Research evaluation

EVALUATION REPORT OF THE UNIT

IJPB - Institut Jean-Pierre Bourgin

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

AgroParisTech / Université Paris Saclay

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

EVALUATION CAMPAIGN 2024-2025

GROUP E

Report published on March, 24 2025

High Council for evaluation of research and highter education

In the name of the expert committee:

Christine Foyer, chairwoman of the committee

For the Hcéres:

Stéphane Le Bouler, acting president

In accordance with articles R. 114-15 and R. 114-10 of the Research Code, the evaluation reports drawn up by the expert committees are signed by the chairmen of these committees and countersigned by the president of Hcéres.

To make the document easier to read, the names used in this report to designate functions, professions or responsibilities (expert, researcher, teacher-researcher, professor, lecturer, engineer, technician, director, doctoral student, etc.) are used in a generic sense and have a neutral value.

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

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Experts:	Mr Olivier Ali, Inria, Lyon Mr Fredy Barneche, CNRS, Paris (representative of INRAE CSS) Ms Séverine Chambeyron, CNRS, Montpellier Mr Jean-Christophe Domec, Bordeaux Sciences Agro (representative of Cneca) Ms Christine Granier, INRAE, Montpellier Mr Dimitri Heintz, CNRS, Strasbourg (supporting personnel) Mr Patrice Lerouge, Université de Rouen Mr Sébastien Mongrand, Université de bordeaux Mr Laurent Nussaume, CEA, Saint-Paul-lès-Durance Mr Silvio Salvi, University of Bologna, Italy Ms Catherine Sarazin, Université de Picardie Jules Verne Ms Daniele Werck, chercheur émérite, CNRS (vice-présidente du comité)

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Mrs Marie-Christine Ralet, Département TRANSFORM INRAE
Mr Norbert Rolland, Département BAP INRAE

CHARACTERISATION OF THE UNIT

- Name: Institut Jean-Pierre Bourgin
- Acronym: IJPB
- Label and number: UMR1318
- Number of teams: 27
- Composition of the executive team: Director: Ms Helen North; Deputy director human resources: Mr Eric Jenczewski; Deputy director scientific strategy: Ms Sylvie Coursol; Deputy director administration: Ms Magali Nawrocki; Deputy director infrastructure and operations: Mr Bertrand Dubreucq

SCIENTIFIC PANELS OF THE UNIT

SVE2: Plan and Animal Production (Agronomy), Plant and Animal Biology, Biotechnology and Biosystems Engineering
SVE3: Living Molecules, Integrative Biology (From Genes and Genomes to Systems), Cell and Development Biology for Animal Science
ST4: Chemistry
ST1: Mathematics

THEMES OF THE UNIT

The IJPB is based at the Versailles campus. Since its inception in 2010, the IJPB has performed as a research entity undertaking fundamental and applied research in agricultural sciences. The unit has a total of 287 personnel, comprising 196 permanent members and one emeritus researcher. There are 27 research teams that are organised into three departments (comprising 7 or 10 teams), each having 3 to 19 members. Non-permanent staff make up a third of the IJPB workforce. These staff members work mainly in the teams (89%) where they make a significant contribution to scientific activity and output. Overall, there are about 36 individuals which are employed on fixed-term contracts (11 postdocs and 25 engineers or technicians). There are 50 students (37 PhD and 13 undergraduate students), two visiting PhD students and one visiting scientist. Research in the teams is supported by the five technical platforms and the Versailles Arabidopsis stock center (VASC).

The IJPB has three main Plant Science focus areas that broadly align with the three departments (Biomass, environment, adaptation and metabolism {BEAM}; Development, signaling and modelling {DSM} and Genomes). All teams employ interdisciplinary approaches that combine whole plant physiology and biochemistry with genetics, cell biology, bioinformatics, molecular biology, and genomics.

Comprising of 10 teams, BEAM research is focused on plant signaling and communication mechanisms, with particular emphasis on hormone and nutrient signaling pathways, as well as characterizing the complex interactions between plants and the environment, including allelopathic, pathogenic or beneficial effects. DSM is also made up of 10 teams, with a remit to elucidate the mechanisms governing plant development over a range of scales (nucleus, cell, organ, whole plant). With emphasis on key cellular processes such as division, differentiation, totipotency and metabolism, DSM research seeks to identify biological and environmental control points and processes within the genetic, metabolic, and hormonal regulatory networks. Although it is the smallest department. GENOMES research has the challenging task of gaining a deeper understanding of the structure and regulated functions of the nuclear and organelle genomes. The GENOMES teams undertake the analysis of genetic and epigenetic mechanisms that maintain diversity, stability, and expression. This department addresses fundamental biological questions related to DNA recombination, repair, and the genetic and epigenetic control of transposons, viruses, and transgenes.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

IJPB stems from an initial informal association of four plant laboratories established on the campus of Versailles (Cell Biology Laboratory, Plant Nitrogen Nutrition Unit, Seed Biology Laboratory and Genetics and Plant Breeding Station). It was then created as a common research unit, the UMR 1318 on January 1st 2010, resulting from their fusion together with the Biological Chemistry Laboratory located on the INRAE campus of Grignon. IJPB was initially headed by David Bouchez until 2016. Anne Krapp then took the role with three deputy directors (O. Loudet (scientific strategy), P. Laufs (HR), M. Nawrocki (administration)) until 2022. The board was then renewed and is currently headed by Helen North (with 4 deputy directors S. Coursol (scientific strategy), E. Jenczewski (HR), M. Nawrocki (administration), B. Dubreucq (exploitation)).

The IJPB is located on the INRAE Versailles campus within the park of the Versailles Palace and administered by the INRAE Ile de France-Versailles-Saclay research center. It is currently affiliated to two governing bodies:

- INRAE (French National Research Institute for Agriculture, Food and Environment) with personnel belonging to two divisions (BAP: Plant Biology and Breeding; TRANSFORM: Science for Food, Bioproducts and Waste Engineering).
- AgroParisTech (SVS department: Life and Health Sciences), the leading French education institution for agronomy, forestry, environmental and life sciences, that encompasses 24 research units.

IJPB was initially also affiliated to CNRS (French National Centre for Scientific Research), but CNRS affiliation of IJPB ended on the 31 December 2019 (as result from a CNRS unilateral decision), with 2020 as transitional year as FRE (formation de recherche en évolution). This led to a newly recruited CNRS researcher being refused integration in 2019. At the end of 2023 IJPB hosts only three CNRS staff members.

RESEARCH ENVIRONMENT OF THE UNIT

IJPB benefits from an ideal environment. It belongs to the circle of 14 entities of University Paris-Saclay (UPSaclay), one of the top 20 academic ranking world universities and one of the leading European campuses in Agriculture and Plant Sciences. It is also a member of Saclay Plant Science (SPS) that gathers 6 Research units providing complementary platforms and expertise (IPS2 (Institut des Sciences des Plantes de Paris Saclay), I2BC (Institute for Integrative Biology of the Cell), GQE (Quantitative Genetics and Evolution), BIOGER (Risk Biology and Management in Agriculture) and URGI (Research Unit in Genomic Info)), a Graduate School of Research dedicated to Plant Sciences, 3 Doctoral Schools with 100 PhD/year, 3 Masters with 150 students/year). A new Agro Paris-Saclay campus jointly owned by AgroParisTech and INRAE, housing 2000 students, was inaugurated in April 2022 in Palaiseau. Two members of IJPB belongs to the board of directors (3 members) of SPS, one being lead coordinator, and IJPB members (37) are largely represented in SPS management at all levels.

Whereas IJPB has no access to UPSaclay lectureships or professorships, it has access to scientific activities and financial support including for equipment, training packages and welcome research packages to newly recruited scientists. In addition by agreement between INRAE and UPSaclay, members of IJPB can participate in specific PhD and university programs facilitating mobility and hosting of foreign visitors (e.g. the Plant and Microbial Molecular Biology (PMB) International program launched in 2023).

IJPB is currently involved in one transversal project of UPSaclay (Living Machine@Work interdisciplinary object via two teams), the SPS-Graduate School of Research (formerly LabEx SPS) and three University Paris-Saclay graduate schools: Biosphera (Biology, Society, Ecology & Environment, Resources, Agriculture & Food Systems), LSH (Life Sciences and Health), and Chemistry (via one IJPB researcher only). Nine members of IJPB are involved in the coordination or councils of Biosphera or LSH. Other members of the unit participate in the coordination of three of the SPS-GSR flagship projects dedicated to Bioinformatics/Bioanalysis, Specialized metabolites, and Beneficial microbes. The latters significantly enhanced IJPB's bioinformatics capacities, supported the implementation of local, national, and European projects dealing with specialized metabolites and helped fostering new internal and national collaborations.

IJPB also benefits from serving as a hub for several cutting edge complementary platforms dedicated to multi-level plant phenotyping (listed in UPSaclay platform inventory Pluginlabs), and from its proximity to the synchrotron Soleil for providing spectroscopic tool and support for structural biology. Other essential assets are the IJPB administration team that efficiently works in coordination with IdF-Versailles_Saclay centre to facilitate collaboration with private partners for contractual agreements and IP protection, the SPS initiatives to promote private-public interactions (such as the SPS's Innov meetings), and the SATT (Technology transfer accelerator office) Paris-Saclay for the set-up and initial funding of spin-offs. To be mentioned also IJPB involvement in the national PlantAlliance consortium, and in the Carnot networks (Programmes Investissement d'Avenir: PIA) 3BCAR (Bioenergies, Biobased molecules and Biobased materials for renewable CARbon) and Plant2Pro (Innovations to enhance sustainable competitiveness of crop production).

Finally, IJPB is supported by the Foundation for Scientific Cooperation "La Diagonale" for funding the implementation and dissemination of its initiative on art and plant sciences.

UNIT WORKFORCE: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	7
Maitres de conférences et assimilés	5
Directeurs de recherche et assimilés	38
Chargés de recherche et assimilés	28
Personnels d'appui à la recherche	116

Sous-total personnels permanents en activité	**194**
Enseignants-chercheurs et chercheurs non permanents et assimilés	5
Personnels d'appui non permanents	19
Post-doctorants	10
Doctorants	39
Sous-total personnels non permanents en activité	**73**
Total personnels	**267**

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: in physical persons at 31/12/2023. Non-tutorship employers are grouped under the heading "others".

Nom de l'employeur	EC	C	PAR
INRAE	0	63	109
AgroParisTech	9	0	7
Autres	3	3	0
Total personnels	**12**	**66**	**116**

GLOBAL ASSESSMENT

The IJPB is a large dynamic organisation that undertakes ground-breaking fundamental and applied research in plant biology and agricultural sciences. The researchers, who work largely in research teams, employ cutting-edge interdisciplinary approaches to tackle key issues and global challenges. The IJPB fosters an inclusive, forward-thinking and dynamic culture that encompasses the aspirations of early-stage researchers, allowing the formation and continuation of very small teams. Overall, the IJPB makes a significant contribution to fundamental scientific activities that are always mindful of the needs of industry and society in three main focus areas that align with the three departments. The scientific objectives of the IJPB are excellent and aligned correctly with the aims of the governing bodies, funding agencies and societal demand. IJPB implemented several important measures in response to recommendations from the previous Hcéres evaluation committee, particularly the strengthening of computational capabilities allowing significant expansion of quantitative, digital, and predictive biology capabilities. The functioning of the IJPB is outstanding, as evidenced by the exceptional number and quality of the scientists, who are involved in the management of the institute. A democratic management is evident in decision making and strategy design, and shared recurrent and external funding. This has forged a strong link between research and the management of the institute. The institute continues to play a leading and outstanding pioneering role in plant science research, not only in France but also internationally.

IJPB has an ideal environment and benefits from interactions with the University Paris-Saclay (UPSaclay), particularly Saclay Plant Science (SPS) with its Graduate School of Research dedicated to Plant Sciences. While IJPB has no access to UPSaclay lectureships or professorships, it benefits from scientific interactions, networking and financial support. Moreover, the strong involvement of IJPB in teaching has resulted in the training of a good number of undergraduate and PhD students. Belonging to the Paris-Saclay campus with its strong international reputation increases the attractiveness, vision and dynamism of the institute.

IJPB benefits from state-of-the-art complementary and optimized technical platforms in the Plant Observatory, large mutant plant collections and the multi-disciplinary expertise of its research community. It is notable that the unit has significant plans to reduce energy consumption and conserve infrastructure and resources. Besides infrastructures, the human and financial resources of IJPB are ranked as excellent to outstanding, providing an outstanding and attractive environment. The organization benefits from an excellent system of shared resources enabling all teams to maintain a steady activity. IJPB promotes open science. Overall, the scientific production of the unit is excellent, with an appropriate combination of very good quantity and excellent to outstanding quality, with about half of the outputs resulting from successful external collaborations that involve nearly 60 countries. Moreover, IJPB publishes in leading specialty but also broad audience international journals and most publications are well cited. Scientific production is generally well balanced between teams taking into account heterogeneity in team sizes, but some teams have an exceptional performance.

Although there is still room for progress in securing major international funding, the IJPB has achieved considerable success in receiving a broad range of grants from national sources and multiple stakeholders. IJPB scientists organize and participate in national and international meetings and conferences. Some of its members are highly visible in the Plant Science community. Moreover, IJPB research makes an excellent contribution to society, and transfer activities are assessed as excellent. Seven patents were registered and one start-up founded during the evaluation period. The outreach activities of IJPB can be regarded as exceptional in French academic research. The involvement of the IJPB in outreach and dissemination is excellent, or even outstanding. Evaluated individually, the overall activities of 27 teams of IJPB were ranked from good to outstanding (for four of them).

The scientific trajectory of IJPB has been carefully planned, based on flagship projects, axes and priorities that will increase in visibility and match the priorities of supervising bodies. Increases in the numbers of ERC applications, submissions to Marie Slodowska-Curie Actions, Horizon Europe and HFSPO are recommended in addition to support from in-country funding. IJPB plans to intensify networking and communication, both nationally and internationally. While the panel acknowledges the ongoing efforts of the unit to maintain critical human resources, as well as recruiting new skills and competencies, the unit should consider merging small teams in the future. Overall, the trajectory of IJPB is extremely well structured and organized, with excellent plans to maintain human resources and funding.

In summary, the panel concludes that IJPB ranks in the top 10% of research organisations focused on plant biology globally. It has an excellent position in education in the Ile-de France region, while maintaining high scientific visibility in France and across the international plant community. The panel expresses concern regarding the withdrawal of the CNRS as a supervisory body and trusts that a reversal of this decision may be possible to strengthen the whole plant science community in the Paris region. Nevertheless, the organization continues to provide an attractive environment for early-stage researchers, within its diverse and vibrant academic community.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The institute has implemented several notable measures in response to recommendations from the previous Hcéres evaluation committee, roughly 9 out of 12 recommendations have been followed.

One significant advancement is the strengthening of computational capabilities. The institute has enhanced its bioinformatics and mathematical expertise through the planned recruitment of one full professor, two engineers, and two research scientists. This initiative is expected to improve quantitative, digital, and predictive biology capabilities while facilitating staff training in bioinformatics and biostatistics. Furthermore, the IJPB has actively encouraged its scientific personnel to apply for competitive European grants. During the evaluation period, 47 european proposals were submitted, resulting in ten awarded including 4 ANR-DFG-PRCI projects, 1 EMBO project, 3 H2020 projects, 1 ERC-STG project, and 1 HORIZON-RIA project. For the moments funds from EU sources however remain rather modest. In terms of communication and inclusivity, the institute has promoted the use of both English and French across all communication channels to maximize inclusivity for all personnel. Additionally, despite its geographical isolation, the IJPB has established itself as an active center within the newly formed UPSaclay scientific community. This engagement is evidenced by the organization of eight congresses (despite the Covid-related restrictions), hosting three summer schools, and providing practical training for over 230 students in the past two years. Moreover, measures have been implemented to enhance work-life balance for personnel, including the adoption of virtual meetings and the creation of shared social spaces.

Among the recommendations that were not implemented, one concerned the limitation of very small teams that seems to not yet be fully integrated in the overall research unit. The institute asserts that small teams did not experience any productivity deficit compared to larger ones during the evaluation period (see Fig.14 p. 21). It suggests that its community-based *modus operandi*, based on shared resources and expertise, may account for these good results. Notably, no new teams smaller than two permanent scientists (including at least one HDR) have been established during this evaluation period. Additionally, the recommendation regarding seeking guidance from an external advisory board was also discarded. Instead, the IJPB initiated a collective internal audit and organized several annual meetings with its governing bodies to discuss scientific strategy and funding prospects. The institute also helped its scientific personnel to maintain awareness of various funding opportunities through regular interactions with local and national stakeholders (*e.g.* various UPSaclay graduate schools and the Carnot Network).

B - EVALUATION AREAS

Guidelines for all areas of evaluation (1, 2, 3 and 4): Considering the references defined in the unit's evaluation guidelines, the committee ensures that a distinction is made on the outstanding elements for strengths or weaknesses. Each point is documented by observable facts including the elements from the portfolio. The committee assesses if the unit's results are consistent with its activity profile.

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

Assessment on the scientific objectives of the unit

The scientific objectives of the IJPB are excellent and well in line with those of its governing bodies, funding agencies and societal demand. Exploiting optimized technical platforms, large mutant plant collections and multiple expertise (including modelling, IA, mathematics, imaging…) allowed them to couple groundbreaking fundamental research in model plant species with diverse practical applications in crops. A strength of IJPB is that these objectives are set collectively and thus receive the adhesion of the community. Prospective thinking to keep at the forefront of science is well integrated in the evolution of the platforms and of some teams, yet not in the creation of new teams, a point that should be improved.

Assessment on the unit's resources

Overall, the resources of IJPB are excellent to outstanding.
Mainly supported by INRAE, IJPB benefits of excellent infrastructures and platforms and of excellent technical support, the combination of which provides and outstanding environment. Its recurrent funding is modest and the unit's operational budget mostly relies on the success of external grant applications variable from year to year, with so far very good success. Currently, the unit owes its survival and efficiency to an excellent system of shared resources and management. The programmed increase in energy costs and reduction in national research budget in the upcoming years may compromise this fragile equilibrium. Competitivity of the unit could also be challenged by a slow but steady decrease in staff number.

Assessment on the functioning of the unit

The IJPB has an outstanding functioning, characterised by the high level of scientists involved in the management of the institute (including direction/departments/platforms) and their regular turnover. This maintains dynamism and a strong links between science and technical facilities. The voluntary policy implemented between the direction and the scientific teams to facilitate the success at the various calls (with meetings organised to analyse feedback and identify ressources to allocate) and attractiveness of the institute should also be highlighted.
Another feature is its choice to share the resources and facilities. This secures the research activities of all teams and facilitates the integration of newcomers.
The IJPB direction decided (in spite of the suggestion of the previous evaluation) not to instore an external scientific advisory board and favoured instead a collective process for internal audit. In light of the outcome developed hereafter, this seems a good choice. The unit's actions seem to have overcome the problem of multi-site working, which involves people spread over different locations, thanks to a remarkable organization.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

IJPB is an historically important research center for basic plant research combining important experimental resources and a broad expertise in biology, chemistry and mathematics. The institute has played a leading and outstanding pioneering role in France in developing the *Arabidopsis* model plant (for which they are a resource center), leading to several major scientific breakthroughs. They remain one of the pillars of fundamental plant research in France. But their expertise is not limited to Arabidopsis and 14 other plant species are currently used

to varying degrees within the institute to address, beside fundamental physiological mechanisms, burning environmental and societal challenges.

The IJPB was subdivided in three departments, whose names reflect the historic scientific objectives investigated:
- Biomass, environment, adaptation and metabolism (for the BEAM department, 10 teams)
- Development, signalling and modelling (for the DSM department, 10 teams)
- Genomes (for the GENOMES department, 7 teams)

The importance of the IJPB Versailles site in terms of human resources (287 people with 1/3 non-permanent, 27 teams), the remarkable support infrastructures available (6 platforms), and its capacity to attract students from Saclay Plant Science (due to the strong involvement of IJPB member in the teaching reflected by the important number (41%) of IJPB members in SPS scientific committee) and from abroad generate a highly dynamic environment for Plant Science. It provides an opportunity to have a broad internal expertise not only scientifically but also technically. It offers the capacity to address with state of art multidisciplinary approaches (including modelling, IA, mathematics, imaging…) complex physiological questions such as multi-stress, adaptation to climate change, natural variations, epigenetics, metabolism modifications… It also allows the capacity to multiply the number of model species (more than a dozen) to facilitate a translation from model plants to cultivated species.

Weaknesses and risks linked to the context

While the major directing lines of the unit as a whole are clearly set, the team's objectives are quite dispersed due to their large number and multiplication of individual initiatives.

Staff retirements expected in the next years may challenge some major research lines.

New team's emergence results from the split of existing teams and competences more than from prospective and development of rupture research. The Unit strategy that is undertaken to support the emergence of innovative themes, high-risk research subjects and rare disciplines is not clear.

2/ The unit has resources that are suited to its activity profile and research environment and mobilises them.

Strengths and possibilities linked to the context

The IJPB benefits of unique facilities. It occupies approx. 12,500 m^2 of infrastructures on the INRAE Versailles Campus, including six buildings of laboratories and offices, two technical buildings hosting the 6 top-notch platforms of the Plant Observatory (see Area 2.4). Included in these infrastructures, an extensive array of plant growth facilities at the S1, S2 and S3 security levels, including 14 glasshouses (3,500 m^2), 15 fully programmable growth chambers (300m^2), 80m^2 of lysimeter boxes, 100m^2 of *in vitro* growth chambers and 100m^2 of seed conservation area that constitute a key asset to answer its research questions.

