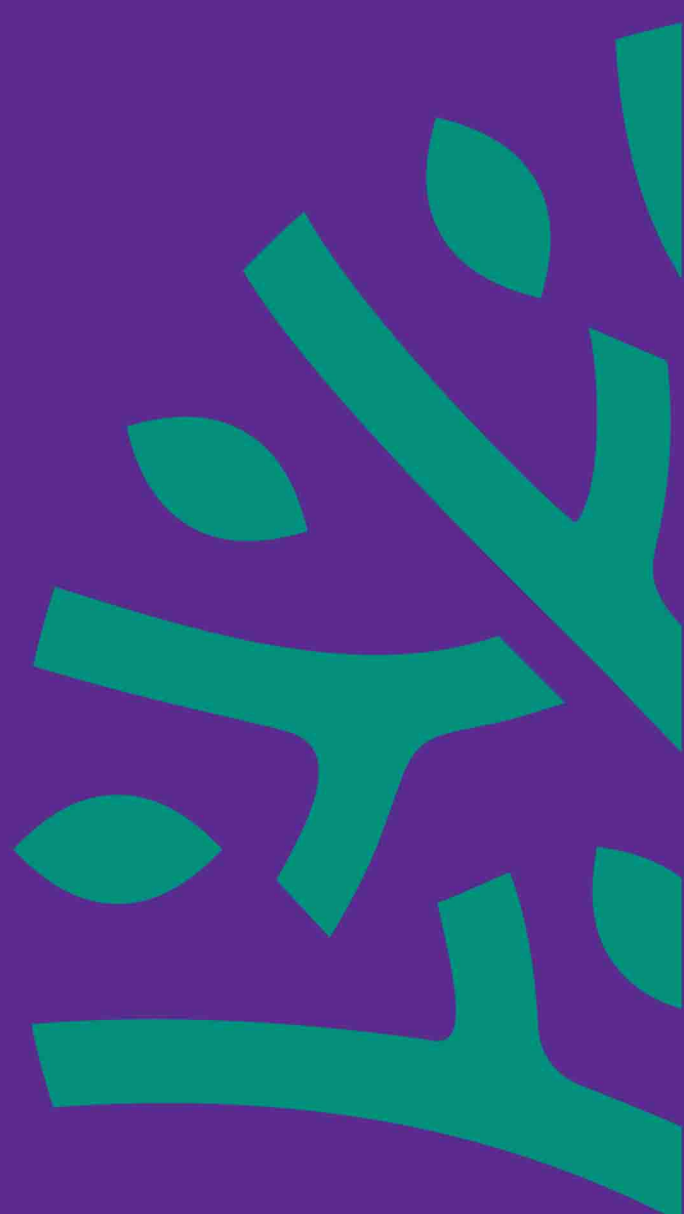
**Evaluation of Universities and Schools**

**Evaluation of research units**

**Evaluation of the academic formations**

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**Evaluation and International accreditation**



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