In addition, five other optimized platforms are dedicated to: 1) automated plant phenotyping (Phenoscope) equipped with robots allowing assessment and imaging of 1500 individual plants under controlled climatic conditions, during vegetative stage or final stages of development, with a dedicated information database. This platform is run by three dedicated staff members; 2) an in-house Arabidopsis Seed Stock Centre with a staff of 2.4 FTEs, providing genetic resources to the scientific community worldwide, including T-DNA insertion lines, homozygous EMS mutant lines, natural variants, QTL mapping populations, epigenetic recombinant inbred lines and cytolines (in which the organelle and nuclear genomes originate from two different natural accessions). This platform allows a computerized follow-up, has its own database and web portal. It has distributed 5,498 seed lots in 2023, generating a total income of €19,935; 3) cytology and microscopy of cells and plant tissues, involving 6 permanent staff members and featuring two complementary high-resolution microscopes permitting development of novel methodologies for the investigation of nanostructures present in the cells of the cell walls. One of them (dSTORM: Stochastic Optical Reconstruction Microcope) is unique in France. This platform is top-ranking on a regional level and leader in France in plant biology; 4) analytical and structural chemistry of molecules derived from plants, on 400 m2 with 6 dedicated permanent staff members.

IJPB permanent personnel includes in total 66 researchers (almost exclusively INRAE), 12 EC and 116 support personnel. It benefits in addition from a very strong support of INRAE that ensures most of the maintenance of its research facilities and provides the 86% of the salaries of its permanent personnel, with as positive consequence a large proportion of full-time researchers and an excellent ratio of support personnel/research FTE (1.48).

During the period, two major renovations of the buildings and infrastructure were carried-out with support of the INRAE and French government regional plan (CPER-2015-2020) to renew the greenhouses, central gallery, boiler system and fume-hood system. Adaptation of a greenhouse as a space for socializing was supported by the unit.

On average, the annual operational budget of the IJPB over the period was 4.7 M€ (65.3 k€/year/researcher FTE), of which recurrent funding from governing bodies represents about 1.25 M€ (26% or 17.4 k€/year/research FTE). Most of the operational budget stems from third party funding (on average around 70%) and own revenues (about 5%, generated by platforms). Third party funding consists in local, national, and international grants from public agencies or from socio-economic partners (see Area 2.3 and Area 4). The main funding contributions stem from ANR (with an increase in success rate in 2022 and 2023 mirroring the transient increase in public research funding under the research programming act), Europe (with an increase in 2022 due to funding of an ERC grant including large imaging equipment), PIA (Programme d'Investissement d'Avenir, with funding of 6 projects in the PIA4 in 2022). To be mentioned also an increase in the funding of innovation-driven projects over the evaluated period, largely thanks to the expertise of the unit's scientists in gene editing technology.

The unit has implemented a system of shared resources that implies pooling of the resources generated by grants at the exclusion of specific grant expenses (salaries, equipment, and specific external services) that allows the survival of young teams and of those that have failed in securing in competitive funding, encourages sharing of consumables and equipment, permits centralized and optimized budget management, and reduces internal competition. Submitted to a vote in 2023, this mutualization system was endorsed by 98% of the personnel.

IJPB has INRAE as main supervising body, which allows excess resources from certain sources to be carried over to subsequent years. This in turn permits the planning of larger purchases of equipment combining funding from several sources.

Weaknesses and risks linked to the context

IJPB has lost its CNRS affiliation at the end of 2019 with the associated funding and recruitment possibilities. So far it has no possibility to recruit lecturers form Paris Saclay University. It now too strongly depends on INRAE for its recurrent funding and recruitments.

IJPB personnel is ageing. Staff number is on decreasing slope. The unit has lost 9 members during the last period (4.3% of its staff). 34 staff members will retire over 2024-2025. The same number of retirements is predicted for the following period. Some recruitments are scheduled but unlikely to compensate departures.

The unit's operational budget is limited compared to that of other units, largely due to rather limited regional funding possibilities.

The increase in energy costs is expected to seriously challenge the unit operational budget in the next years.

Funds allocated by INRAE for facility maintenance and renovation is limited per year or requires participation of the unit.

The high dependence of the IJPB budget on grant and contract success results in high variability and risk in planification of the expenses. French programmatic research funding is likely to decrease in the next years which may significantly impact the unit.

3/ The unit's practices comply with the rules and directives laid down by its supervisory bodies in terms of human resources management, safety, environment, ethical protocols and protection of data and scientific heritage.

Strengths and possibilities linked to the context

IJPB actively promotes open science and dissuades its scientists from publishing in predatory journals.
The unit had implemented a plan aiming reduction of energy consumption (closure of 2 old greenhouse, modernization of existing ones, exploitation for less efficient one focus in autumn and spring to reduce their energy requirements).

Efforts of IJPB to go beyond requirements concerning staff management with specific annual evaluations of work achieved and of new objectives. The unit implements a whole series of protocols for self-evaluation, self-criticism, questioning, tackling problems in a participative and collegial way, which can't be easy, given the number of people involved.

Weaknesses and risks linked to the context

The main problem (but not specific to IJPB) is the ageing of the population (from 2018 until 2030 up to 7 people are predicted to retire every year compared to 6 arrivals on average per year) and reduction of hiring. Until 2028 these departures will not affect the 27 teams but difficult and highly selective choices will be needed thereafter to limit impact on scientific objectives and administration of IJPB.

Buildings and infrastructures are ageing and increasingly require repairs.

The high cost of living in the Paris region is another problem the unit has had to face.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractivity of the unit is excellent.

The institute and its outstanding Paris Saclay environment have made it possible to bring together a wide range of excellent scientific and technical expertise, facilitating high-quality multidisciplinary research and capacities to develop high-quality platforms with outstanding centralised access. The resulting vitality of the IJPB can be assessed on the basis of several criteria. The scientific production combines quantity and quality (73% of the publications are in the highest reputation journals). Half of this production resulted from external collaborations involving 58 countries. Such vitality benefits from the policy of the institute to promote multi-scale scientific and technical animation through training and an important number of internal and external seminars (with 8 international congresses/meetings on IJPB campus). IJPB's also has implemented a strong politic favouring communication with the general public.

The dynamism of IJPB is also illustrated by the broad range of grants obtained (240 national, 83 with the private sector, 21 European, 1 HFSPO), even if there is still room for progress here in terms of securing major international funding.

1/ The unit has an attractive scientific reputation and is part of the European research area.

2/ The unit is attractive because for the quality of its staff support policy.

3/ The unit is attractive through its success in competitive calls for projects.

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

Strengths and possibilities linked to the context for the four references above

IJPB is a historical place for Plant science and its reputation extends far beyond France's borders (illustrated by collaborations with 34 countries around the world). It hosted the Plant Observatory (accredited IBISA and Strategic Regional INRAE Platform). Its 6 technical platforms grant free access to an outstanding scientific environment in terms of equipment, know-how and genetic resources. They are precious resources but innovation (which has been the strength of IJPB) must not be lost from sight.

For example, the Versailles Arabidopsis Stock Center (VASC) hosting 55000 mutants, 600 natural variants, Homozygous EMS Mutants collection, RIL. is a very important resource for the plant community which greatly benefits local research teams.

It is important to note the strong involvement of the 78 IJPB scientists in research administration: they often combine administrative or management tasks with their research activities. This creates a strong link between research and the management of the institute. They benefit from abundant and high quality technical support (116 people) contributing to the quality of the scientific environment provided. The strong involvement of IJPB in teaching (AgroParisTech, University Paris-Saclay, Saclay Plant Science project, Erasmus Mundus Joint Master in Biological and Chemical Engineering for a Sustainable Bioeconomy…). The success of this is illustrated by the important number of undergraduate (around 60 per year) and PhD (37 in 2023) students. One can guess, from an external point of view, that simply being on the Paris-Saclay campus with its strong international reputation brings additional notoriety and self-confidence to the institute itself.

Weaknesses and risks linked to the context for the four references above

Although the number of non-permanent students is high, there are very few post-doctoral students (only 11 in 2023). While this can be explained by the low ANR funding and the cost of living in the Paris region, compensatory measures should be devised to attract this category of staff, crucial to the Institute's dynamism and potential recruitment pool.

The fall in permanent staff numbers (-6% since 2018), which is general in the research sector, mainly affects INRAE (AgroParis Tech staff numbers remain stable but are only 8% of INRAE's 89%) and CNRS staff. The loss of the CNRS supervisory body is truly regrettable as it deprives IJPB of a source of recruitment that contributes to its dynamism. The attractivity and competitivity reflected by the contractual resources of the institute (close to 75% of the operational budget) can be improved even if the cost of the infrastructure with numerous buildings does not facilitate cost optimization. The number of prestigious international grants at the European level (1 ERC) and large H2020 grants remains small. It does not reflect the important network of IJPB and the reputation of its scientists.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

Overall the scientific production of the unit is excellent. The scientific output of IJPB is original and of high quality, including both basic and applied science. Production is very good from a quantitative point of view (1.81 publications/FTE/year) and excellent to outstanding from a qualitative standpoint, with 73 articles in high-level journals aimed at a wide audience. Two articles in Science were published under the lead of the unit in 2020 and 2023, demonstrating its outstanding imaging and modelling capacities. This production is on average well balanced between teams, with a few teams performing above average from a quantitative or qualitative point of view. Non-permanent and support personnel are involved in publication. Integrity, ethics and open science policies are excellent. The production in terms of patents is good given the size of the unit and could be improved.

1/ The scientific production of the unit meets quality criteria.

2/ The unit's scientific production is proportionate to its research potential and properly shared out between its personnel.

3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science. It complies with the directives applicable in this field.

Strengths and possibilities linked to the context for the three references above

Over the course of the evaluated period, IJPB research scientists published a total of 626 articles in peer reviewed journals, 44 book chapters, 7 books and 228 other publications, maintaining a comparable scientific productivity compared to previous periods. This corresponds to 1.26 (in peer reviewed) or 1.81 (all types) publications/FTE/year. 56% of the articles have an IJPB scientist as first, last or corresponding author, 21% are co-signed by PhD students. The unit lists 348 conferences at national and international meetings, of which 76 were invited (67 international) and 3 keynote lectures. Seven patents have been filed since 2018 and start-up initiated in 2021 based on the development of an innovative seed priming technology (by team 4).

On average about 50% of IJPB articles result from collaborations with other French or foreign units. 50,3% are co-publications with foreign scientists mainly located in Europe (Germany, UK, Belgium and Sweden being the most represented), US also in the top five, and Japan well represented. 49.7% are co-publications with French partners, mainly within the local SPS-GSR network (123) which reflects the benefit of the synergy between the members of the GDR, but also with other renowned French units.

The production of IJPB is original and of high quality, as attested by a high number of citations (on average 18.5 citations per article), 21 articles cited more than 90 times, a review paper cited more than 930 times. 73% of the articles are published in high quality journals, 54% in the highest quality journals in the field of 'Plant Science' or 'Biochemistry and Molecular Biology' of the Web of Science, and 11% (73) in the highest quality multidisciplinary or general biology journals aimed at a wide audience such as Science, Nature, Nature Communications, PNAS, Science Advances, NAR, Development, PLOS Genetics, EMBO Journal, Current Biology or ELife. Those provide major contributions to fields tackled in the unit and are too numerous to be listed here (see teams).

Among highlights:

- Two articles with members of the PAR team as lead authors and providing a novel understanding of the processes driving cell wall formation and expansion were published in Science. One uses super-resolution microscopy to identify pectin nanofilaments with expansion capacity as active participants to the shaping of the plant cell and providing a turgor-independent driving force for the cell-wall expansion (Science, 367, 2020; doi: 10.1126/science.aaz5103). The second reports the collaborative discovery of a family of signaling peptides, also structural components of the cell wall, which regulate the formation of protein/pectin complexes driving the formation of a load-bearing and expandable filamentous network (Science, 382, 2023; doi: 10.1126/science.adi4720). This disruptive work is now further developed in the context of an ERC starting grant.

- An important publication of team FTA (Development (2020) 147, dev183277; cited 21 times to date) describes how organ shape arises from the coordinated behaviour of cells. This paper describes how the interplay between auxin transport and transcription factors named CUP SHAPED COTYLEDON (CUCs), which are expressed dynamically in a small number of cells at the leaf margins, trigger differential growth, leading to serration at the leaf margin in Arabidopsis thaliana. Crucially, this paper uses time lapse imaging to illustrate the sequence of cellular events that establish boundary domain identity and result in leaf serrations.

- A 2021 paper published in Nature Communications (https://doi.org/10.1038/s41467-021-22995-3) by the EpiARN team identifies the key epigenetic differences that allow organisms to distinguish between endogenous and exogenous sequences, which explains why transgenes are subject to systemic silencing. This study suggests that this epigenetic phenomenon may serve as an evolutionary probationary period for transgenes, determining whether they are silenced or integrated as endogenous loci into the host genome.

- A 2021 PNAS (10.1073/pnas.2105274118) paper in which all five authors are from the OrgaRepro team identified the genetic determinants of the widely-used restorer of fertility *Ogura-INRA locus* that prevents the textbook process of Cytoplasmic-Male-Sterility. This study should have important implications in Brassica crop breeding strategies, and opens new perspectives in the genetic control of mitochondrial-nuclear incompatibilities in plants. This study was highlighted by INRAE and selected as a 'fait marquant' by the BAP INRAE department.

- DYSCOL published a major scientific discovery in Plant Cell in 2018 (doi: 10.1105/tpc.18.00275) about the metabolism of lipid droplet (LD) proteins. LD contain the reserve necessary for the emergence and the growth of seedlings. LD are surrounded by a monolayer of proteins. The DYSCOL team discovered a new molecular machinery named LD-associated degradation necessary for the dislocation of that monolayer surrounding LD, where LD proteins are anchored. This important mechanism allows the further mobilisation of reserves and the development of the seedlings from the embryo.

Remarkably, 12% of the unit's scientific output results from the scientific expertise of several IJPB researchers, mainly concerning NBTs (New Breeding Techniques) as 98 articles published by the European Food Safety Authority, but also from other expertise of the members of the unit.

Scientific production is on average well balanced between teams, taking into account publication strategies and missions of general interest of their members. Yet a few teams standout.

Non-permanent staff contribute to the IJPB production, post-docs on average to 2.5 articles during their contracts and PhD students to 1.8 during their PhD. In more than 85% of the cases those are published in first quartile journals.

IJPB has implemented several strategies to promote scientific integrity, including posting The European Code for Research Integrity as well as authorship rules in the Intranet. Scientific proposals are evaluated at the department level. Technical staff are also co-authoring articles in agreement with scientific integrity rules.

Ethical reviews of projects are facilitated by the ethical self-evaluation questionnaire posted by INRAE in 2023. Genome editing projects involving crops are evaluated by an Ethics Committee at the INRAE level.

The unit favors open access, with 81% of the peer-reviewed articles of the period in open access. In addition, the unit encourages deposit of all its production in HAL and has implemented a HAL IJPB catalogue including all the production of the unit.

Data repositories have been identified and recommended for each type of data, preferably within European repositories, and the unit has established an IJPB Dataverse. The bioinformatics team has developed shared pipelines for common analyses and provides suitable training courses for all employees.

Team, department and unit seminars allow constant sharing and follow-up of scientific progress and novel data.

Weaknesses and risks linked to the context for the three references above

While there very high standards of publication are maintained and consolidated through publication in high quality international journals, it is difficult to determine how the topics covered in the publications truly distinguish the unit's scientific production from other similar organizations in terms of theoretical and methodological positions.

The editorial policy and the level of requirements that the unit sets itself to ensure optimum recognition of its research results might be improved to have a wider consideration of global challenges and societal needs.

The proportion of articles in collaboration with scientists outside of Europe, in particular in China is surprisingly low.

The Unit has a modest number of PhD students, who appear to make a sound contribution to the outputs of the organization.

The FAIR (**F**indability, **A**ccessibility, **I**nteroperability, and **R**euse of digital assets) data management plan is still under construction.

As in all organizations, scientific production is limited by the time dedicated to management, reporting and other non-scientific activities. However, relatively few of the research staff are involved in teaching. It is not clear how time management is organized at an individual level to ensure that all researchers have sufficient time to spend on seeking funding and consolidating their research by publication.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

IJPB research strongly contributes to society, and transfer activities are assessed as excellent.

The Unit partly succeeded in this endeavor since over half of the teams (but NOT ALL..) are engaged in strong collaborative relationships with many industrial and socio-economic partners. Since the last Hcéres review the number of projects funded with the private sector went from 40 to 60, with in particular a doubling in the number of Cifre public-private partnership research contracts.

Sharing knowledge with the general public at the interface between science/society is a strong and increasing part of the IJPB activity, with a goal to keep society informed and to support public policy decision making.

The outreach activities of IJPB can be considered as exceptional compared to other French units, very well structured and coordinated at the level of the unit.

1/ The unit stands out for the quality and the amount of its interactions with the non-academic world.

2/ The unit develops products for the cultural, economic and social world.

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

Strengths and possibilities linked to the context for the three references above

In terms of industrial collaboration, the IJPB has an excellent record over the evaluation period. Compared to the previous evaluation period, these collaborative projects with industrial and socio-economic partners increased by a factor 1.5 and the corresponding budget for the IJPB almost doubled (from 3363 to 6547 k€). 40% of these projects concern private companies and 40% are established through the Carnot network. The first effect of these increased interactions was an almost doubling (4 to 7) of Cifre PhD grants hosted by the institute. This can be seen as a result of the IJPB active policy to promote such partnerships, notably by organizing dedicated events (Saclay Plant Innov Day, activities of the "Plant Biotechnology" group). During the evaluation period, **ten Patents** have also been registered during almost doubling the number of active patents held by the institute (16). For example, the PHYGERM team has developed an innovative seed priming technology, called **Smart Priming** that enhances germination vigor, promotes seedling stress resilience against biotic and abiotic factors and extends the longevity of the primed seeds. This process and its applications were protected by **two international patents** and is now exploited by a **start-up Seed-in-Tech** established in 2021 that offers prospects for international developments. This promising start-up received numerous awards and funding (7, see table 8 p.69) during the evaluation period.

IJPB scientists are also taking an active part in the public debate and interact will policymakers based on their expertise in GE. This involvement takes two main forms: memberships in biosecurity panels (*e.g.* 44 publication co-authored by IJPB researchers for the EFSA since 2018, and involving Anses as well) and testimonials during public hearings (*e.g.* intervention in front of the french Senate in 2021 about NBT). For example, leveraging unique know-how in plant genome engineering using new genomic techniques (NGTs) such as CRISPR/Cas Prime and Base Editing, DRAGON has established strong partnerships with industry leaders and is deeply engaged in GMO policy decisions as an expert within the European Food Safety Authority (EFSA) working group since 2009.

The involvement of the IJPB in outreach and dissemination is excellent, or even outstanding. During the evaluation period the IJPB has significantly developed its leadership in outreaching and dissemination through the creation, hosting and participation of/to various dedicated groups with its various trustees (SPS, INRAE and EPSO). The institute also coordinated several outreach projects supported through external funding, partnered with national and local associations (*e.g.* Association Robert Debré, Yvelines environnement) and even hosted two artist residencies, leading to exhibitions, conferences and debates toward the general public (48 actions during the evaluation period, see section 3-1-4-3-3). The IJPB has also produced 15 outreach support activities (*e.g.* serious games, 3D printed materials) that are regularly used in public and school events. The institute has also had a long-lasting interaction with Ministry of Education and the Versailles Academy. It notably provides training for secondary school teachers (19 scientists involved, 100 trainees) and conducts on site interactive visits for pupils (*e.g.* "Des Plantes et des Hommes" program). Overall, **1305 pupils** have been interacting with 43 researchers of the institute. Furthermore, this did not stop when the pandemic hit, since 14 IJPB scientists have been involved with 600 pupils through visio-conference events during this sad period.

Weaknesses and risks linked to the context for the three references above

While coupling of fundamental and applied research is excellent in some teams, some others despite working on topics with strong potential agricultural applications seem to show less interest in translational research.

The number of patents is relatively small given the size of the unit, concentrated in the same few teams.

One point is sometimes not clear in the document. Often, we cannot see which research team is leading the efforts of sharing scientific knowledge with the general public, and which ones really take part in debates in society. So, some clarifications are needed in the future to avoid the risk of having always the same "people" within the IJPB who are engaged in outreach and societal activities.

Outreach activities often result from the efforts of a restricted number members of IJPB members.

ANALYSIS OF THE UNIT'S TRAJECTORY

IJPB was created in 2010 through the fusion of five research units to form what was one of the first TGUs of INRAE, as a centre of excellence in plant biology. Its initial focus was plant biotechnologies for breeding, and renewable carbon and biomass. A major force of IJPB is its multidisciplinarity resulting from the expertise of its five founding laboratories; in molecular genetics, biotechnology, plant physiology, chemistry and mathematic modelling.

The objective of the unit for the last contract was to contribute to determination and prediction of plant growth and production under changing environmental conditions and evolving societal expectations via fundamental science, mainly in three areas: genome adaptation, metabolism, and signaling and development. Agroecology, smart crops, biotech and synthetic biology were targeted for exploitation and innovation. This has led to the development of new research having agroecological applications in particular with focus on biostimulants and biocontrol, deciphering the molecular mechanisms controlling plant-plant and plant-microorganism's interactions, with reinforcement and reorientation of two teams SYNAPS and SAS. In addition, a start-up Seed-in-Tech was created by the PHYGERM team to exploit the smart-priming technology to stimulate seed germination. Another strategic priority was to boost the development of modelling and prediction of plant growth. This was achieved via a recruitment in the PAR team (supported by an ERC grant) and the purchase of two super-resolution microscopes. A third strategic choice was to extend the existing competencies of the unit in primary metabolism tor the study and exploitation of specialized metabolites. It was supported by technical development of the PO-Chem platform and four recruitments of young scientists in the domains of synthetic biology, biomass, cell wall and seeds (ABSYNTH, GAS, PHYGERM, SEEDEV teams). The already outstanding reputation of the unit in the domains of epigenetics and seed science has been comforted by a recruitment in the EPIREP team.

In a context of accelerated retirements and limited recruitments, two teams have however been or will be discontinued: those dedicated to lipid protein homeostasis and to retroelements in *Nicotiana*.

IJPB on the evaluated period is an extremely well structured and managed unit that found an equilibrium between scientific freedom given to its staff and soft reorientation toward common goals. This is achieved through an excellent fit within the BAP (Biologie et Amélioration des Plantes) and TRANSFORM (Aliments, produits biosourcés et déchets) departments of INRAE and AgroParisTech thematic priorities and an exceptional set of state of art platforms in an optimal local scientific environment. During the period, the unit has succeeded in maintaining or slightly increasing its ground scientific production, while initiating novels research lines, increasing its local and international visibility, as well as interactions with the socio-economic world, its teaching and outreach activities within well-structured frames. It has also actively worked on the consolidation of its platforms, making sure to maintain them at the highest technical standard and sometimes making them unique at the national or international levels. Efforts were also made, with significant success, to keep the work forces required in key domains while recruiting novel competencies in innovative fields, in a context of recurrent waves of retirements. We just regretted that emergence of new teams resulted from split of in-house competencies rather than prospective thinking to promote the emergence of innovative themes or rare disciplines unrepresented in the current research.

Importantly, the future trajectory and priorities of IJPB have been defined collectively and therefore have the acceptance of most if not all staff. In this positive context and dynamics, IJPB has defined its main goal as "development of multidisciplinary concepts and tools that extend fundamental knowledge about plant biology and agronomy towards solutions for complex scientific and societal challenges". Its multiscale strategic project was outlined as six core values (collective work and resources, multidisciplinarity, team scientific independence, strategy for synergy, visibility, sustainable development), three flagship projects (future trends) advertising IJPB strength in emerging domains and contribution to societal needs and 17 scientific priorities pooled in three main axes. Those were defined via an internal audit and unit teams around key questions.

Two notable changes can be mentioned. Visibility is the motivation for changing the name of the Unit to Institut Jean-Pierre Bourgin for Plant Science. Another important change will be the diversification of the plant species used as models to answer specific questions. A diversification now permitted by the availability of new genomic tools.

These changes will be complemented by definition of four new scientific departments (Biomass, Seeds and Bioproducts; Developmental Biology, Signaling and Modelling; Genome Biology; Physiology and Interactions) ensuring additional interest intersection among teams.

The three flagship projects that will guide transversal activities and the strategic choices of IJPB during the next period, including equipment and human resources are:
1. The development of new breeding technologies in plants: from lab to field: the aim here is to exploit the exceptional know-how of the unit in genetic engineering to increase genetic diversity to enhance varietal creation.

2. The understanding of plant biological processes at micro- and nano-spatial level and the link to macro-phenomena: this flagship project is aiming at an optimal exploitation of the unique imaging tools currently available in the unit as well as their expertise in laser-assisted microdissection of plant tissues (unique at the national level).
3. The multiscale integration of natural and induced trait plasticity into regulatory networks: this flagship project takes advantage of the exceptional phenotyping and modelling capacities of the unit, associated with available and new omics data to describe and understand plasticity effects and plant adaptation to changing environments.

The new IJPB scientific priorities have also been grouped in 3 main axes for increased visibility and more integrated scientific strategy. Each encompasses research priorities involving participation of several teams. Axis 1: Advancing knowledge of basic plant functions and interactions (involving the 27 teams and (57% of the work forces). Axis 2: Design of Smart Crops for sustainable agriculture in the face of climate change (25 teams and 30% of the work forces). Axis 3: Toward novel plant-based products for food and non-food uses (12 teams and 12% of the work forces).

The scientific trajectory of IJPB is thus very carefully planned, based on flagship projects, axes and priorities so as to boost the unit's visibility and to best match the priorities of supervising bodies (at the interface of the BAP and TRANSFORM objectives and fitting AgroParisTech thematic areas), IJPB scientific specificities, technical and synergistic potential, latest scientific developments, and societal expectations. The objectives that include optimal valorization of the existing expertise and tools as well as exploration of emerging topics have been appropriately selected. The Unit may however include strategic thinking in terms of opening new teams as already mentioned above.

For each priority and flagship project, needs in resources are anticipated as far as possible. Obtention of project running costs is anticipated via funding applications from ANR. At the date of the submission of the SAD, funding for 33 projects were already acquired and this number has significantly increased at the date of the visit, some of these fundings running until the end of the next period. Five new ERC applications, submissions to Marie Slodowska-Curie Actions (one) and Horizon Europe (two), expected support from PIA France 2030 with the expertise of IJPB sought in four areas (plant breeding biotechnology, protein diversification, bio-sourced products, biomass valorization) and a further 8 proposals are under evaluation. Axes 2 and 3 are strategically designed to be sources of collaboration with industrial partners. In this respect, the unit expects opportunities to be provided by the UPSaclay innovation cluster that was selected to support technology transfer through the France 2030 investment plan.

Concerning the running costs, the unit maintains steady efforts to reduce the rising utility costs, in particular energy, via greenhouse closure or optimization (refrigeration, lighting), yet energy running costs may become a problem on short to medium term, given the large surfaces of plant cultivation and increasing data storage and processing. Maintenance and renewal of the platform equipments to keep them at the top may also become a problem. We also have to mention that possible reduction in the national allocation to contractual research (in particular in the overall budget of ANR) could seriously challenge the IJPB project.

Human resources could be another problem since a peak of departures via retirement is ongoing and further expected for the next years (34 staff members in 2024-2025, the same number during the coming contract). Given the predicted trajectory, a third of the teams could be with a single researcher by the end of 2028, but no team is at risk to close. The unit is very actively searching new recruits, both via mobility and novel recruitments: six positions (2 professors or lecturers, 2 engineers or technicians) were expected to be filled by 2025 at the date of the SAD. Six others were awaiting decision to be opened. Some delayed retirements could also help filling a gap. We consider that IJPB has strong assets (excellent visibility, exceptional equipment and infrastructures) to attract very good candidates in the next years. For recruitment, so far, the Unit benefits of excellent support from its current funding bodies. Another possible source of workforce could be found in the inclusion of IJPB into Paris Saclay University, which is strongly encouraged.

To support its projects, IJPB will intensify its networking and communication, both nationally and internationally (in particular to create opportunities for industrial collaborations via the UPSaclay Institut Pascal), for example via a renewal of the INUPRAG trilateral agreement with Swedish and Spanish laboratories, or a new partnership with a Cornell-hosted start-up (Meiogenix). More teams could consider seeking funded collaborations with industrial partners, hosting Cifre students or LabComs. Considering the size of the facility, hosting an external start-up could be a source of income.

The international networking of the Unit is already very active but could intensified in particular in terms of well-funded collaborations, via more actively searching MSCA candidates and entering large European projects. The ongoing partnership of the OrganoRepro team with team of the Shanghai Jiao Tong University supported by the 111 programs of the Chinese Ministry of Education can be a first step to the establishment of an LIA. It can however be noted that, given the performance, equipment and expertise of the IJPB, the extra European networking would be expected more intensive, in particular with China which is in active demand of such

collaborations. The outstanding tools and platforms, as well as topics of the unit could be excellent starting points to set-up new international funding applications from the HFSPO that provides excellent transcontinental funding with minimal administrative constraints.

Concerning teaching and outreach activities, IJPB is planning to pursue its activities within UPSaclay in a context that is not definitely set, possibly within a European COFUND structure, which would be an excellent idea. Given the evolution of the UPSaclay Plant Science Master programs, an increase in student internships is expected. There was a very significant increase in outreach activities during the evaluated period. These activities will be pursued and further structured via the appointment of an outreach working group in 2024. Future actions will include increased accessibility of the laboratories (regarding security constraints), increased quality and relevance of offers and supports to fit target audiences, increased number of long-term projects with schools with special focus on elementary and middle schools, reinforcement of the art and science activity with the implementation of large-scale project in the local historical context in partnership with local actors like the Versailles Palace, the King's Kitchen Garden, departmental archives, a design school and UPSaclay Diagonale. This should further reinforce the already outstanding outreach activities of the unit. Given the central location of the Unit, more activity of its members in the media would also be welcome.

Open science policy is already implemented though HAL Open Access Repository and the data repository Recherche Data Gouv. It will be further enhanced by the creation in 2024 of the IJPB HAL collection and the appointment of a dedicated personnel (reconversion) to feed this resource. The creation of an IJPB Dataverse in 2024 will facilitate the exploration and reutilization of data. The unit will pursue its reorientation away from predatory journals and continue to inform its scientists of the existence of the INRAE ethical committee. Optimal cooling strategies will be reinforced for energy saving. Communication will be further optimized especially regarding the systematic use of English language, which is required and strongly encouraged. Welcome administrative support to foreigners should also be implemented as a welcome booklet or any other form.

In summary: overall the trajectory of IJPB is extremely well structured and organized, especially from a scientific point of view, with excellent anticipation to maintain human resources and self-funding capacity. The main challenges the units will have to face are 1) the reduction of its human resource that might lead to refocusing and team fusions, 2) a possible decrease in recurrent/competitive funding of research at the national level. More efforts in the search for international funding is thus recommended, even beyond European borders. It could benefit from increased international visibility via an international teaching structure.

Concerning team's trajectories:

Team 1 ((APSYNTH)
The trajectory is in line with the team's skills and know-how, but more importantly it's well positioned both in terms of lignin sourcing and fractionation and in terms of scientific challenges. The two internal collaborations with the GAS and Qualibiosec seem really pertinent.

Team 2 (CATS)
The team is investigating the interplay between carbon allocation, primary metabolism and plant growth by studying the molecular physiology of sugar transporters at different scales (subcellular, cellular, tissue organ). In this field of investigation, the team is working on two axes. The first one is to advance knowledge of essential plant functions and interactions; the second one is the identification of new strategies to mitigate climate change and its negative effects. Of particular interest is the plan to investigate sugar transporters in the root system, considering root architecture and exudation. Similarly interesting is the plan to investigate sugar transport in environmental conditions typical of climate change (elevated atmospheric CO2, water scarcity, etc.). Overall, the team's trajectory for the near future is correctly oriented and very well defined.

Team 3 (DYSCOL)
The scientific trajectory of is to capitalize on previous work and to investigate plant Lipid Droplets to develop sustainable bioeconomic systems based on plants. They will study whether LDs are degraded by lipolysis or autophagy during the recovery phase, and follow the analysis of LD structure in the frame of an ANR.

Team 4 (NPI)
In the near future, the team will continue to work on the understanding of the mechanisms behind abiotic-biotic multistress interactions. One commendable activity of the NPI team is the extension of abiotic effect factor beyond N deficiency. Specifically, in a recently funded project, the NPI team is extending its activities to the effect of iron (Fe) deficiency on biotic stresses. Activities will also be devoted, in collaboration, to other plant systems, ie. tomato. The team also plans to extend its activity to the study of apoplastic fungal and bacterial endophytes, with a new proposal has been deposited and selected for the second phase.

Team 5 (NUTS)
The team trajectory is a direct continuation of work in progress focusing on a few important regulators identified in TOR (LOKI) and N pathways (NRT2.7; NLP2, 6 and 7), the interconnection between micro-organisms & plant N nutrition and the identification of targets of biostimulants. An important part of this research will be performed on crops. As it stands, this would appear to be the logical way to complete the work in progress but does not give any indication of the choices that will have to be made to take into account the retirement of an important part of the scientific staff.

Team 6 (PHYGERM)
For the next period, PHYGERM builds on its recent advances to develop projects within the three thematic axes of IJPB. Projects in axis 1 include investigations of the molecular mechanisms underlying germination, priming and seed vigor, with focus on potential signaling capacity of novel seed specific apocarotenoids, role of sterols, influence of xyloglucan on germination, and pectin synthesis. Axis 2 projects are focused on seed and seedling adaptation to biotic and abiotic environment to improve seed protection. This includes testing the potential of biocontrol and biostimulants on seed properties, continuation of the exploration of the role of non-coding RNAs in seed dormancy, determination of the role of seed exudates in shaping the seed microbiota (and impact on defense). Axis 3 projects aim at boosting seed nutritional quality, performance and immunity via different seed treatments and agricultural practices. Besides fundamental research, the team also proposes several innovative translational projects focused on the nutritional quality of the seeds or biocontrol/biostimulation. All these projects sound exciting and fully relevant. Investigations pursued in the three axes are often interrelated, and significant funding is already obtained for several projects, to the horizon 2028-2029 for a few of them. The recent integration of two lecturers and two support staff members in mobility is a significant asset for the implementation of the team plans. It also brings new competency and potentially new ideas and projects. Care has however to be taken to avoid a too large dispersion.

Team 7 (QUALIBIOSEC)
The team combines multidisciplinary expertise to answer common questions on the plasticity of biomass digestibility. Their results provide a better understanding of the relationships between cell wall composition and recalcitrance. The new biochemical and histological analysis methodologies developed during the evaluated period will now facilitate rapid analysis and screening of a large number of genotypes and new abiotic or biotic stress events (considered isolated or in combinations), including other forage species, in collaboration with other groups. The project proposed by the team is in line with what has been done to date and with the IJPB's research priorities. There are no major changes, except perhaps in the CHAMPAGNE project, in which the team plans to study how cell wall modification at root level has an impact on mycorrhization, extending the objective of understanding plant resilience to climate change to the level of agro-ecological transition.

Team 8 (SAS)
The SAS team has a solid international reputation built over the years, visible in its scientific products and its high-level scientific network. In addition, the group can draw on its institute's platforms to continue developing new methodologies. Among these, the team is now implementing gene editing in Pea, in order to streamline strigolactones-related gene functional analysis, based on a new starting PhD positions. The group has strong expertise in metabolomics, and recently published a paper proposing a method for analyzing strigolactones by mass spectrometry. Under this perspective, several molecules will be identified from moss exudates of various mutants in order to characterize the strigolactones-based plant to plant communication mechanisms.

Team 9 (SATURNE)
SATURNE is qualitatively and quantitatively highly productive. Year after year, the team continues to produce regular, high-quality work. Their well-known expertise on autophagy and NUE provides opportunities to get fruitful collaborations and to raise important funding from both public and private origins. The various approaches (GWAS, proteomic) resulting from extensive groundwork have borne fruit, enabling us to identify a large number of candidates. The team therefore has a number of promising avenues open to it, which now need to be validated to produce publications commensurate with the efforts made. The foreseeable drop in technical staff should be an opportunity for collective reflection to decide where to concentrate the team's strengths.

TEAM 10 (SYNAPS)
SYNAPS is currently trying to provide applied sustainable solutions to implement agroecological concepts to current "classical" agriculture. Based on their previous expertise (the maize nitrogen nutrition and metabolism), they are moving towards integrating the microbiome compartment as part of these solutions to better fit the IJPB Axis 1 and Axis 2. They are also relying on their metabolic modelling expertise and the hire of two new scientists (B Alunni and K. Magne). The future recruitment of an AgroParisTech assistant professor (Maitre de conférences) in 2025 will help strengthen the team.

The team's trajectory is mainly a continuation of previous work on the molecular and physiological processes involved in maize nutrition, which is logical since the team is well recognized and very competitive in this area. It seems that these proposed research plans have been influenced by the arrival of the team leader in 2018 (A. DELLAGI) who seems to have strengthened the team structure.

However, it is good that the 3rd trajectory point of the team aiming at studying mechanisms involved in N nutrition in inter-cropping systems is not solely related to corn, but also to legumes and other cereals. Studying inter-cropping agricultural systems is seen as a good way to extend the team's expertise on applied ways to mitigate the application of synthetic nitrogen fertilizers, and also to foster further collaboration with outside research teams.

Team 11 (ACCI)
The scientific trajectory of team 11 is shifting toward a relevant and genuine multi-disciplinary approach of cell-to-cell adhesion. Despite this promising perspective, its very small size and the other duties of the team leader could prevent the team to achieve its scientific ambition.

Team 12 (BRC)
The team will continue to study the mechanisms involved in totipotency and the initiation of morphogenesis. The team's trajectory is well positioned at the interface of two IJPB axes (knowledge of basic platinum functions and design of intelligent crops for sustainable agriculture). The project is mainly based on recent ANR PRC project consolidated and coordinated by the team until 2027 with a post-doc recruited in this context. The team will still devote a part of its time to sharing with the scientific community how to transform, regenerate and edit the genome of several plant species, through the RegenCrop consortium and with the support of the PEPR SVA.

Team 13 (CHRODYNO)
The main team trajectories are in line with IJPB axis 1 and are related to seed biology. The team is first proposing to develop novel lines of research based on current funded projects (such as the ANR-CLEANSE project) to better understand the pathway of cell wall-derived signaling and its developmental and evolutionary implications. They are also proposing to keep working on sugar signaling and the elimination of the nucellus. We appreciated that the team plan on submitting an ANR project on this topic in 2024. It is also good that the team plan on strengthening its leadership in the study of amaranth seed development by searching for new lines of funding. We also appreciated that the team wants to expand its expertise by working on projects in line with the IJPB axis 2 and 3 which would be related the study and the connections that exist between metabolites (amines, sugars), gene regulation and epigenetics in the plant responses to abiotic stresses. The team is planning to recruit a new researcher (CR) which may prove crucial for the sustainability of the team. Note that the description of the project on chromatin and drought (PORTFOLIO 3) is not very clear and is described in very general terms despite previous requests for clarification and precision. For example, no precise experimental work plan has been presented.

Team 14 (DIPOL)
The scientific trajectory of team 14 DIPOL is to investigate the role of lipid metabolism during abiotic stress like drought and heat stress as usually found during summer cropping. Notably, the ANR RecovOil will be pursued in collaboration with other teams of IJPB to understand how and why LDs are degraded after heat stress in Arabidopsis. Since the last evaluation, the team has decreased in size. A Junior Professor chair has been selected by AgroParisTech for 2025 to develop the Camelina program. The evaluation committee cannot but express some worries about the small size of the team and the number of scientific perspectives which strongly overlap with other IJPB's team like DYSCOL for lipid droplet or SEEDEV for Camelina. In its present configuration, it is not obvious at all that the team DIPOL is well equipped to achieve its goals.

Team 15 (FTA)
This team is already well established internationally in its topic of research. Future plans build on this solid foundation, seeking to gain an improved knowledge of the transcription factors that regulate organ boundary domains (BD) and plant architecture, as well as to explore the structure and function of hydathodes. This trajectory, together with modelling approaches, will allow a deeper investigation of BD roles in plant development but with the important added focus of "across different scales". This is an innovative aspect of the future work in this team as is a strong focus on new tools for the quantification and modelling of development.

Team 16 (GAS)
Considering that GAS is a young research team, its project is in line with what has been done for two years. The team's trajectory first concerns the perception of free oligosaccharides arising from the plant cell polysaccharides or plasma membrane phospholipids during the plant development. The second project focuses on the comparative analysis of oligosaccharides released by resistant and susceptible plants in two pathosystems with the final goal to identify new elicitors. However, the project is not clearly funded, and this further emphasizes the imperative need to rapidly get national and European grants.

Team 17 (MIN)
Over the evaluated period, team 17 has been steadily gaining international visibility thanks to a series of excellent scientific results. The team has identified three main axes of development for the coming years, some requiring outside expertise. Collaborations and/or recruitment will therefore be of prime importance.

Team 18 (PAR)
The team proposes to benefit of its internationally recognized expertise on primary cell wall assembly and expansion to implement new research topics on (i) the study of this process on root hairs and hypocotyl epidermis as model for tip- and diffuse growth, respectively; (ii) the investigation of biomass quality traits through imaging techniques and (iii) investigation of single polysaccharide mapping by super-resolution microscopy. The project is already funded and workforces are available.

Team 19 (SEEDEV)
The scientific trajectory of team 19 SEEDEV is to study the mechanisms that control seed development, composition and quality, that will allow the development of tools to modify the accumulation of storage compounds in seed. The seed resilience in response to heat stress will be also studied. Investigation of the biological functions of the unusual fatty acids already identified will be followed under the frame on an ANR project. Strong translational research is developed towards crop species like pea, camelina, lens and chickpea (Projects Pea-Value 2020-24, Oleoprotid and ValoN project 2024-28, TriHelix 2020).

Team 20 (SPACE)
The size and complexity of the multi-gene families making up the TTP complex and its relationship with the cell cycle means that there is a huge amount of work to be done. The team continues to produce high-quality work that has led to very fruitful collaborations. Nevertheless, its own productivity is very limited, resulting probably from a combination of factors (a strong methodological investment that has not yet fully paid off, a desire to aim for prestigious publications, multiple grants but limited number of important ones, etc.). If the publications announced as part of the preparations materialize, everything should return to normal but if this is not the case, the team will have to revise its publication strategy in the near future.

Team 21 (DRAGON)
The DRAGON team proposes pursuing fundamental research on DNA double-strand breaks and applied research. The team has obtained two grants with MeioME, which will end in 2026. This strategy and important fundraising should help to keep basic research efforts at a high level. In addition, the PI has established a consortium that has successfully obtained PEPR funding, which will end in 2028, with two IJPB teams participating as partners (SAS/VAST). However, the forthcoming retirement of a permanent scientist in 2025 may hamper the ability to maintain basic and applied research simultaneously.

Team 22 (EpiRep)
Anticipating the forthcoming retirement of M.A. Grandbastien and the progressive ending of her research lines on Nicotiana TEs, the trajectory opens a new cycle of research developed by F. Borges, a young INRAE research scientist currently co-PI and future PI of the team. The project ambitions to integrate a highly competitive field of research on the epigenetic determinants of Arabidopsis seed-based hybridization barriers, with potentially important outcomes on the molecular mechanisms affecting inter-specific, inter-ploidy, or inter-variety hybridization. Initially supported by two JCJC and PRCI ANR grants, at the time of submission the trajectory was not sustained by funding after 2025.

Team 23 (EpiARN)
Over the last 30 years, the EpiARN team has made groundbreaking discoveries on the molecular mechanisms of transcriptional and post-transcriptional silencing in Arabidopsis. The scientific projects are given a new orientation toward genome defense mechanisms in response to biotic and abiotic stress that are, again, highly promising. The team has secured funding until 2028. However, the PI questions the team's future after the two founding members will retire in 2029. In the forthcoming years, they might no longer be legitimate to apply for new funding or launch new projects unless a new permanent researcher could take the team over.

Team 24 (MEIOME)
Building on established expertise, solid collaborations with both academic and private players, and highly successful fundraising until 2028, the proposed trajectory on multiple aspects linked to meiotic recombination is very ambitious but realistic. Despite a very promising future, the imminent retirement of a key team member raises concerns about how the MeioMe team dynamics will evolve, with a possible loss of expertise (e.g. in genomics), and its ability to support multiple research directions alongside the planned collaborative studies while maintaining its successful path.

Team 25 (OrgaRepro)
The OrgaRepro team will pursue its long-term efforts in deciphering the mechanisms regulating mitochondrial gene expression through RNA processing and translation regulation, complemented by strategies to address the role played by mitochondrial cis-regulatory elements in CMS in plants and in *P. patens*. If successful, investigations on CMS and fertility restorers could become the main research focus of the team. Involving international and agro-industrial partnerships, this ambitious trajectory is solidly established and should open important opportunities in translational research. Yet, at the time of submission, most funding was ending in 2025.

Team 26 (VarEpi)
The team's trajectory is a follow-up of ongoing research on Arabidopsis and tomato with a potential bridge between both axes with the generation of tomato ibm2 CRISPR/Cas mutant alleles. The first axis on Arabidopsis should provide original insights on chromatin modification mediated by the IBM2 complex. Yet, benefiting from unique collections of tomato lines, the 2nd axis is both solid and ambitious and could be more promising given excellent partnerships and potential openings in translational research. However, at the time of submission, both funding and manpower were cruelly lacking.

Team 27 (VAST)
The team's project is in line with what has been done to date: to go further in elucidating the genetic architecture of the traits underlying plant adaptation and evolution. What is new, however, is the systematic use of state-of-the-art phenomenological, bioinformatics and modelling approaches. Mathematic modelling in particular will be intensified, via new interdisciplinary collaboration with the MathNum division of INRAE (Miaige, Jouy), which will add more potential but also an additional level of complexity and require more input from the biological side, Resource balance analysis models will be used to predict resource allocation in plants subjected to various isolated or combined stresses, to predict plant responses to complex stress scenarios and to inform quantitative genetic approaches with candidate genes or at least pathways. An INRAE Digitbio programme has begun to fund this new approach and the consortium has submitted an ANR project at the Math/Bio interface, an ANR grant has already been obtained on this subject in 2023 (Project *ModLSys 2024-2028)*. The project is very ambitious for the size of the team, and the contributions of the other teams in the IJPB unit are not described, if any.

RECOMMENDATIONS TO THE UNIT

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

The committee acknowledges the steady efforts of the unit to maintain critical positions and to recruit new competencies. These efforts must be maintained, if not intensified, in the next years to maintain platforms at the same level and to keep teams with critical mass (or some teams will have to consider joining their forces). Further increasing international visibility via teaching and networking activities might help to attract more talents.

The unit is on an excellent trajectory regarding the increase of partnerships with socio-economic actors. Reinforcement of this trend might become critical to maintaining a suitable operational budget.

European and extra-European networking with other continents (in particular with Asia), could provide additional resources (self-funded students, grant funding) that have not yet been fully exploited.

The committee strongly supports the unit in its shift to a more general use of English language. This could include training of technical staff in English language.

Increase the pooling of technical resources by forging more partnerships with platforms and laboratories on campus and with other INRAE sites. INRAE is known for its exceptional technological platforms. We can therefore imagine that the unit will benefit from access to additional microscopy, phenotyping, metabolomics, etc. resources through more collaborations within the INRAE networks themselves.

In the context of the energy crisis, the unit is encouraged to apply to grants, especially European ones, that could help cope with their increasing energy expenses. The committee also encourages to explore infrastructure upgrade programs, in partnership with the trustees and local policy makers (*e.g.* région Ile-de-France), that could help reduce their functioning costs as well as their carbon footprint.

The unit should consider merging small teams working on the same topic with complementary skills/approaches or using the same technical resources in the future.

Recommendations regarding the Evaluation Area 2: Attractiveness

Thanks to its dynamic policy and its excellent position in plant education in the Paris region, the unit has maintained a high level of scientific visibility in both the French and international plant communities. This is clearly illustrated by the significative number of PhD students (15%). On the other hand, the number of post doc (4%) is quite low for the size of the IJPB. The institute should consider ways of increasing its attractiveness to attract students with their own funding. In both cases, foreign candidates should be identified to take profit of the EU Marie Sklodowska Curie funding program.

Live oral presentations at scientific meeting are essential to maintain the IJPB international visibility, but also to build-up the personal relationships required for structuring international collaborations. Those should not be restrained for the sake of carbon cost that is very minor compared the total carbon footprint of in-house research.

Given the IJPB's prominent position in French plant biology research we regret the withdrawal of the CNRS as supervisory body. Discussions between supervisory bodies should be held to reverse this regrettable situation in order to fight the decline in the plant science community in the Paris region as Versailles facilities clearly offer outstanding conditions for plant research.

Joining Paris Saclay University could also counterbalance the loss of staff process and benefit the coherence of plant biology in the Ile-de-France region.

To increase its visibility in the media, the unit should capitalize more on the local youth of the Paris region, especially on PhD students and ITAs.

Recommendations regarding Evaluation Area 3: Scientific Production

The organization has a large, committed and successful research consortium that are internationally competitive. It has maintained a strong publication output, highlighting the current relevance and internationally competitive nature of the research. While the unit should continue to focus on high quality basic research, the number of publications could be increased, particularly involving a wider range of top journals, highlighting the wider relevance and implications of the research.

The organization provides an attractive environment for early-stage researchers, and should not only seek to promote the output of these researchers but also engage them in the wider distribution of published information through social media, international meetings, etc.

The organization has developed a diverse and vibrant academic community that not only publishes basic research but also serves local needs but addresses key environmental challenges. These areas could be represented more in terms of scientific output, serving to reach high level generalist journals.

The organization has hosted significant numbers of visiting scientists, but it is not clear how this strength links between the parent institutions. Joint publications between leading institutions, particularly in Asia would serve to increase the visibility of the organization overall.

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

IJPB contribution of research activities to Society is excellent over the period. However, some teams should be encouraged to join the unit's translational efforts to increase the application and patent output.

A better description of what could be achieved in the next 4-5 years is a bit lacking. The team's future strategy does not appear to be clear enough in order to increase its impact beyond basic science when involving private partners, or to interact more widely with society.

For example, how is the IJPB going to try to increase the participation of women, persons with disabilities and underrepresented minorities in science and technology? Additionally, nothing really was mentioned about how the different research projects can improve the well-being of individuals in society… Finally, it would be interesting to see what is done (or will be done) to improve education and educator development from middle to high school in science and technology. These points need to be addressed in more detail in the future Hcéres report.

The IJPB community could be more active in classical and social media, with participation of a larger number of staff members, in order to further stress the importance of Plant Sciences. While this is already the case, the young permanent and non-permanent staff can be further encouraged to participate to all types of outreach activities.

TEAM-BY-TEAM ASSESSMENT

Team 1: Lignocellulosic Biopolymers: from Cell Wall Assemblies to Synthons for Green Chemistry (APSYNTH)

Name of the supervisor: Ms Stéphanie Baumberger

THEMES OF THE TEAM

APSYNTH is a research team focusing on lignin and its phenolic derivatives. Their works are developed according to three interconnected axes: the understanding of lignin structural variability on the delignification process, the development of methods for its chemical and biological conversion, and establishing structure-function relationships for high-value bioproducts.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Although no section is devoted to this part of the team report, it is clear that the team has continued its excellent scientific production. Concerning oral presentations in international meetings, 11 talks were given in international congress abroad whom two in France and four invitations during the period beside the Zelcor meetings.

Following the recommendations about the Zelcor project results exploitation, between 2018 and 2023, Zelcor has produced 20 original scientific papers, half of them involving Apsynth.

The team has also developed many external collaborations additional knowledge and/or experimental approaches (Ineris, CNRS Institut Lavoisier de Versailles, Univ. Paris-Est Créteil, INRAE UMR FARE and others, Univ. of Warwick.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**7**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	**3**
Total personnels	**10**

EVALUATION

Overall assessment of the team

The team is very good to excellent in terms of visibility, projects coordination, outcome and leadership in higher education. Their work has the potential to make a significant impact on the development of a sustainable lignocellulosique biorefinery.

Strengths and possibilities linked to the context

APSYNTH has gained an international reputation on lignin and relative phenolic compounds. The team was coordinator of a large-scale European project (H2020-BBI) and partner in two other projects (ERA-NET and ERA-CoBio) that have contributed to its international reputation. Other national projects have added to their scientific objectives such as ANR, PIA as partners and two Cifre contracts. Their dynamism in submitting and obtaining projects enables them to attract a substantial budget. Collaborations reflect the team's attractiveness in its field: lignin fractionation, depolymerization and functionalization, and are reflected in joint publications. The team has a robust expertise in lignin characterization allowing to contribute in establishing structure-function relationships. The team is also regularly invited for peer-reviewing activities (editors, funding agency, recruitment, thesis juries and committees) which reflects their visibility. The team strengthened its attractivity with the creation and coordination of an Erasmus Mundus Joint Master program gathering 5 European universities and involving other IJPB teams for training and allowed the team to host one visiting professor and one PhD student from abroad.

The team has a very good publication record of 39 articles in peer-reviewed journals, half of which have a major impact in the field, such as Ind. Crops and products, ChemSusChem, Sustainable Materials and Technologies, Carbohydrate Polymers, Nature Communications,… They also published 2 review articles, 2 book chapters, 1 edited book and were very active to present their works in congress (30 oral communications and 18 posters). There are also 5 invited conferences, mainly in France and editorial activities. Publications involve support staff and PhD students, 4 during the period, who have a reasonable scientific output as first author. During the period, the application as lignin-based emulsifying agent has been patented on the PhD' work under a Cifre contract. The team has developed links with the non-academic world through projects with the private sector, including a Cifre contract and targeted industries in plastic packaging and cosmetic concerned with lignin or its derivatives for bio-based applications, in addition to the partners involved in EU projects. The team is also involved in teaching, notably as part of a joint Erasmus Mundus joint master's program and the organization of three summer schools. This led to one contribution for large audience on bioeconomy.

Weaknesses and risks linked to the context

The leadership position is not clearly visible in the publications since only five publications are co-authored as last author. This can also be seen from the relatively low first-author publication rate for doctoral students.

The team is not yet very involved in the aspects of contributions to inclusion in society by the mean of sharing its knowledge with the general public and debates in society.

The major risk will be to face to staff departures (1 Research Director and 1 Technician on 7 permanents).

Analysis of the team's trajectory

The trajectory is in line with the team's skills and know-how, but more importantly it's well positioned both in terms of lignin sourcing and fractionation and in terms of scientific challenges. The two internal collaborations with the GAS and Qualibiosec seem really pertinent. There is no indication of the fundings for the next period.

RECOMMENDATIONS TO THE TEAM

The desire to add value to lignin, although not new, is both highly competitive in terms of research and still struggling to find high-value-added industrial applications on a large scale. The team could get involved in policymaking to influence supporting to this field.

The team should include in silico approaches including molecular modelling, for example through collaborations to save time and human resources, in order to strengthen understanding and predictive aspects.

International visibility should be increased by co-authoring more articles as last author.

Team 2: Carbon, Allocation, Transport and Signaling (CATS)

Name of the supervisor: Ms Sylvie Dinant

THEMES OF THE TEAM

The team investigates the molecular mechanisms governing carbon allocation throughout plant development, particularly when plants face environmental challenges. Specifically, the team studies the functions of sugar transporters in cell-to-cell and intracellular sugar transport. The team uses a wide range of methodologies spanning molecular biology and physiology.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report, the committee recommended to increase publication outputs, increase grant acquisition with emphasis on international agencies (ie. EU), and to recruit PhD students. These recommendations were addressed in the examined period, and the publication record can now be considered satisfactory. Grant acquisition and recruitment of PhD were also addressed but not completely solved, so that the same recommendations still apply.
The committee also suggested to continue the investigation around root exudates analysis, which was addressed by the team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**0**
Total personnels	**6**

EVALUATION

Overall assessment of the team

The scientific activities were assessed overall as very good to excellent.
The team has an excellent expertise in carbon allocation and sugar transport mechanisms as it is witnessed by the very good publication record. Team reputation is very good as members are invited to international conferences and are involved in outreach and innovation projects. Grant acquisition ability is very good and can be improved on internationally funded grants. Integration of PhD and post-doc scientists can be improved. The research trajectory appears excellent.

Strengths and possibilities linked to the context

The unit has a strong expertise and reputation in its field of research, as it is witnessed by the relevant publications (17 research articles and 3 review articles), including relevant articles in highly selective journals Plant Physiology and Journal of Experimental Botany. Publications appear really original in content and with strong impact. The team's original research works and skills represent solid points of reference for the group's near future. The paper Aubry et al. 2022. Plant Phys. appears of particular relevance as the authors demonstrated the sugar exchanges at the tonoplast, regulated by SWEET16, are important for xylem cell division.

The team appears strong in attractiveness as team members are invited to international conferences as speakers (8 invitations in the evaluation period); team's members also committed important efforts in the organization of scientific conferences (3 conferences or meetings).

Team members are active part of top-level master school at UPSaclay.

The team provided efforts in the organization of public outreach event (1) and other initiatives, including public-private networking innovation projects and R&D project. The team is engaged with initiatives aimed at reaching the general public to raise awareness about the importance of plant sugars in our society.

Weaknesses and risks linked to the context

The TEAM ability to secure research grants was good in the examination period, however no major European or other internationally-funded grant was obtained, and the majority of financial support was obtained by applying to internal (France) calls and agencies. There is a risk that inadequate funding will prevent the team from realizing its potential and prevent from keeping the pace of other international research groups.

Another weak point, somewhat linked with the first one is the limited presence of PhD students and post-doc level scientists in the group, which can potentially limit the production of deep, ground-breaking scientific results. A clear policy of recruitment of younger research-level staff should also be implemented in light of the planned retirement of some of the more expert team members.

Analysis of the team's trajectory

The team is investigating the interplay between carbon allocation, primary metabolism and plant growth by studying the molecular physiology of sugar transporters at different scales (subcellular, cellular, tissue organ). In this field of investigation, the team is working on two axes. The first one is to advance knowledge of essential plant functions and interactions; the second one is the identification of new strategies to mitigate climate change and its negative effects.

Of particular interest is the plan to investigate sugar transporters in the root system, considering root architecture and exudation. Similarly interesting appears the plan to investigate sugar transport in environmental conditions typical of climate change (elevated atmospheric CO2, water scarcity, etc.). Overall, team's trajectory for the near future is correctly oriented and very well defined.

RECOMMENDATIONS TO THE TEAM

While the scientific, teaching and outreach results of the team are overall very good, the team members should increase their participation to internationally funded research initiatives in order to increase team funding and integration in international networks.

The team will take advantage in having PhD and post-doc positions and a clear path addressing personnel recruiting and turn over should be defined in light of planned retirements.

Team 3: Dynamics and Structure of Lipid Bodies (DYSCOL)

Name of the supervisor: Mr Thierry Chardot

THEMES OF THE TEAM

The team Dynamics and Structure of Lipid Bodies (LB) is a rather large team with 9 permanent people which tackles the structure and dynamics LDs (Lipid Droplets) both at the lipids and proteins levels.
Four main axes are studied:
1/The dynamic of plant LD metabolism which aims to decipher the mechanisms involved in lipid remobilization and plant adaptation to heat stress. They identify a novel machinery for LD-associated proteins degradation necessary for the post-germinative remobilisation of lipids and discovered key components (proteins called PUX10 and CDC48A) of a novel LD-associated machinery they named the LD-associated degradation system (LDAD). Notably, PUX10 are integral LD proteins and are required for the correct extraction of ubiquitinated oleosins from the LD surface This work is published in Plant Cell in 2018, paving a new field in LD and a research project funded by ANR in 2021 for 4 years (RecovOil) investigating the role of LDs in plant tolerance to heat stress.
2/ Deciphering the structure of plant LD.
The team acquired powerful methodology to examine the structure of LDs and monitor their fate by a new micro-nano tomography beamline (ANATOMIX) at the synchrotron SOLEIL to image *A. thaliana* seeds at a subcellular level. It allows to characterize oleosin fold and insertion in the LD surface and analyse for the first in native condition the lipid segregation inside LDs.
3/ Insights into the structure-function of enzymes particularly DGATs catalyze the last step of triacylglycerol (TAGs) biosynthesis. The team gave focus on the peculiar DGAT3-type family. After expression in *E. coli* and purification they showed that AtDGAT3 possesses a [2Fe-2S] cluster, a new feature for enzymes with DGAT activity and pointed out an unexpected interaction with specific phospholipids including phosphatidylinositols (PIP3, PIP4) and cardiolipin. This first report of a metalloenzyme with DGAT activity was published in Science Report
4/Engineering of proteins for cancer research.
The team benefits from a great expertise in engineering of enzymes and in the field of 3D structure determination. In the frame of a collaboration, they have been solicited by the Institut du cancer et d'immunogénétique (ICIG) to engineer a new class of enzymes, the methionine gamma-lyases (MGLs). MGLs are effective in a wide variety of cancer cell lines and animal models, the team, recognized in the field of 3D structure determination, has been solicited by ICIG to engineer this enzyme. This theme attracts for a master, a PhD or post-doc.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In 2019 " Given its small size and heavy involvement in teaching, the team should prioritise its efforts on either the functional and structural characterization of lipid droplet proteins or on DAGAT acyltransferases."

This recommendation was clearly followed in the current evaluation period.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	2
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	9
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	2
Total personnels	11

EVALUATION

Overall assessment of the team

The team DYSCOL has been overall assessed as very good by the committee. Over the course of the evaluated period, the production of the team is very good with 16 primary articles among them published in the Plant Cell and Scientific Reports as leaders, one preprint; three review articles, seven oral communications. One can note that most of the production is in collaboration within or outside the IJPB.

In terms of funding, the team was successful with 14 contracts, with 11 as coordinator in particular the ANR project RECOVOIL "Plant lipid droplets in post stress recovery". Among other publications, the team published a major scientific article in Plant Cell in 2018 in which they discovered a very new components of the LD-associated machinery named LD-associated degradation (LDAD) system, LDAD is necessary for the dislocation of that monolayer surrounding LD, where LD proteins are anchored, the further mobilisation of reserves.

Strengths and possibilities linked to the context

The team is clearly developing a holistic approach on the subject of LDs in plants.

Although very internationally competitive, the team did some great achievement in the field of plant LD. They clearly contributed to the evolution of the status of LDs from rather inert structures to very dynamic organelles.

The team is very active in teaching and academic coordination. Two HDR were defended during the period.

Weaknesses and risks linked to the context

Most of the scientific production is in collaboration, the committee prompted the team to try to be more leaders in the next period.

Analysis of the team's trajectory

The 4 axes will be followed in the future to generate the knowledge on plant LD and the need to develop sustainable bioeconomic systems based on plants. However several of the research projects initially planned need to be reconsidered in a new context, although the dynamic forces present over the period 2018-2023 suggested a more solid DYSCOL collective for the future, this balance was completely reversed (i) following the tragic death in November 2023 of an APT assistant professor who was a member of DYSCOL and (ii) following the departure of a professor, a research engineer and a research technician from the DYSCOL team to the DIPOL team in June 2024.

RECOMMENDATIONS TO THE TEAM

The team DYSCOL It is recommended that team reconsiders many of its initial plans following the major recent modifications that occurred in its personnel.

Team 4: Nitrogen-Pathogen interactions (NPI)

Name of the supervisor: Ms Mathilde Fagard

THEMES OF THE TEAM

The team working area is the understanding of how N limitation impacts biotic stress with emphasis on necrotrophic pathogens. The main pathosystems under investigations are *Arabidopsis thaliana-Erwinia amylovora* and *Arabidopsis thaliana-Botrytis cinerea.*

The team's research goals are to study the impact of abiotic stress on the infection process, identify the genetic factors involved, determine their function in the infection process and contribute to the development of sustainable solutions to protect crops in a context of climate change.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous report suggested to continue to characterize the pathosystems under investigation because the work was considered highly original. The committee also suggested to try to expand investigations from model species to crop species, although considering this with great care and in proportion with the human resources available. An advice was given to make more effort to improve visibility at the international level. All these advices were indeed addressed and in part acquired by the team, with improvements. However, internationally visibility would still need to be increased as discussed below.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**0**
Total personnels	**3**

EVALUATION

Overall assessment of the team

The overall assessment of the team is good to very good. This is a small team including one permanent scientist and two technicians. The team's working area is the clarification of how abiotic stresses (mainly, N deficiency) impacts plant tolerance to biotic stresses. Scientific production including eight research articles and one review article is very good considering the small team size, however targeting more influential journals could be possible. Networking and outreaching activities to the public are also very good and commendable. The ability to attract funds from European or international competitive calls is considered good. Presence of team members in international conferences is good. The main limitation of the team is its size, however, the team declared a recruitment plan.

Strengths and possibilities linked to the context

Scientific production of the team, considering its small size, is satisfactory, including eight research articles and one review article. However, the team could try to increase the quality of the target journals.

The team is the promoter of the ENVIE - Impact of ENvironment on plant immunity and pathogen VIrulencE networking initiative, aimed at understanding the effect on plants of the interactions between multiple biotic and abiotic factors. ENVIE involves 70 researchers from more than 25 labs and include private companies as well. Within ENVIE, webinars are organized every two months.

The NPI team also carries out an appreciable non-academic interaction in partnership with Institut Technique de la Betterave (ITB), INRAE-BIOGER and Anses in order to study leaf spot disease in sugar beet, which is leading to important transfer of know-how out of academia. The team leader, M. Fagard is also carrying out public outreach activity (including the participation to four workshops in the period under examination and other initiatives targeting the general public and young students).

Weaknesses and risks linked to the context

The team is clearly undersized in comparison with the importance of the field and in relation with the expertise of the team leader. Therefore, the team would strongly benefit from the addition of at least one permanent scientist. This weakness is recognized by the team and an application for the recruitment of a young INRAE scientists was prepared. Additionally, at least one PhD student will be recruited within the newly started project IMMUNIRON, in the area of investigation of the effect of Fe deficiency.

The participation to European or internationally funded projects could be stronger, since there is just one participation to France-Austria collaborative project (Pectosign) in the period under examination, whereas all other financial support arrived from French agencies or networks.

Dissemination of team's results could be increased and made more efficient (including more international) as the group leader (M. Fagard) seemed to have given oral conference presentations in France only.

Analysis of the team's trajectory

In the near future, the team will continue to work on the understanding of the mechanisms behind abiotic-biotic multistress interactions. One commendable activity of the NPI team is the extension of abiotic effect factor beyond N deficiency. Specifically, in a recently funded project, the NPI team is extending its activities to the effect of iron (Fe) deficiency on biotic stresses. Activities will also be devoted, in collaboration, to other plant systems, ie. tomato. The team also plans to extend its activity to the study of apoplastic fungal and bacterial endophytes, with a new proposal has been deposited and selected for the second phase.

RECOMMENDATIONS TO THE TEAM

The team should try to increase the level of target journals for publication, and more actively explore and participate to the international scientific community in terms of funding acquisition and conferences for dissemination.

Certainly, much of the possibilities to increase and extend this team's range of activities and impact is constrained by the possibility to recruit additional staff and non-permanent scientists, which is a constraint well recognized by the team.

Team 5: Nitrogen Use, Transport and Signaling (NUTS)

Name of the supervisor: Ms Anne Krapp

THEMES OF THE TEAM

The NUTS team is focusing its research on the nutritional signalling pathways of nitrogen and the TOR complex (The TOR complex plays an important role in regulating the coordination between nutrition and stress). The team pursues four research topics:

-The plant TOR signalling pathway

-Study of NLP transcription factor's role for N signalling in Arabidopsis and cereals

- NRT nitrate transporters

-Beneficial nutritional effects of plant microorganism (MO) interactions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous report did not raise specific points of recommendation and rated the team as excellent based on international visibility and publications record.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	**9**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**3**
Total personnels	**12**

EVALUATION

Overall assessment of the team

The activity of the NUTS team is appreciated as very good to excellent due to the balance between scientific productivity, visibility and the award of numerous contracts. Indeed, throughout the mandate, the team has maintained a high scientific publication standard. A majority relies on the broad network of collaborators, but the production of the team where its members are leaders remains substantial (40%) with a few substantial articles (Plant Cell, Plant Physiology, Cell report…). It is also very proactive in the search for both public and private funding, as revealed by the amount recovered (1953 k€) and the important part of the contract they coordinate (12 out of 20). They keep a good international visibility, as attested by the number of oral presentations in international congress (6).

Strengths and possibilities linked to the context

The team has excellent internationally recognised expertise on N (uptake and signalling) and master regulator TOR complex. This provides an opportunity to attract both public and private funding.

The research topics are very competitive, so it is requested that forces are not spread too thinly in the context of scientific staff reduction. Nevertheless, the consequent pool of technical staff present still provide good investigative capacity. IJPB offers great facilities for working on numerous different species and the team use them with work on Arabidopsis and crops such as wheat or Brachypodium. This is an opportunity, which must be carefully considered due to the strong competition with Asian countries using the rice model.

The important teaching activities from a team member is an opportunity to attract students with Ecophysiology training.

Weaknesses and risks linked to the context

The retirement of two PI and two more in the coming contract (including main PI in charge of the TOR theme), will lead to important modifications of the scientific perimeter of the team. It is important to anticipate such an event as the remaining members of the teams do not provide elements indicating the emergence of future PIs (publications with last authorship). As it stands, this should lead to a focus on the nitrate signalling research led by Dr Krapp.

The team proposes to develop more studies on crops in the future but the retirement of one of the scientists working on cereals (on interactions and nitrate transport) is a putative obstacle to this goal which needs to be taken into account.

Analysis of the team's trajectory

The team trajectory is a direct continuation of work in progress focusing on a few important regulators identified in TOR (LOKI) and N pathways (NRT2.7; NLP2, 6 and 7), the interconnection between micro-organisms & plant N nutrition and the identification of targets of biostimulants. An important part of this research will be performed on crops.

As it stands, this would appear to be the logical way to complete the work in progress but does not give any indication of the choices that will have to be made to take into account the retirement of an important part of the scientific staff.

RECOMMENDATIONS TO THE TEAM

The important reduction of scientists faced in previous and coming periods requested anticipation and focus on a limited number of research themes to keep competitiveness. We are confident that this challenge will be overcome by the team: its leader being now relieved of her important administrative duties at the head of the institute, and will have more time to devote for this task.

Team 6: Germination Physiology (PHYGERM)

Name of the supervisor: Ms Helen North

THEMES OF THE TEAM

PHYGERM focuses on the molecular mechanisms contributing to seed quality such as dormancy and longevity, and to seed perception and response to environmental factors. Main lines include the role of phytohormones (ABA and other apocarotenoids), sterols, stored mRNAs, proteins and polysaccharides in seed physiology. The aim of the team is to exploit the gained knowledge to improve seed performance via trait selection or innovative technologies, such as the novel priming technology coined 'Smart Priming' patented during the evaluated period. Its main model remains Arabidopsis, but recent investigations progressively extend to grain crops such as barley, rice or pulses.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Following recommendation of the prior evaluation, PHYGERM coordinated two H2020 projects, but with small to medium financial rewards. Its other international projects were mainly funded by ANR.

The development of the team's scientific and funding strategy was well thought and quite successful, allowing to maintain a critical staff number and development of several novel research lines. This was mostly due to success at raising national grants and to an intensification of partnerships with socio-economic actors.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	**9**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	1
Doctorants	2
Sous-total personnels non permanents en activité	**5**
Total personnels	**14**

EVALUATION

Overall assessment of the team

PHYGERM is excellent and extremely solid on all grounds. The team implements an excellent project integrating both fundamental knowledge and agricultural applications. Its funding capacity is excellent. The scientific production of the team is very good to excellent both quantitatively and qualitatively. PHYGERM **also has an outstanding translational activity with two international patents filed and a start-up dedicated to seed priming initiated during the evaluated period.** Its outreach activity is excellent to outstanding.

The team's trajectory is excellent and set on very solid bases, already well supported financially, although challenged by a prominent staff member retirement.

Strengths and possibilities linked to the context

The team's research topics and complementary expertise on seed physiology/performance favour development of both fundamental and applied research while addressing important challenges such as agricultural productivity and food security, well in line with the supervising bodies and European priorities.

Despite 5 departures of technical staff members during the last period, thanks to 3 new recruitments PHYGERM still benefits of an equilibrate support staff/researcher ratio of 0.95.

Retirement of a researcher was at least partially compensated by the recruitment of a young assistant professor. External funding provided abundant non-permanent staff resources to support of the projects of the team.

The expertise and strong international visibility of the team provide excellent leverage for fund raising. PHYGERM has been able to raise 3336 k€ for IJPB during the evaluated period (161 k€/FTE/year) of which 676 k€ from international sources, 1138 k€ from national, 673 from PIA grants and 845 k€ from socio-economic partners. Those stem from 37 contracts, of which 20 in coordination. For example, two H2020 projects in coordination (for a total of 243 k€), one ANR DFG PRCI as coordinator for collaboration with Germany, one ARN PRIMA as participant for collaboration with mediterranean countries, five ANR PRC grants (of which one in coordination) and nine supported by INRAE or AgroParisTech.

The team owes its high visibility to historical competencies developed in seed physiology, and to publications providing significant advances in this field. During the period PHYGERM has published 33 original articles, 12 reviews and 5 book chapters (i.e. 2.4 publications/FTE/year), 40% of them as first, last or corresponding authors. 10% of these publications were co-signed by PhD students. 44% are in open access. These publications essentially appeared in very good to excellent journals specialized in the plant field (Plant Physiology, Plant Journal, Journal of Experimental Botany, Plants, Frontiers in Plant Science, Sexual Plant reproduction). Among the most significant, we can cite three articles in Plant Physiology. The first reports the functional characterization of ABA DEFICIENT4 as a major contributor to the biosynthesis of the plant hormone abscisic acid (ABA). The second results from an internal collaboration for a transcriptome analysis of the developing ABA deficient seeds to identify the biological processes controlled by ABA during seed development and establishment of dormancy. The third reveals the key adaptive function of the pectin rhamnogalacturonan 1, the major component of the mucilage and provides new insight into its biosynthetic process.

PHYGERM visibility is also attested by seven invitations for oral presentations at international meetings, organisation of the 2023 Seed Colloquium and of the 2019 meeting of the International Plant Growth Substances Association, membership to four editorial boards of international journals, co-editorship of a special issue of Plant Reproduction, presidency of the International Plant Growth Substances Association.

PHYGERM members are actively engaged in the promotion of innovation and collaboration with private partners via involvement in the steering committee of the Saclay Plant Science Network, heading the "Innovation and Partnerships" working group, and "Innovation" working group of METABIODIVEX, contribution to the "Saclay Plant'Innov" meetings. Practical applications of the data generated by the group have resulted in multiple expertises for companies, one Cifre collaboration, interaction with competitive clusters, seed industry (SEMAE), and the Biocontrol and Plant Alliance consortia, with 8 funded projects representing 25% of the funds raised by the team. Two international patents and two secret know-hows have been filed as a result. Based on these patents and supported by a maturation project BOSS of the SATT Paris Saclay, this led to the creation of the start-up Seed InTech in 2021 for the exploitation of an innovative seed treatment coined "Smart Priming" enhancing seed vigor, promoting seed stress resilience and enhancing longevity of the primed seeds.

The team is very active in teaching (488.5 h/year) and academic coordination. Three team members have an HDR.

The members of PHYGERM have been contributing to a broad range of outreach activities, some as a group (Salon de l'Agriculture, hosting of high school students, common programme of IJPB) and one of its members is very active in the broader public communication (14 events, including conferences Café des Sciences, and articles in broad audience journals such as Science et Vie, Science et Avenir, Wapiti, and more).

Weaknesses and risks linked to the context

The team could be more ambitious in its publication strategy and target higher-ranking journals given the impact and originality of the results.

The international funding of the team (outside of that managered by ANR) remains rather small in proportion. This implies a risk if the budget of the ANR decreases. Given the high visibility of the team members and the agricultural impact of the topic investigated, it should be possible to attract more European/international funds.

One full-time permanent INRAE researcher left in 2021. A second full-time and very visible INRAE researcher is going to retire during the upcoming period (with a risk of loss of the ABA expertise). The third is spending a half-time in the direction of the unit. The professor has, in addition to his teaching activities, to participate to the management of the start-up. Overall given teaching and collective activities, the permanent research staff became small. As a consequence, topics investigated might require refocusing.

Most valorisation and outreach activities rely on a single member of the team.

Analysis of the team's trajectory

For the next period, PHYGERM builds on its recent exciting advances to develop projects within the three thematic axes of IJPB. Projects in axis 1 include investigations of the molecular mechanisms underlying germination, priming and seed vigour, with focus on potential signalling capacity of novel seed specific apocarotenoids, role of sterols, influence of xyloglucan on germination, and pectin synthesis. Axis 2 projects are focused on the seed and seedling adaptation to biotic and abiotic environment to improve seed protection. This includes testing the potential of biocontrol and biostimulants on seed properties, continuation of the exploration of the role of non-coding RNAs in seed dormancy, determination of the role of seed exudates in shaping the seed microbiota (and impact on defence). Axis 3 projects aim at boosting seed nutritional quality, performance and immunity via different seed treatments and agricultural practices. Besides fundamental research, the team also proposes several innovative translational projects focused on the nutritional quality of the seeds or biocontrol/biostimulation. All these projects sound exciting and fully relevant. Investigations pursued in the three axes are often interrelated, and significant funding is already obtained for several projects, to the horizon 2028-2029 for a few of them. The recent integration of two lecturers and two support staff members in mobility is a significant asset for the implementation of the team plans. It also brings new competency and potentially new ideas and projects. Care has however to be taken to avoid a too large dispersion.

RECOMMENDATIONS TO THE TEAM

The committee would suggest considering targeting higher impact journals. The team member visibility and originality of their work could make it successful.

The team should pursue its efforts to participate to EU or other internationally funded projects in a context of French budget constraints.

A single half-time permanent INRAE researcher is expected to remain in activity at the end of the upcoming period. It has already been anticipated, but the team is encouraged to seek for potential candidates that could be competitive for successful INRAE recruitment to maintain the expertise on ABA.

Team 7: Biomass Quality and Interactions with Drought (QUALIBIOSEC)

Name of the supervisor: Mr Matthieu Reymond

THEMES OF THE TEAM

The team 7 (QUALIBIOSEC) aims to identify processes involved in genetic and environmental (drought) variations of biomass digestibility and cell wall properties in grasses. Processes are studied at the biochemical, histological and molecular scales. The work is mainly performed in maize and miscanthus also gaining insights from Arabidopsis thaliana knowledge.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Three main concerns addressed in the previous Hcéres report have not been addressed during this period.

1) *It was suggested that the team increases its visibility by attending and presenting at relevant conferences outside of France*. Of the 12 oral presentations made during this period, only 1 was given outside France, in the USA, by one of the PhD students. However, the team leader has been invited to two international conferences, but these were organised in France, in Montpellier and Saclay.

2) *The team would raise their profile by publishing review articles.* The team has a good rhythm of publication for sharing both methodological advances and scientific results. The team published three book chapters during the review period, which we believe partially addresses this recommendation made in the previous Hcéres report. Notably, one of these book chapters was recently cited in a 2025 review article in *Nature Communication (Sulis et al., https://doi.org/10.1038/s41467-025-56472-y)*.

3) *The team should seek to recruit new PhD students.* The previous Hcéres identified the low number of PhD students as a risk for the team. It is still the case here with currently one PhD student in the team (despite the high ratio of HDR in the team: 4 for a total of 4 scientists).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	3
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**7**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**2**
Total personnels	**9**

EVALUATION

Overall assessment of the team

The QUALIBIOSEC performance of the team is very good to excellent.

The team addresses very important biological and agronomic questions with a multidisciplinary expertise. Scientific outputs are very good and the recent team's effort and ability to establish relationship with the socio-economic world (mainly seed companies) is excellent. Although successful in national grant applications, the team would be certainly able to extend to international grant applications.

Strengths and possibilities linked to the context

The QUALIBIOSEC team publishes 1) studies that address the relationship between biomass digestibility and histological or biochemical variation (or both) in grasses; 2) studies that reveal the genetic determinisms of biochemical and histological traits related to biomass digestibility; and 3) methodological papers to share with the scientific community novel phenotyping tools developed for their studies. It is noteworthy that the themes addressed here are challenging in both the climate change and agroecological transition contexts. In addition, the methods and work hypotheses developed in the team are transferable to other grasses (or perhaps other crops) and to the study of stresses other than drought, thus widening the opportunities for extending collaborations.

Over the course of the evaluated period, the Team published a total of 23 articles in peer reviewed journals and three book chapters. This corresponds to 2.05 (in peer reviewed) publications/FTE/year (taking into account the 4 scientists but they do not work full-time). Among these 23 articles, 10 have a QUALIBIOSEC scientist as a last author. These 10 papers are co-authored by at least 2 of the 4 scientists of the team, with a good balance of publications among the PIs. Engineers and technicians are also co-authors on most of the team's papers, and the PhD students have 1 or 2 papers as first authors and co-authors on some of the papers. This emphasizes that the whole team is really working together on a same project, each bringing to the team project its own discipline or knowhow. In addition, PhD students have the possibility to combine their work for sharing papers which is a real strength to ensure publications and enrich their CVs for further positions.

The team also filled one patent on plants with improved biomass digestibility.

The team has developed important links with the non-academic world during this period and a number of projects have been developed and funded with seed companies.

Weaknesses and risks linked to the context

In terms of quality, the team's scientific output could be improved. It includes too few articles published in highly valued journals and/or less specialized journals. There is a risk that the team will lose visibility and therefore attractiveness in the future in the academic world (which is necessary for national or international collaborative projects).

The team has a good level of grant applications: in total, it has been involved in 23 projects and has coordinated 5 of these 23 projects. However, all sources of fundings come from national grants (INRAE and Idex for projects coordinated by the team). The team could be more involved in coordinating larger projects at the national scale or, even applying for international grants. Such grants could be used to secure budgets for hiring (1) post-docs or PhD students (2) but also technicians as it seems that the team needs additional technical helps during large-scale experiments (the number of non-permanent technical staff during the period is high: 10 ETP).

The size of the team is rather small and this could be a difficulty in obtaining funding for PhD students, but all 3 scientists in the team have an HDR, which could make it possible to have a larger number of PhD students (1 scientist with HDR has just left the team but is still working in strong interaction with QUALIBIOSEC from Montpellier).

Analysis of the team's trajectory

The team combines multidisciplinary expertise to answer common questions on the plasticity of biomass digestibility. Their results provide a better understanding of the relationships between cell wall composition and recalcitrance. The new biochemical and histological analysis methodologies developed during the evaluated period will now facilitate rapid analysis and screening of a large number of genotypes and new abiotic or biotic stress events (considered isolated or in combinations), including other forage species, in collaboration with other

groups. The project proposed by the team is in line with what has been done to date and with the IJPB's research priorities. There are no major changes, except perhaps in the CHAMPAGNE project, in which the team plans to study how cell wall modification at root level has an impact on mycorrhization, extending the objective of understanding plant resilience to climate change to the level of agro-ecological transition.

RECOMMENDATIONS TO THE TEAM

The team could increase its visibility at the international scale as it addresses important issues with a societal demand in the context of climate change. The nature of these issues could make it more attractive for international collaborations, but also the recruitment of post-docs or PhD students.

To increase actual visibility, PIs should take the lead in large national collaborative projects (other than INRAE or Idex fundings) but also European projects.

In addition, the dynamics of publications if good, could be improved in terms of quality by targeting journals with greater visibility (not too specific), which implies carrying out certain work in larger context.

The team could also be more involved in teaching at the university which does not seem to be the case and this will maybe attract motivated PhDs when the fundings are here.

Team 8: Strigolactones and Allelochemicals Signalling (SAS)

Name of the supervisor: Ms Sandrine Bonhomme

THEMES OF THE TEAM

All research activities of the SAS team are focused on strigolactones, which have been identified as phytohormones by one of the former members and leader of this team, C. Rameau. C. Rameau has now retired (April 2024). In the past years, the team has investigated the role of strigolactones in shoot branching, the mechanisms of strigolactones perception and signalling, the roles of strigolactones in plant-plant interactions and allelopathy. The team has recently started to work on pea (a model species in this field) genome editing.
The SAS team is composed since December 2023 by 7 permanent and 4 non – permanent scientists and technicians, and has grown significantly in this examination period.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The strengths identified are the followings: Excellent collaborative network, national and international biologists/chemists/biochemists

- Arabidopsis, pea and moss multiple complementary models
- Pea: a model crop of ecological value for projects on agroecology

The weaknesses: Difficulty to develop applied projects despite the numerous potential applications of strigolactones.

The opportunities: Pea and other legume model transformation; genome editing

- IJPB chemistry platform for hormone analysis; chemical library from ICSN with natural compounds
- Project on allelopathy: development of agroecology at INRAE; genetic resources in pea and Arabidopsis; Plant com, RecreA and PHARE networks

Threats: Retirement of the group leader (C. Rameau)

- SLs/KL: still a highly competitive field
- Diversification of thematics/orientations/models.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	2
Post-doctorants	1
Doctorants	1
Sous-total personnels non permanents en activité	**5**
Total personnels	**11**

EVALUATION

Overall assessment of the team

The Team's overall assessment is very good to excellent. The team is world-renowned in the area of strigolactones science and is expanding its research activities in novel and challenging areas of strigolactones field. Team publication record is excellent. Its network of collaboration is also excellent, providing the basis for continuing the research activities at the highest level. While the team's ability to secure funds was very good in the evaluation period, the team has all the capabilities to obtain more funding at the international level. Interactions with private companies could also be extended in number and scope.

Strengths and possibilities linked to the context

The team is a pioneer in the field of strigolactones and is continuing to produce results and create collaborations based on its great expertise and its good international reputation. The team has grown stronger in recent years. It has well-matched plant models (Arabidopsis, Moss and Pisum) on which to base its research.

In the examination period, the team published a high number of research articles (26) and review articles (5) in peer-reviewed journals. Of particular excellence are the publications reporting about novel strigolactones receptors in parasitic plants and mosses (De Saint Germain A. et al. 2021. Plant Comm., and Lopez-Obando M. et al. 2021. Plant Cell), and the development of new protocols and approaches to clarify the molecular basis of plant-plant interaction underpinning allelopathy. This is particularly important for shaping, in the long term, novel crop production systems.

The team has a very good record of research contracts (15) with many of them (11) as coordinator. However, most of this research funding was obtained from national funding. Included in the count are three paid collaborative partnerships in the area of science to innovation and collaboration with private companies.

The national and international collaboration network where the team is working is large and excellent and provides the basis for continuing the research activities at the highest levels. The team is also positively involved in outreach (nationally) and dissemination activities (both nationally and internationally).

Weaknesses and risks linked to the context

The team has shown a good capability of research funding acquisition, however only a relatively minor EU funded project (an EU COFUND-FP7 People Programme « AgreenSkills » for postdoctoral fellowships) was obtained in the examined period. All other research grants (n = 15) were obtained from national calls.

The team has now an acceptable number of permanent people (n = 7). However, the age pyramid cannot be avoid and the recent retirement of the group leader (C. Rameau) remains a threat.

The team is aware that diversification of thematics/orientations/models can be a weak point in terms of competitiveness.

Despite the numerous and successful grant applications obtained, and the potential practical applications of strigolactones in breeding and agronomy, the interactions with private companies for collaborative research contracts could be improved in number and scope. In line with this, no PhD funding by non-academic partners was reported.

Analysis of the team's trajectory

The SAS team has a solid international reputation built over the years, visible in its scientific products and its high-level scientific network. In addition, the group can draw on its institute's platforms to continue developing new methodologies. Among these, the team is now implementing gene editing in Pea, in order to streamline strigolactones-related gene functional analysis, based on a new starting PhD' positions. The group has strong expertise in metabolomics, and recently published a paper proposing a method for analyzing strigolactones by mass spectrometry. Under this perspective, several molecules will be identified from moss exudates of various mutants in order to characterize the strigolactones-based plant to plant communication mechanisms.

RECOMMENDATIONS TO THE TEAM

Among the phytohormones, strigolactones are the ones we still know too little about in terms of both basic biology and possible applications. The team has done a commendable work by extending its activities in both the areas of basic biology and crop application. Planned future research activities appear also very promising, for instance the investigation of the role of strigolactones in plants growing in degraded/polluted environments, the study of allelopathic interactions, the use of untargeted metabolomics to characterize allelopathy and more generally plant-to-plant communication. The recruitment of further young collaborators (PhD students or post-docs) and the strengthening of the international network with both academic and private partners are recommended.

Team 9: Senescence, Autophagy, Nutrient Recycling and Nitrogen Use Efficiency (SATURNE)

Name of the supervisor: Ms Céline Masclaux

THEMES OF THE TEAM

This team focuses on nitrogen management during leaf senescence (to elucidate mechanisms involved in N-uptake, N-remobilization and N-recycling). The studies are performed at the whole plant level to characterise the master players that control nitrogen recycling and remobilisation along plant development and in response to the environment.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Previous report pinpointed a good scientific strategy relying on the high skills of the members team resulting in excellent scientific results. They also pointed necessity to focus more the research (produce strategic plan) and work more together to reach more ambitious publications. Great expertise complementarity. Good aptitude getting financial support. Good interactions with IJPB teams. Strong international reputation

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**3**
Total personnels	**9**

EVALUATION

Overall assessment of the team

The activity of the SATURNE team is appreciated as excellent. Indeed, the team has an established international recognition (attested by 19 oral presentions in Congress including 7 as invited speakers) and is highly productive (51 publications with 36 research articles many of them published in well-known journals such as: Autophagy, Plant Journal, Plant Physiol, New phytologist…). They are also very successful in getting grants and contracts (including with private partners) raising 1089 k€ for the evaluated period. There is a fairly high number of research themes (but this does not appear to affect productivity). The search for varied funding sources is often at the root of such fragmentation, but care must be taken, especially in a context of limited human resources.

Strengths and possibilities linked to the context

The team has well-recognized expertise and complementarity on a broad spectrum of plants (Arabidopsis, crops) in the field of autophagy and Nitrogen Use Efficiency (NUE). This enables them to get involved in the agro-ecological (biostimulants) and plant/microbes interaction issues that are currently gaining ground.

Their good scientific network provides opportunities for scientific collaboration and to raise funds with academic and private partners.

The involvement of a member of the team in university teaching is an opportunity to attract good students. The team should look into ways of participating/creating courses that would give it a higher profile with students.

Weaknesses and risks linked to the context

The team have difficulty attracting bright students from the university (despite receiving an important number of students (14 if we include PhD students).

So far, they have a good ratio of one between Scientists and technical support but the retirement of a technical assistant within three years will reduce this ratio.

Diversification of activities presents risks of thematic dispersion, which should be kept in mind as it can have negative consequences in the context of staff reduction.

Analysis of the team's trajectory

The SATURNE team is qualitatively and quantitatively highly productive. Year after year, the team continues to produce regular, high-quality work. Their well-known expertise on autophagy and NUE provides opportunities to get fruitful collaborations and to raise important funding from both public and private origins.

The various approaches (GWAS, proteomic) resulting from extensive groundwork have borne fruit, enabling us to identify a large number of candidates. The team therefore has a number of promising avenues open to it, which now need to be validated to produce publications commensurate with the efforts made. The foreseeable drop in technical staff should be an opportunity for collective reflection to decide where to concentrate the team's strengths.

RECOMMENDATIONS TO THE TEAM

We would suggest aiming for papers, where the team's members are leaders that target even more visible journals. The numerous targets identified by GWAS approach for NUE, or for autophagy by proteomic analysis should provide opportunities for this. Now, the team's multidisciplinary skills should be focused on a limited number of these targets to concentrate its strike force.

Pay attention that the diversity of topics covered does not hamper the effectiveness of research. While seeking partnerships with the private sector is a commendable undertaking, the team must nevertheless be careful not to stray too far from its research themes, as it does not have enough technical staff to allow it to do so. From this point of view, the work on bio-stimulants must be clearly defined, as research dealing with indirect action on the biological activity of soils requires specific skills that are not available in the team.

Keep on fostering links with the academic world to attract good students.

Team 10: Symbiotic Nitrogen Acquisition in Plant-Microbe Systems (SYNAPS)

Name of the supervisor: Ms Alia Dellagi

THEMES OF THE TEAM

The SYNAPS team, which was formerly known as GAPV, research program aims at keeping or if possible, improving the productivity of plants (corn mainly) when nitrogen fertilization is reduced. To do this, researchers study the beneficial impact of the microbial environment at the root-soil interface (rhizosphere) and the crop genetic diversity regarding the absorption and assimilation of nitrogen. To answer these questions, the team uses direct plant physiological measurements, modified genetic phenotypes but also modelling tools, and try to work at different scales, from leaf to the whole plant.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The size of the team substantially changed during the reporting period. The scientist composition of the SYNAPS team evolved over three periods (Period 1 => January 2018 - mars 2021: 1 PR (0.5 FTE), 1 DR (1 FTE) and 1 IR (0.5 FTE); Period 2 => April 2021 - August 2023: 1 PR (0.5 FTE) and 1 IR (0.5 FTE); Period 3 => September 2023 - December 2023: 1 PR (0.5 FTE), 1 DR (1 FTE), 1 CR (1 FTE).

Regarding then the previous GAPV team, it was suggested that the team try to collaborate with researchers at Inrae Dijon and with more non-academic sectors to reinforce the competence of the team. This was achieved in the frame of the Plant2pro project MOMA which involved a collaboration with INRAE Dijon (PE Courty and D Wipf). In addition, the team collaborated with Rouiller during the ANR FIXNMAIZE and BEST. The team is currently applying for several ANR PRCE programs in collaboration with C. Roux from LRSV Toulouse who have similar skills as INRAE Dijon and with companies such as Limagrain, Mycophyto, Agronutrition and De Sangosse.

Also it was noticed that their scientific approaches were very descriptive and their work hypotheses were not clearly described, which unfortunately is still the case (see description of the microorganisms competition for plant resources for example). They are still mentioning in length the overall aim of reducing chemical fertilizer, which is seen as a new opportunity for the development of innovative research to improve plant N nutrition, but the stated future lines of research were not and are still not very innovative, especially when compared to other international research teams that work on corn. Maybe the SYNAPS team should look at other crops in the future proposals (they are already working on Barley for example).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**1**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The activity of the SYNAPS team is appreciated as good to very good. The main highlight of this team is the development of three patents.

We appreciate the effort of the team to recruit new faculty. Over the past 5 years, the team supervised one PhD student and no post-doctoral researchers. The last PhD student defended in 2023. During the evaluation period there was a single scientist with an HDR in the team. An effort should be made there, which seems to have been understood by the research unit, since the TEAM is likely to hire in 2025 two PhD students as part of the startup funds of the new scientists.

On a more positive side, the scientific production of the team over the period is of very good quality (21 peer-reviewed papers over the 5-year period, which represents 4.2 papers per year for the whole team or an average of 2.8 papers per full-time scientist per year (excluding the last 3 months when 2 new scientists arrived)).

Strengths and possibilities linked to the context

Even though the team does not currently advise graduate students, the 21 peer-reviewed publications (and the 3 patents obtained in the last 5 years) reflect a good balance between well-established international journals (i.e. Plant Journal, Nature communication, J Exp Bot) and more specialized journals (i.e. Journal of Crop Science and Biotechnology Agronomy), reflecting the multidisciplinary approaches of the team.

Considering the small number of full-time researchers (3 FTE), the SYNAPS team was able to secure 15 contracts (7 as coordinator) for a total of 1 254 k€ over 5 years. This represents 167.2 k€ per scientist per year.

This is seen at different organization levels (from molecular to whole plant levels). Research has been conducted in the lab and in the field. This allows important scientific and agronomic questions to be addressed. The management of plant N nutrition has been characterized in the important crop species, maize. The team leader is globally recognized for his work at the international level (e.g. 6 invitations as a speaker). The team also has developed excellent networks at the national level (the team coordinates or has coordinated 2 ANR projects and participates to a PIA project).

Not only the SYNAPS team was able to secure basic research federal grants (ANRs), it also received contracts with private partners (ANR-FIXN MAIZE and ANR BEST with the company CMI Rouiller). These projects are allowed to hire several engineers under contracts. All other projects listed above were related to maize N nutrition and interaction with beneficial microorganisms which fits perfectly with the team. The subjects of these projects address a crucial issue for the society which is the reduction of N input in agriculture by exploiting crop breeding or beneficial microbes.

Weaknesses and risks linked to the context

The team is quite small and the addition of another permanent position in 2025 is a good thing. This new faculty (assistant professor/MCF) in microbial ecology AgroParisTech will probably increase the research impact of the team.

Also, and this was already suggested in the previous report, we feel that intra- and inter-institute collaborations could be improved. For instance, the existing collaboration with the SATURNE or the QUALIBIOSEC teams could be further increased through a shared advising of a PhD student or postdoctoral fellow…,

Analysis of the team's trajectory

SYNAPS is currently trying to provide applied sustainable solutions to implement agroecological concepts to current "classical" agriculture. Based on their previous expertise (the maize nitrogen nutrition and metabolism), they are moving towards integrating the microbiome compartment as part of these solutions to better fit the IJPB Axis 1 and Axis 2. They are also relying on their metabolic modelling expertise and the hiring of two new scientists. The future recruitment of an AgroParisTech assistant professor (Maître de conférences) in 2025 will help strengthen the team.

The team's trajectory is mainly a continuation of previous work on the molecular and physiological processes involved in maize nutrition, which is logical since the team is well recognized and very competitive in this area. It seems that this proposed research plans have been influenced by the arrival of the team leader in 2018 who seems to have strengthened the team structure.

However it is good that the 3rd trajectory points of the team aiming at studying mechanisms involved in N nutrition in inter-cropping systems is not solely related to corn, but also to legumes and other cereals. Studying inter-cropping agricultural systems is seen as a good way to extend the team's expertise on applied ways to mitigate the application of synthetic nitrogen fertilizers, and to foster further collaboration with outside research teams.

RECOMMENDATIONS TO THE TEAM

The SYNAPS team should continue using a multi-disciplinary approaches in its research projects to sustain a good scientific production and a strong interaction with the private sector.

However, most research projects of the SYNAPS team are related to corn N nutrition and maybe it is time they extend their expertise to other crops, always to study the positive role of microorganisms and nutriment interaction on growth and yields.
In addition, we recommend that the team increases its size by finalizing the hiring of the assistant professor from APT and by advising more doctoral students. Merging with the Cell-to-Cell Adhesion and Communication team (ACCI) could be considered.

The team should continue its strong investment towards the multiple approaches that were developed to ensure its strong scientific position (by maintaining scientific production) and its interactions with the private sector. The team should also try to keep a good balance between basic and more applied research activities.

Team 11: Cell to Cell Adhesion and Communication (ACCI)

Name of the supervisor: Mr Grégory Mouille

THEMES OF THE TEAM

The team aims to identify actors and mechanisms involved in cell-to-cell adhesion in plants. The objective is to better understand its regulation and the formation of intercellular spaces during development. To that end, the team has been developing, during the evaluation period, multi-disciplinary approaches mixing classic molecular biology with biomechanical experiments and numerical simulations.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

During the previous evaluation, the team has been encouraged to cultivate their collaborations as to maintain their excellent level of scientific production and to increase the number of publications in last/before last author position.

The previous report mentioned 28 articles in journals among which five as corresponding author. These numbers have been roughly maintained throughout the current evaluation report (23 articles in journals, 2 book chapters and 1 conference) with three last authorships on the book chapters and the conference and three before last authorships.

While no significative shift toward the end of the author line-up can be reported, the team has however, despite its very small size, succeeded in maintaining its rich eco-system of international collaborators and involvement in numerous very good publications.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**2**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**1**
Total personnels	**3**

EVALUATION

Overall assessment of the team

Despite its very modest size, the ACCI team has delivered a good scientific production over the evaluation period, issued from numerous fruitful international collaborations. However, its involvement in these collaborations and scientific outputs are often limited to the technical expertise related to the Chemistry/Metabolism platform, also managed by the team leader, rather than the ACCI team project. Nonetheless, the scientific project on the cell adhesion is considered as relevant.

Strengths and possibilities linked to the context

The scientific focus of the team, cell to cell adhesion regulation during development, is a topic with a low competitive pressure. Combined with the technical expertise of the team on analytical chemistry, this leads to the development of multiple and fruitful collaborations with other national and international groups. These collaborations enabled the team, despite its modest size, to produce excellent scientific results over the evaluation period; as its publication list demonstrates an average of 16 citations per journal article (21 articles have been considered) with seven publications in journals with impact factors higher than five. Among the collaborations of the team, a trend can be seen: Over the past years, the team has increased collaborations with experts from other scientific fields, mostly material sciences (5 journal articles have been published with such collaborators), chemistry (2 articles) and also biophysics (1 article). This trend seems on the rise as the number of concerned articles increases with time. Combined with the work achieved during the PhD of R. Ben Malek, *c.f.* portfolio 1: book chapter https://hal.science/hal-04143971v1, the team is clearly developing an holistic approach on the topic of cell-to-cell adhesion and its role in development.

The team scientific activities also contributed to transfer toward society: Given its technical expertise the team managed to develop & register a patent on drought resistance in maize (this patent is mentioned in the 3-2-1 section of the document provided by the team but no patent ID was provided). The team is also involved in 3 R&D projects specifically designed to transfer knowledge & methods from academics to farmers (CASDAR programs: HOLOVITI, UBELIX & FILFRUI). Finally, the team has also been involved in some outreach programs such as "Nuit des chercheurs" or "Plantes & Sociétés". During these events, the team is touring scholar groups throughout the lab for half a day, three to four times a year. Let's also mention that the team has been involved in two papers in a professional journal for French winemakers and oenologist.

Weaknesses and risks linked to the context

Despite a low competitive pressure and its very good publication record over the evaluated period, one obvious weakness of the team is its lack of leadership in its field of research. This weakness is evidenced by the absence of team members as first or corresponding authors in any of the 23 peer-reviewed journal articles enumerated in Appendix 4-1.

A primary factor contributing to this leadership deficit can be attributed to the team's limited size; combined with the engagement of its sole researcher in the leadership of the PO-chemistry/metabolism platform. This platform is composed of 4,5 full-time equivalent staff members, twice the magnitude of the ACCI team. This management role is therefore a doubled-edged sword as it provides collaboration opportunities but must also be very demanding and time consuming. This double positioning of the sole researcher of the team as team-leader/platform-leader is apparent in the presented publication record where only three articles (Kohorn *et al* 2021 Plants, Kohorn *et al* 2021 Development, Kohorn et al 2021 PLoS ONE) among the 23 listed seem explicitly related to the team's scientific topic, cell-to-cell adhesion; the others being related to more general cell wall composition matters.

Beside this management task, the team leader is also involved, as an executive board member, in an interdisciplinary program METABIODIVEX spanning several graduate schools within the Paris-Saclay University .Although important and rewarding, such a commitment is also time-consuming and therefore dilutes the team's scientific focus.

The foreseen risk is that the team could be kept in a position of technical expert, assigned with specific and limited aspects of the big trans-disciplinary projects it is involved in.

This scenario could impede the team's ability to establish a genuine scientific identity.

Furthermore, the team's limited size poses an additional risk concerning its visibility and attractiveness to prospective students and doctoral candidates.

Analysis of the team's trajectory

Since the last evaluation, the team has not grown, with only one permanent staff scientist and one technician.

The scientific trajectory of the team is starting to shift toward a multi-disciplinary approach of cell-to-cell adhesion which seems very relevant and promising. The team has already established collaborations with local experts (*e.g.* A. Boudaoud at École Polytechnique) with complementary skills. In this perspective, the collaborations with material scientists, to better understand the complex behavior of the middle lamella is also very relevant.

Despite this promising perspective, we cannot but express some worries grounded in the small size of the team. Establishing a leading position in any scientific field is a demanding task that requires a lot of dedication. In its present configuration, it is not obvious at all that the team is well equipped to achieve this goal.

RECOMMENDATIONS TO THE TEAM

We recommend to the team, and its trustees, to increase its size; either by recruiting or by merging with another team focused on a related topic. The addition of an assistant professor would be ideal, for it would grant the team access to a streamline of students for putative internships and PhD programs.

Team 12: Cell Biology and Plant Regeneration (BCR)

Name of the supervisor: Mr Pierre Hilson

THEMES OF THE TEAM

The aim of the BCR (Biology of the Cell and Regeneration) Team is to identify and hierarchize processes that are involved in the first stages of organogenesis or somatic embryogenesis mainly in the model plant *Brachypodium distachyon*. As the regeneration process is similar between model species and related cultivated species, the team extends its work to the control of regeneration in plants of agronomic interest.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"*To maintain continuity of research, attention should be paid to recruitment of advanced scientists with relevant expertise, for example international fellows with individual funding (EMBO, Marie-Curie fellowships), and promotion of training of PhD students*"
No high-level scientists were recruited during this period. Two PhD students have been trained, which is a good thing given the small size of the team, which has only one HDR.

"*Participation of team members at international meetings and workshops should be encouraged to increase international visibility of the team and to promote international collaborations*."
The team has a wide range of activities at the national scale and is small in size. This may be a difficulty (an obstacle) in promoting international visibility through international collaborations and participation in international conferences.

"*The research plan of the BCR team is consolidated, but timelines and priorities of project objectives must be specified in light of available funding and human resources*."
This point seems to have been taken into account for this period. The project objectives are proposed in the light of the funding and human resources available.

"*Considering the research focus of the lab over the last period, the somatic embryogenesis in Brachypodium might be strategically more appropriate than diluting efforts in other ambitious projects. Expansion towards parallel research lines on the androgenesis should be considered after securing sufficient funding*."
The team seems to have repositioned its efforts on somatic embryogenesis for the future.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**1**
Total personnels	**4**

EVALUATION

Overall assessment of the team

The BCR team's performance is good. The team has invested a great deal of energy in knowledge sharing (see portfolios 2 & 3), perhaps to the detriment of scientific production. The number of publications over the period is very low, with only 3 primary articles and 1 review. The recent coordination of an ANR PRC project, SomaGreen, from 2023 to 2027 could serve as a springboard for the team's future.

Strengths and possibilities linked to the context

The team's technical expertise in plant biotechnology (somatic embryogenesis, genome edition, plant transformation, IVC) is recognised by the national academic and non-academic world. In this context, the team has been successful in obtaining funding, with 7 contracts over the period with 5 as coordinators, for a total IJPB funding of 1,416 k€ (among this, a Cifre PhD from BASF).

Students trained by the team have a job after their training period as technicians or researchers.

The team is able to apply and get funds in calls for fundamental or applied research, and for science communication.

The team makes a highly significant contribution to the dissemination of research to a wide audience and is also involved in training (44 h/year) in 4 modules at various universities. Dissemination to various audience is facilitated by team leadership in the RegenCrop consortium and the 'Plantes et Société ' working group. The RegenCrop Consortium includes more than 20 French public laboratories (from different institutes INRAE, CIRAD, IRD). In parallel, the team coordinates the working group called " *Plantes et Société* "" whose goal is to boost science mediation activities within the Saclay Plant Sciences network.

Weaknesses and risks linked to the context

Very small group (1 DR2, 1 IR and 1 TRex) with one PhD (ending in 2024). An emeritus CIRAD scientist left the group in 2018.

Only 4 publications during the period. The two publications for which a member of the team is corresponding author are in the journals Plants and Plant Methods. Only 3 oral communications in international meetings are listed in the report but all in the same meeting (Dublin, 2018).

There is a need for additional engineers for the team's activities, as shown by the recruitment of fixed-term contracts by various ANR projects over the period, suggesting a need for manpower that is highly dependent on funding and may be problematic in the future.

The (small) team reports that 35% of its time is devoted to research activities.

Analysis of the team's trajectory

The team will continue to study the mechanisms involved in totipotency and the initiation of morphogenesis. The team's trajectory is well positioned at the interface of two IJPB axes (knowledge of basic platinum functions and design of intelligent crops for sustainable agriculture). The project is mainly based on recent ANR PRC project consolidated and coordinated by the team until 2027 with a post-doc recruited in this context.

The team will still devote a part of its time to sharing with the scientific community how to transform, regenerate and edit the genome of several plant species, through the RegenCrop consortium and with the support of the PEPR SVA.

RECOMMENDATIONS TO THE TEAM

The team's involvement in its collaborations (projects, co-authorship of articles, partnerships with the socio-economic environment) could go well beyond its technical expertise. This would increase the team's attractiveness. The recent award of an ANR project as coordinator with the arrival of a postdoc on somatic embryogenesis is a good opportunity to reinforce the team's manpower in research activities.
The committee encourages again the Team BCR to participate to international meetings to increase its international visibility and to initiate international collaborations.

Team 13: Chromatin Dynamics and Signalling (CHRODYNO)

Name of the supervisor: Ms Valérie Gaudin

THEMES OF THE TEAM

Being recently established, the CHRODYNO team spent its effort in concluding previous scientific projects, while laying the foundations for the study of the genetic and epigenetic response to metabolic signalling. Currently, The CHRODYNO team aims to investigate how plants incorporate metabolic signals to achieve appropriate developmental and environmental responses and set up relevant molecular and physiological programs. The few researchers making up this team investigate two paradigmatic systems, one for stress response in stomatal opening and the other for developmental transitioning in seed tissues, which are associated to significant metabolic changes. This approach allows them to advance knowledge on mechanism involved in plant water saving and seed nutrient storage.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The CHRODYNO is a new team (started in 2018) replacing the former CHROMA team. However two new permanent researchers joined the team driving a new research orientation.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	2
Doctorants	1
Sous-total personnels non permanents en activité	**3**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The activity of the CHRODYNO team is appreciated as very good.

The team had a strong scientific applied and theoretical expertise. Thanks to the new scientists working on cellular signalling that joined the team, it can now tackle cutting edge research such as the study on amine role in stomatal opening, or on the developmental and physiological response to metabolic cues at the genetic and epigenetic level. The team presents original results on metabolites. Congratulations!

We can maybe regret that this team is not really visible internationally.

Strengths and possibilities linked to the context

Compared to its size, the team is scientifically doing well. The team has authored 11 peer-reviewed papers in top tier journals (6 primary research articles, 2 opinion articles, 3 review article) as well as contributed to 1 book chapter. International visibility of the team is attested by invitation to contribute a review to a leading journal (Trends in Plant Science), a book chapter in Methods in Molecular Biology, the co-organisation of two international conferences, several invitations to international conferences and numerous reviewing tasks for top tiers journals and grant agencies. The team was a partner in the EpiTrait ITN and coordinator of two ANR projects.

Considering the small number of full-time researchers (2 FTE) the CHRODYNO team was able to secure five contracts, four of which as coordinator, for a total of 700k€ over 5 years. This represents 70 k€ per scientist per year. On the top of that, the team trained two Postdoctoral fellows and four PhD students.

Weaknesses and risks linked to the context

The team is quite small and the addition of and the team should find ways to secure an additional permanent position.

Analysis of the team's trajectory

The main team trajectories are in line with IJPB axis 1 and are related to seed biology. The team is first proposing to develop novel lines of research based on current funded projects (such as the ANR-CLEANSE project) to better understand the pathway of cell wall-derived signalling and its developmental and evolutionary implications. They are also proposing to keep working on sugar signalling and the elimination of the nucellus. We appreciated that the team plan on submitting an ANR project on this topic in 2024.

It is also good that the team plan on strengthening its leadership in the study of amaranth seed development by searching for new lines of funding.

We also appreciated that the team wants to expand its expertise by working on projects in line with the IJPB axis 2 and 3 which would be related the study and the connections that exist between metabolites (amines, sugars), gene regulation and epigenetics in the plant responses to abiotic stresses.

The team is planning on recruiting a new researcher (CR) which may prove crucial for its sustainability.

Note that the description of the project on chromatin and drought (PORTFOLIO 3) is not very clear and is described in very general terms despite previous request for clarification and precision. For example, no precise experimental work plan has been presented.

RECOMMENDATIONS TO THE TEAM

Overall, the prospects of the team are judged good. Specifically, the team should continue using a multi-disciplinary approach in its research projects to sustain a good scientific production and a strong interaction with the private sector. Similarly, the team should continue advising and training undergraduate and graduate students and help them (as it was done) to publish at least one/two papers during or shortly after their training. The seed/epigenetic project is excellent (interactions between metabolites, gene regulation and epigenetics in the plant responses to abiotic stresses). However, the research direction on sugar signalling in the elimination of the nucellus is not that clear and was not convincingly presented.

Considering the small size of this emerging team, careful attention should be given to a focused research strategy. We then recommend that the team increases its size by finalizing the hiring of the research scientist.

Finally, the team should also try to keep a good balance between basic and more applied research activities.

Team 14: Design, Engineering, Compartmentalization of Lipid Metabolism (DIPOL)

Name of the supervisor: Mr Jean-Denis Faure

THEMES OF THE TEAM

The DIPOL team is a small team with one professor, one assistant professor, one INRAE researcher and 2 technicians. The team tackles three rather independent scientific questions:

1/To link lipid metabolism to the unfolded protein response (UPR) in response to biotic and abiotic stress. UPR is a cellular stress response related to the endoplasmic reticulum (ER) homeostasis which can be linked to various cellular responses including biotic and abiotic tresses. By lipidomic approach, they identified the lipid classes which are under the control of UPR under ER stress. During the period, the team patented the use of 4-phenylbutyric acid and/or 3-phenylbutyric acid and/or 2-phenylbutyric acid in preventing and treating biotic stress such as cryptogamic diseases,

2/To manipulate the lipid metabolism in camelina to improve oil and resistance to stress. Although Camelina represent a weak economic strategy, editing strategy was carried on complex traits like polyunsaturated fatty acids. During the period, the team manipulated flowering with the help of CRISPR-cas9-induced combinations of mutations, reduced apical dominance and bushiness; traits potentially valuable in intercropping for summer catch crop. This work was published in Agronomy. The team also chose Camelina as chassis for accumulating various bioactive lipids like sphingolipids

3/The formation of lipid droplets was imaged using TGIR SOLEIL synchrotron light multimodal approach and contributed to increase the lipid droplets LD structural knowledge for engineering applications for example to express and purify highly hydrophobic viral proteins like Sars-Cov2. A PhD student was hired under a Cifre contract in Collaboration with CoreBiogenesis (CB) startup; a Declaration of Invention INRAE has been deposited.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In 2019: "*There is a risk in developing too many participating projects and few coordinating ones… which might induce a lack of focus and this could likely be diversified further with the outcomes of the forward screens… It would be advisable to reconcile the translational research on Camelina with the fundamental techniques that the team nicely mastered. At the moment they appear as two separate domains.*"

We think that this recommendation is still very accurate in the present reviewed period, particularly in view of the decrease in the number of permanent people in the team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	1
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**3**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The scientific activity of the DIPOL team is appreciated as good to very good. Even though the team lost several people during the period 2018-2023, its scientific production is still good. Over the course of the evaluated period, the DIPOL team has published 19 Primary articles and 4 as leaders in Biotechnology Journal, Agronomy, Journal of Agricultural and Food Chemistry, J. Synchrotron Rad, 3 Review articles in Journal of Experimental Botany.

Notably the team submitted one patent.

Strengths and possibilities linked to the context

The team benefits from the large collection of genetic resources of model plants (Arabidopsis and camelina). There is a complementary expertise in genetics, imaging and lipid-protein biochemistry, and an expertise in field trials with its collaboration with the Rothamsted Research Centre and agronomic evaluation. They are supported by a professional network to improve research in different domains like biocontrol, breeding of camelina, molecular farming and pharmaceuticals.

The team obtained 23 contracts mostly national with 17 as coordinator. They belong to the H2020 European consortium UNTWIST in which DIPOL is coordinating WP1 on genetics and (epi)genomics of camelina breeding. Notably, the team built a collaboration with Core Biogenesis, a start-up created by a former IJPB post-doc.

The lipid derivative 4-phenylbutyric acid (4-PBA) and its isomers in biocontrol solutions to cope with cryptogamic diseases have been patented.

The team is extremely active in teaching and academic coordination. One HDR was defended during the period. The team organized a camelina day event in June 2023.

The team is involved in art and science project.

Weaknesses and risks linked to the context

The team's limited size raises a risk concerning its visibility particularly in the context of the number of different projects, and attractiveness to students and PhD candidates.

We noted the strong involvement in research/teaching impairing a lot of the involvement in research. As a consequence, the different topics studied might require refocusing.

In terms of quality, the scientific output could be improved. It includes too few articles published in well-recognized journals and/or more generalized journals.

Analysis of the team's trajectory

DIPOL would like to investigate the role of lipid metabolism during abiotic stress like drought and heat stress as usually found during summer cropping. The ANR RecovOil will be pursued in collaboration with other teams of IJPB to understand how and why LDs are degraded after heat stress in Arabidopsis. They will investigate whether LDs are degraded by lipolysis or autophagy during the recovery phase and follow the analysis of LD structure.

Since the last evaluation, the team has decreased in size, with only a few permanent scientists and technicians. The arrival of a novel member is good news, as wells as the Junior Professor chair that has been selected by AgroParisTech for 2025 to develop the Camelina program.

The committee suggests the DIPOL team discusses possible interactions with IJPB teams having the same center of interest like DYSCOL for lipid droplet or SEEDEV for Camelina.

RECOMMENDATIONS TO THE TEAM

We recommend reducing the number of scientific topics they are currently being investigated.

Team 15: Transcription Factors and Architecture (FTA)

Name of the supervisor: Mr Patrick Laufs

THEMES OF THE TEAM

This team focuses on proteins particularly transcription factors that regulate organ boundary domains (BD) in plant development and morphogenesis, with a focus an BD role in plant development across different scales. The specific expression patterns of key transcription factors that govern BD are studies together with their impact on cell dynamics and growth using genetic, genomic, and cellular analyses, integrated through multi-scale modelling.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	**8**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**2**
Total personnels	**10**

EVALUATION

Overall assessment of the team

This team has an excellent publication record with 14 primary publications, 8 review articles and 1 book chapter, together with 13 oral communications and 7 posters. This includes some important publications such as that in Development (2020) 147, dev183277 and Plant Cell (2022) 34, 4738-4759 that are well cited**.** While this output is very good, and the role of P. Laufs in administration is considered, there is still room for improvement considering that the team is comprised of 8 permanent staff (who have very little or no teaching responsibility) as well as 4 HDRs and 7 PhD students. The team works in a niche area of fundamental biology, in which they have gained a significant international reputation in the topic. This is a strength in that the team has a tight focus, but it is also a weakness in that it limits interactions with non-academic partners. However, the international visibility of the team could be improved. There is a relatively low number of invitations to international meetings and there are too few interactions with industry and society. This limits the attractiveness of the team. While it is not always easy to find financial support for purely fundamental research, the team has secured six research contracts with four as coordinator.

While the main focus of the team research program has been fundamental biology, the development of new tools for the quantification and modelling of development is innovative and important. The focus will increase the international profile and overall attractiveness of the team. Similarly, the team is developing new directions and opportunities, such as hydathodes and meristem conversion. It will be crucial to move forward quickly in these areas to gain a competitive advantage. The SWOT analysis highlights the problem of strong international competition in this research (with large groups having overlapping interests) as well as the imminent retirement of three team members.

Strengths and possibilities linked to the context

The team has considerable strength in its skills and expertise in an important area of plant biology. This topic has clearly proved to be attractive to Master and PhD students. To date team expertise has been focused largely on basic research, with important new directions in modelling and hydathodes. There is considerable to potential to extend this expertise to studies under field conditions that may increase the attractiveness of the team to industrial partners. There is also the possibility to increase team efforts for wider international collaborations that will enhance the visibility of the team and its activities. The team already has a good number of shared research projects within FTA, IJPB (in particular MIN), national and international labs. These collaborations could certainly be increased in number the future. The team has highlighted the original and efficient tools for quantitative phenotyping that are available and used within the group. The team has excellent facilities and expertise that can be used to better advantage in the future.

Weaknesses and risks linked to the context

The team works on a very focused area of fundamental research that has constricted funding opportunities and international visibility. Moreover, while the publication output is good there is a considerable amount of competition in the field from other labs. These limitations pose a risk to the future viability of the team, particularly as some team members are close to retirement.

The team currently has a high level of attractiveness to Master and PhD students but this may decline if the number of publications and level of funding do not improve.

To date there has been little effort to include elements that are related to the needs of industry or society. Efforts are being made to rectify these issues, with higher prioritization of translational activities.

Analysis of the team's trajectory

The team has made sound and appropriate plans for its future research directions that should increase the possibility for publications, particularly through increased national and international collaborations and innovative collaborations with non-academic partners. The team's trajectory is important. It is designed to continue to develop a deep understanding of how BD genes direct plant development and crucially to analyse the agronomically-relevant processes in which they are involved. This latter part of the project will be particularly important to the future security and success of the team.

RECOMMENDATIONS TO THE TEAM

The team should focus on increasing its international profile by increasing collaborations with a wider range of partners, for example in Asia.

Team members should participate in more national and international conferences.

It would be beneficial for the team to focus on publications, increasing the number of outputs but also consideration of a wider range of journals.

It is important that the team increases the scope of its research. The panel fully supports the strategy of an increasing focus to the application of research findings to the field context.

Succession planning is vital to the future of the team and plans should be made on how to replace staff who are retiring.

Team 16: Glycans and Signaling (GAS)

Name of the supervisor: Ms Samantha Vernhettes

THEMES OF THE TEAM

The research activity of Team 16 GAS concerns the investigation of the biological functions of oligosaccharides released from plant cell wall polysaccharides and plasma membrane phospholipids in plant development and plant defence against pathogens. These topics benefited of the implementation of an innovative analytical strategy based on the identification of minute amounts of free oligosaccharides by liquid chromatography coupled with high-resolution mass spectrometry.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

No previous report concerning this Team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**2**
Total personnels	**5**

EVALUATION

Overall assessment of the team

The overall activity of this recently created team (2022) is not assessable. Its scientific project is considered as relevant and promising. Scientific outputs of this young team should be evaluated in-depth at the end of the next contract.

Strengths and possibilities linked to the context

The Team was created in 2022 and so, the report only covers a two-year evaluation period. Its scientific project was initiated in Team 18 PAR. The team is composed of two full-time permanent INRAE researchers, one technician, one engineer and one PhD.

Within Team 18 PAR, members of Team 16 GAS were previously involved in demonstrating that pectin-derived oligosaccharides are released by Arabidopsis cell wall after infection with Botrytis. During the 2022-2023 evaluation period, Team GAS demonstrated that oligosaccharides arising from plasma membrane phospholipids (GIPC) are also released during this infection. Interestingly, these GIPC-derived oligosaccharides, likely released by PLC from Botrytis, are able to down regulate plant defence mechanism allowing the pathogen

to evade the plant defences. This is an original result that opens a completely new field of investigation. It is worth noting that these results benefited of the development by Team 16 GAS of an efficient and sensitive method to identify, by liquid chromatography coupled with high-resolution mass spectrometry (LC-HRMS), minute amounts of oligosaccharides in complex glycan mixtures isolated from plant tissues.

The output of this Team GAS consists in 5 articles, 4 as collaborators in excellent journal (Plant Cell (1), Science advances (2)) and 1 as main contributor (Frontiers in Plant Science). GAS also published 4 preprints of which one is related to the main research project of this new Team. Four oral communications in international meetings are also listed in the report.

Team GAS was active in getting competitive grants at the national level with 1 ANR JCJC and two grants from INRAE, together with two local smaller-scale funding supports. In addition, they obtained an ANR PRCE with a private company (Ellicityl) and a lab in Amiens. This more applied project aims at identifying new plant-derived oligosaccharides that can stimulate the plant immunity and so, be useful for plant health treatment as alternative of chemical fungicides.

Weaknesses and risks linked to the context

As for all new team, the main risk is its ability to emerge in a competitive scientific field. This would require to publish articles in top journals enabling the Team GAS to get an international reputation on oligosaccharide signalling and to improve their success rate to competitive national and European grants.

Analysis of the team's trajectory

Considering that GAS is a young research Team, its project is in line with what has been done for two years. The team's trajectory first concerns the perception of free oligosaccharides arising from the plant cell polysaccharides or plasma membrane phospholipids during the plant development. The second project is focusing on the comparative analysis of oligosaccharides released by resistant and susceptible plants in two pathosystems with the final goal to identify new elicitors. However, the project is not clearly funded and this further emphasizes the imperative need to rapidly get national and European grants.

RECOMMENDATIONS TO THE TEAM

Team GAS must develop international collaborations with labs on the oligosaccharide signalling. This should be achievable considering the innovative LC-HRMS *analytical strategy developed by GAS for the identification of free oligosaccharides*. The committee would also recommend considering targeting the best considered journals to improve its international visibility and to focus on a limited number of scientific questions, the first one being the role of GIPC-derived oligosaccharides in plant defence mechanisms, to avoid any risk of scientific dispersion.

Team 17: Modeling and Digital Imaging (MiN)

Name of the supervisor: Mr Philippe Andrey

THEMES OF THE TEAM

The team develops mathematical methods and implements numerical tools to perform quantitative image analysis and numerical simulations with ubiquitous applications in quantitative biology.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

During the previous evaluation, two main recommendations were suggested: the team should increase its international visibility & should focus more on its own research topics and not dilute its efforts in too many projects. Over the evaluation period, the team has considered these recommendations and taken active measures to address them.

Three achievements of the team vouch for a significant increase of its international visibility: First, the researchers of the team have been invited speakers in 5 international meetings (one every year) & have organized (as members of the organization & scientific committees) one international meeting held at IJPB. Secondly, roughly 40% of the published articles stem from international collaborations. Finally, the researchers of the team have also been involved in prestigious international grant evaluation (ERC, DFG) as well as top-tier journal reviewing (Nat. Com., Scientific Reports, Nat. Comput. Sci.).

The team has also succeeded in fine tuning the balance between personal projects & fruitful collaborations, which is a major challenge for every computational biology research team. Two main observations back this fact: First, the MIN team has been coordinating 30% of the funded projects it has been involved in (23% in terms of total funding). Secondly, the team researchers are listed as corresponding or co-corresponding authors in one third of the 18 peer-reviewed articles produced during the evaluation period.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	1
Sous-total personnels non permanents en activité	**2**
Total personnels	**6**

EVALUATION

Overall assessment of the team

The team has been delivering an excellent scientific output over the evaluation period. It has gained international visibility and has been involved in numerous fruitful collaborations, spread over a large scientific spectrum, including but not limited to the core topics of the institute. It is worth noticing that methods and tools developed by the team for plant sciences have also found their ways in neurobiology. Its involvement in training and teaching could be improved to attract more students.

Strengths and possibilities linked to the context

The main strength of the team certainly relies in the expertise of its core members who have a solid experience in the development of quantitative image analysis and modelling methods. Its balanced composition with an equipartition between researchers and engineers is also an asset, for it enables the simultaneous development of genuine numerical methods and their efficient implementation as plugins (for the widely used ImageJ software notably, Laruelle *et al* 2023) and software (Morpholeaf, Portofolio #1).

The team has an excellent scientific production, with a majority of published articles in highly respected journals. The team researchers appear as corresponding or co-corresponding authors in a third of the published articles, accounting for their leaderships in the corresponding projects. It is also worth noticing that the team scientific production leads to publications in major biology-oriented journals (*e.g.* eLife, Development, cell reports) but also in more technical and specialized ones (*e.g.* Plos Comp. Biol., Spatial Statistics, Quant. Plant Biol.), accounting for the novelty and technical quality of its developments.

Finally, another inspiring strength of the MIN team is its ability to develop generic mathematical and computational tools with broad applications. In the context of plant biology, the team has been involved in a very wide range of topics, from quantitative analysis of heterochromatin dynamics (Portfolio #2) to estimation of leaf morphogenesis trajectories (Portfolio #1), through modelling complex 3D cell division patterns in early embryo (Portfolio #3). Moreover, it is important to note that the team has been successfully exporting its methods outside its native plant biology field (5 articles have been published in neurosciences or associated fields).

Weaknesses and risks linked to the context

Git-based platforms are nowadays essential tools, widely adopted in the computational biology community, to disseminate numerical methods, plugins and libraries. Although a github repository is dedicated to the tools developed by the team (https://github.com/L-EL), the team's presence on such platforms seems rather limited and not properly advertised. This might limit the dissemination of the team's methods as well as its visibility.

Over the evaluation period, the team has been training two PhD candidates, two post-docs, one engineer and 5 interns (2 M2, 2 M1 and 1 L3). Although these numbers are not bad *per se,* they are lower than during the previous evaluation despite the team having gained one permanent staff member. This might come from a lack of exposure to students due to the very limited teaching activity of the team members (10h/y as mentioned in the 3-3-1 section of the report). In the long run, this could impact the ability of the team to expand and develop properly its scientific objectives.

Analysis of the team's trajectory

Over the evaluated period, the team has been steadily establishing itself as one of the major players in the European plant computational biology (*PCB*) community, through its implication in successful collaborations within the IJPB but also with national and international partners.

For the coming years, the team has identified three main axes of investigation: Intelligent microscopy, genetic/geometric atlases and cellular Potts models for plant morphogenesis. These three topics are natural developments from the current expertise of the team and match currents trends in the *PCB* community. The team will certainly deliver solid results on these subjects.

RECOMMENDATIONS TO THE TEAM

The modest involvement of the team in teaching duties could be detrimental to the recruitment of graduate students. To cultivate its attractiveness, the team is encouraged to engage itself, if possible, in more teaching activities. The recruitment of a young assistant professor could really help on that matter.

The "era of low hanging fruits" is over in plant computational biology. It is very unlikely that any single PCB group will centralize all the expertise needed to achieve ambitious scientific breakthroughs in the coming years. Establishing a solid network of collaborations, not only with biology teams, but also with other math/info-focused teams will therefore be crucial during the next evaluation period. One concrete example would be the topic of genetic/geometric atlas. Similar initiatives have already been initiated (see for instance Refahi *et al* 2021, Leggio *et al* 2019); the team personal ambitions on the matter would certainly benefit from existing expertise, for instance the morphonet team lead by Emmanuel Faure in Montpellier. We therefore encourage the team to continue its efforts to increase its interactions and participation into the national and international PCB community.

Team 18: Primary Cell Wall (PAR)

Name of the supervisor: Mr Herman Höfte

THEMES OF THE TEAM

During the evaluation period, the Team 18 PAR has focused its research on the understanding of the mechanism controlling the assembly and expansion of primary cell walls, the identification of pectin oligosaccharides involved in plant immunity and the coordination of a large national project concerning the biomass use.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The concern raised in the previous Hcéres report regarding the involvement in student training has not been fully addressed during this period. The second recommendation on maintaining the synergy between individual topics, notably with the emerging project on oligosaccharide signalling, has not been achieved because a new team was created in 2022 on that specific scientific topic.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	3
Sous-total personnels non permanents en activité	**4**
Total personnels	**8**

EVALUATION

Overall assessment of the team

The output of the Team 18 PAR as a whole is **outstanding**. PAR has gained an outstanding international reputation attested by several publications in top large audience journals and by their success rate in obtaining highly competitive international funding sources. The evaluation committee would like to highlight the scientific outputs on cell wall assembly and expansion now developed in the context of an ERC starting grant.

Strengths and possibilities linked to the context

In December 2023, PAR is composed of three full-time permanent INRAE researchers, one technician (80%), three PhDs and one post-doc. PAR was reorganized in 2022 due to the creation of Team 18 on oligosaccharide signalling. Team PAR leadership also changed in September 2024.

The Team 18 PAR has been delivering an **outstanding** scientific output over the evaluation period with 36 peer-reviewed articles published in top large audience journals of which PAR is the main contributor for 20 articles (Science (2), PNAS (2), Current Biology (1), The Cell Surface (3), Development (2) and Plant Physiology (1)). PAR members were also co-authors of 16 articles also published in top journals (Nature Comm. (1), Current Biology (2), The Plant Cell (1), Development (2) and Plant Physiol. (1)). Most articles resulted from international collaborations.

The main strength of the team relies on major scientific outputs in plant primary cell wall biology. Using the super resolution microscopy for the study of cell wall molecules they demonstrated that pectin filament expansion provides a driving force for cell wall assembly and expansion (Science 2020). They also discovered pectin-binding peptides and their receptor kinase THESEUS 1 are involved in the regulation of cell assembly (Current Biology 2018; The cell Surface 2018; Science 2022). The identification of pectin-derived oligosaccharides involved in plant immunity (PNAS 2019 & 2020) (project being now carried out by Team 16 GAS). Coordination of the large project « Biomass for the future » (8-year project, 20 M€, 21 partners) aiming at promoting an added value chain of three lignocellulosic biomass crops in France is also a main achievement of Team 18 PAR.

Team members (of the current composition of the Team) gave 20 oral presentations in international meetings and were involved in the organisation of several congresses.

The funding capacity of Team 18 PAR is also **outstanding** with one ERC starting grant (notably allowing the financing of a super resolution microscope), two European H20 projects as participants and of one International ANR (ANR PRCI) as coordinator. They have also coordinated two ANR PRC and two smaller-scale projects funded by INRAE. They also received regional funding supports, including a grant from PIA Biotechnologies and Bioresources (Biomass for the future) on the study of lignocellulosic biomass crops in collaboration with Teams APSYNTH and QUALIBIOSEC.

The members of Team 18 PAR have been contributing to a broad range of outreach activities (interviews, press release, video, conferences) for both large audiences and students.

The Team has anticipated the retirement of the previous PI with the appointment of a young scientist as new team leader since September 2024.

Weaknesses and risks linked to the context

Considering its high-level expertise and international reputation, Team 18 PAR is not involved in higher education training.

Analysis of the team's trajectory

Team 18 PAR proposes to benefit of its internationally recognized expertise on primary cell wall assembly and expansion to implement new research topics on (i) the study of this process on root hairs and hypocotyl epidermis as model for tip- and diffuse growth, respectively; (ii) the investigation of biomass quality traits through imaging techniques and (iii) investigation of single polysaccharide mapping by super-resolution microscopy. The project is already funded and workforces are available,

RECOMMENDATIONS TO THE TEAM

The committee recommends the Team PAR to maintain their outstanding international reputation on the primary cell wall assembly and organization.

We also recommend that the team pay more attention to ensuring that PhD students and post-docs obtain first-author papers during their contract period.

Its involvement in training and teaching could be largely improved.

Numerical simulations of cell wall mechanical behaviour are a useful tool to complement the team investigations. The team should, if it is not already the case, establish a collaboration on this matter with biophysicists or computer scientists.

Team 19: Seed Development and Quality (SEEDEV)

Name of the supervisor: Mr Loïc Lepiniec

THEMES OF THE TEAM

The team Seed Development and Quality (SEEDEV) studies the mechanisms that control seed development, composition and quality. The team is mainly focused on two regulatory networks namely the "LAFL" and "MBW" (that control seed development and maturation in relation with the accumulation of the storage compounds (oil and proteins) and flavonoid biosynthesis, respectively. The current staff of the team is composed of 12 permanents and 5 non-permanents.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In 2019: *"In the future the team will use new plant models that have a high potential for accessing otherwise limited approaches in Arabidopsis and will extend the knowledge in crops. The team should however be careful to not be overloaded by this new amount of work.*

The Group enjoys a strong international reputation. The group is very dynamic in obtaining financing including for more applied crop science and very efficient in scientific production.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	3
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	**12**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	3
Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	**7**
Total personnels	**19**

EVALUATION

Overall assessment of the team

Overall assessment of the team is excellent. The complementary nature of the team members is a major asset. The SEEDEV team can draw on a solid international reputation built up over the years, visible in its scientific products and high-level scientific network. The Seedev team has a strong expertise in seeds not only at the level of fundamental research but also with a strong collaboration network with private partners with industrial valorization in mind (e.g. Vegepolys Valley, a national competitive cluster in the area of seed quality). The team leader is as member of many scientific committees such as GEVES (French Seed Association),

The team is very successfully in transferring this knowledge and findings to crops such as rapeseed, maize, rice or raspberry.

Over the course of the evaluated period, the Seedev team has produced an excellent scientific production with 3 book chapters and 42 primary and review articles published as leaders in The Plant cell, Journal of New Seeds, Plant Journal, Progress in Lipid Research, Cells, Journal of Molecular Sciences, Frontiers in Plant Science, Plants, BMC Plant Biology, BBA, Sexual Plant Reproduction, PLoS ONE.

The team has developed strong links with the non-academic world and a number of projects have been developed and funded with seed companies. Finally, the team has an excellent international recognition.

Strengths and possibilities linked to the context

Among the strengths of the team, we would highlight the complementary scientific skills and topics within the team combined with the technical expertise on analytical lipid and specific metabolite chemistry, this lead not only to the development of multiple and fruitful collaborations with other national and international groups, but also the Synergies between basic and mission-oriented researches. The ability to obtain contracts and fundings associated with the high level of publications and the high quality of the papers are definitively major strengths The team has reported a major finding in The Plant Cell, 2020 that illustrates the transcriptional control of lipids in seeds and show that partially redundant Δ9 Stearoyl-ACP Desaturase genes are critical for Omega-9 Monounsaturated Fatty Acid biosynthesis during seed development in Arabidopsis. This work is highly cited, and very important in term of understanding reserve accumulation in oleagineous seed.

They obtained a lot Contractual funding with the notable example of the ANR the SEEDREG project (2021-25), which involves all team members, and Erasmus project (2023-26).

The team is very active in teaching (400 h of teaching per year) and academic coordination. Five HDR were defended during the period.

The team is very active in public outreach and interacts as experts on different committees, particularly the team leader.

Weaknesses and risks linked to the context

Heavy involvement in management and collective tasks and Limited time for non-academic activities

Analysis of the team's trajectory

The team's solid foundations make it all the more optimistic. The team will capitalize on the previous period to study the mechanisms that control seed development, composition and quality, that will allow the development of tools to modify the accumulation of storage compounds in seed.

The seed resilience in response to heat stress will be also particularly studied. Investigation of the biological functions of the unusual fatty acids already identified will be followed under the frame on an ANR project.

A strong translational research will extend the studies to crop species like pea, camelina, lens and chickpea (projects Pea-Value 2020-24, Oleoprotid and ValoN project 2024-28, TriHelix 2020).

RECOMMENDATIONS TO THE TEAM

We recommend continuing in the direction the team has been going for the past few years. Put in place more resources to seize numerous new opportunities in seed proteins for industry and food. The team might consider forging more links in Paris on the Saclay campus with other teams and with existing start-ups. An in-house startup might define an interesting perspective in this respect…

Pay attention that the diversity of topics covered in the team does not hamper the effectiveness of both applied and fundamental research.

Team 20: Spatial Control of Cell Division (SPACE)

Name of the supervisor: Mr David Bouchez

THEMES OF THE TEAM

The SPACE team focus its activities on cytoskeletal (cortical microtubules) organization and transitions during cell division: crucial parameters for morphogenesis

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team produced outstanding results in previous periods with publications in Science and Nature communication. It was suggested that if interdisciplinary approaches assayed turn out to be successful, the team should use them to increase stable collaborations and find ways to hire new scientists, as a lack of manpower was pinpointed. It was also advised to look actively for solutions such as increasing collaborations with other IJPB groups or elsewhere, accepting more students for internships, and looking more actively for PhD students. These recommendations have been mostly taken on board with multiple fruitful collaborations established inside IJPB and external national and international teams. This leads to the production of several excellent joint scientific articles. Unfortunately, this has not (yet) provided the opportunity for new recruitment. Concerning additional mannpower the team hosts two PhD students and two Masters students, but no post-docs).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**2**
Total personnels	**8**

EVALUATION

Overall assessment of the team

The activity of the SPACE team is judged good as it stands and is assumed to improve significantly in the near future. After a previous mandate that produced remarkable results, the team has invested a lot of energy in technological development and collaborative work, which has not yet paid back.
If the quality of publications remains excellent, the productivity appears limited (four articles and two book chapters). Besides, the team appears in the majority of these articles as collaborators. This situation is probably the result of a strategy aimed at producing outstanding articles in the very best journals (4 articles in preparation have been announced, 3 of which are first authored by researchers from the team). However, this can be perilous, especially for young scientists, and needs to be more measured. As recommended, the team has taken care to make itself more attractive by welcoming two masters and two PhD students, but, regrettably, young researchers (post-docs) do not complete this picture. Finally, it is surprising not to see a strategy for the future of the team and emergence of a new PI.

Strengths and possibilities linked to the context

The different grants (Human Frontier Science Program, ANR, SPS) provided the opportunity to create a solid scientific network attested by excellent joint publications (Nature Commun, EMBO report, Science Advances). An established network of collaborations with the RDP laboratory is very appreciated to understand collectively with various approaches the events leading to cell division in plant cells.

The team invested a lot during past years in methodological development. It provides them with remarkable expertise (mainly in cell biology, including high-resolution imaging resulting from a collaboration with D. Kierzkowski's team in Montreal). Its exploitation must contribute to the team's competitiveness in a field where competition is increasing.

Weaknesses and risks linked to the context

If the quality of the scientific publications is still of very high level, the productivity appears limited (four articles and two book chapters), as the team appears in the majority of these articles as collaborators. This situation is probably temporary, as the result of a strategy aimed at producing outstanding articles in highly visible journals (5 articles in preparation have been announced, 4 of which are first authored by researchers from the team). However, this can be perilous, especially for young scientists, and needs to be measured.

The number of students remains limited and the absence of post-doctoral fellows is regrettable but we note a collaboration with Canada (Univ of Montreal) providing an opportunity of co-supervision. We'd like to see more of this kind of operation, the good collaborations established these last five years give grounds for optimism in the field. Unless this has been omitted, involvement in higher education appears to be very low; collective involvement of the team's researchers would increase the team's visibility and attractiveness.

Funding is respectable, but the majority are limited, please be careful this may contribute to spreading thin the team's strengths.

Finally, it is surprising not to see a strategy for the future of the team. This is perhaps the point that needs the most work to enable the emergence of scientific leaders among the team's researchers.

Analysis of the team's trajectory

The size and complexity of the multi-gene families making up the TTP complex and its relationship with the cell cycle means that there is a huge amount of work to be done. The team continues to produce high-quality work that has led to very fruitful collaborations. Nevertheless, its own productivity is very limited, resulting probably from a combination of factors (a strong methodological investment that has not yet fully paid off, a desire to aim for best possible publications, multiple grants but limited number of important ones, etc.). If the publications announced as part of the preparations materialise, everything should return to normal but if this is not the case, the team will have to revise its publication strategy in the near future.

RECOMMENDATIONS TO THE TEAM

Pay attention to the regularity of your own production by maintaining a balance between research and methodological development.

The team, as a whole, needs to become more involved in higher education to boost its attractiveness and target contracts offering opportunities to hire experienced researchers (post-doctoral students). The excellent collaborations established should offer opportunities to reach this goal.
Seek to identify PIs to prepare the future.

Team 21: DNA repair and genome engineering (DRAGON)

Name of the supervisor: Mr Fabien Nogué

THEMES OF THE TEAM

The research carried out by the team aims at understanding DNA double-strand break (DSB) repair mechanisms in the model moss *Physcomitrium (Physcomitrella) patens*, with the long-term objective of optimizing CRISPR/Cas9 genome editing in model plant species and crops. A related axis involving multiple fruitful collaborations with academic laboratories and private stakeholders leverages the expertise in DSB formation to optimize New Genomic Techniques (NGT) with the aim to study plant gene function and improving crop breeding strategies.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Three main recommendations were made in the previous evaluation. The first was prioritizing scientific output over the team's activity in GMO risk assessment and associated expertise with national and international boards. A second suggestion was to recruit young scientists, such as PhD students and postdocs, and finally to complement the research on the CRISPR-Cas mechanisms in *Physcomitrella* with work in well-selected plant species.

The PI appears to have successfully balanced his role in GMO risk assessment with the scientific management of the DRAGON team, as illustrated by his position as the corresponding author in 10 articles. The team hired several young scientists, with a PhD student who started in 2022 and another expected to start soon, and two postdocs were recruited in 2020 and 2023, respectively. Additionally, the team is engaged in several collaborations, such as with INRAE Avignon, resulting in five publications demonstrating the application of genome editing to potato, tomato, and other Solanaceae.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	2
Doctorants	1
Sous-total personnels non permanents en activité	**4**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The team's scientific aims are 1/research on DNA repair mechanisms in the model moss *P. patens*; 2/ optimization of genome editing tools for *P. patens* through the development of CRISPR/Cas Prime and Base Editing; 3/ expertise in NGT development to study plant gene function and improve crop breeding strategies. Despite being a significant added value to INRAE, crop genome editing may soon disappear due to manpower lack. Combining original and important research, an excellent publication track record, patents' deposition, and exceptional fund rising combining public and private stakeholders, DRAGON overall assessment is outstanding.

Strengths and possibilities linked to the context

As evidenced by its numerous collaborations and efficient fundraising with academic laboratories and private stakeholders, the team has an excellent visibility and reputation in both fundamental and applied research. Five grants were also obtained in collaboration with three teams from IJPB, further demonstrating an excellent integration at IJPB for the development of fundamental research.

The expertise gained through mechanistic studies of DSB formation and repair has significantly contributed to enabling the team to develop new tools for engineering plant genomes. Initially working with CRISPR-Cas, the team recently adopted advanced Prime and Base Editing technology that led to six publications, the deposition of two patents, and secured additional funding during the evaluation period.

Success in applied research further helped the PI to launch and coordinate the TYPEX project involving 13 partners.

The team is leading one of the four flagship axes of the PEPR-SVA program, leveraging its expertise in genome editing (NGT).

The PI and another team member, P. Guerche, also played a significant role as part of the European Food Safety Authority (EFSA) Panel on Genetically Modified Organisms (GMO), actively contributing to the *EFSA Journal*, of several other committees instructing EU, France and INRAE policies in NGT and plant GMO management. The PI is also very active in dissemination of these problematics to the media and the public. As such, he has been in charge of Biosafety at the IJPB since 2019 and has engaged in numerous debates, interviews, and consultations regarding New Genomic Techniques (NGT) applied to plants.

Weaknesses and risks linked to the context

As appropriately identified by the team, its size, which will comprise only three permanent members after January 2025, can hamper the capacity to maintain simultaneously fundamental and applied research.

Biotechnologies evolving fast, maintaining the team as a reference in crop genome editing entails long-term risks that should be mitigated by prioritizing fundamental research.

Analysis of the team's trajectory

The team proposes to continue developing its three main research axes and GMO policy management, extending the use of NGTs to Leguminosae. In particular, the interesting results on the role played by BRCA2 in homologous recombination in *P. patens* will be followed up. The knowledge gained from studying BRCA2 and its protein partner TOP3B could potentially impact genome editing using CRISPR-Cas and should be beneficial for applied research. The initiation of complementary projects employing a DNA repair *P. patens* mutant collection and building on high-level national and international collaborations further promise to open new important perspectives.

However, team size reduction could have a major impact on this multi-tasking activity. The team seems to reinforce its collaboration with the MEIOME team bringing complementary expertise in DNA DSB formation at IJPB. This collaboration is an excellent strategy to maintain a high standard of fundamental research while continuing to develop applied research in parallel.

RECOMMENDATIONS TO THE TEAM

The committee proposes to maintain and strengthen collaborations with partners at IJPB, INRAE, and from abroad. It supports the efforts made to retain postdoctoral positions within the team to ensure the continuation of fundamental research, especially considering the retirement of one of the permanent staff members in January 2025. The team should overcome the challenge of preserving its know-how in genome editing of specific crop species despite relying mainly on ending short-term contracts, possibly through the dedication of a permanent staff member and/or contributing to the establishment of a genome editing platform at IJPB.

Team 22: Epigenetics, Reproduction and Transposable Elements (EPIREP)

Name of the supervisor: Ms Marie-Angèle Grandbastien

THEMES OF THE TEAM

The research carried out by the EPIREP team, formerly named RETROS, smoothly switched from its historical investigations on TE control using *Nicotiana* and led by M.A. Grandbastien to a new project led by F. Borges on *Arabidopsis* focusing on the role played by TEs in the inability to hybridize different species or parents with different ploidy. Recent insights set the ground for long-term research on parent-of-origin regulation of epialles by DNA (de)methylation and small RNAs. The new project employs state-of-the-art approaches to address important aspects of plant fertility, somehow pursuing the team's long lasing exploration of the Mc Clintock concept of "genome shock" in the contexts of endosperm formation, TE natural variation, as well as interploidy and interspecific hybridizations.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Considering the suboptimal size of the team and the forthcoming retirement of its PI, the former panel recommended considering the recruitment of young researchers as the highest priority to ensure that the valuable knowledge about the role of retrotransposons will stimulate the next generation of scientists and not get lost. This essential issue has been addressed brilliantly by recruiting an excellent young INRAE research scientist with a demonstrated solid and complementary expertise in plant epigenetics.

To increase the team's visibility and attractivity, the panel also encouraged the team members to contribute to academic teaching of the lab's research, in the form of courses, journal clubs, or contributions to doctoral programs or summer schools. Despite regular outreach activity with school students, there is still room for dedicating more efforts aimed at Science vulgarization to a large public and a more expert audience, thereby increasing the visibility of the new team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**2**
Total personnels	**6**

EVALUATION

Overall assessment of the team

EpiRep has been created in 2022 by the association of Filipe Borges with the RETROS team, ensuring a smooth transition after the retirement of its initial founding member. With four new PhD students and post-docs, the scientific context is excellent but could benefit from additional permanent staff. Despite its potential in breeding strategies, it does not involve private stakeholders and translational research. Exploiting original insights, a good initial fundraising, and top-level partners, the trajectory shows great promises of outstanding research in a highly-competitive field.

Strengths and possibilities linked to the context

The former RETROS team made important contributions to the field of TE biology and its role during plant adaptive responses to stress and upon hybridization. This research coordinated by M.A. Grandbastien has long remained productive, as shown by a 2019 article in New Phytology.

In 2022 the RETROS team became the EpiRep team, initially co-led by M.A. Grandbastien and F. Borges, INRAE research scientist since 2018 and supported by an ANR Young Investigator grant (JCJC). Upon the recent retirement of M.A. Grandbastien, F. Borges took the lead. Given the important changes in manpower and research axes induced by this transition, a fair assessment of the EpiRep track record and review is too early. Yet, it is evident that the EpiRep team has already gained a new dynamics. F. Bourges having gained experience in a world-class laboratory and already established relevant collaborations, the team is expected to thrive into a highly competitive field of research, as demonstrated by a recent article in Nature Coms signed by team members as the first and last authors.

The new trajectory successfully builds on an ANR Young Investigator project (JCJC) project ending in 2024, and a more recent International ANR PRC project undertaken by F. Borges. While succinctly detailed, this new trajectory on the epigenetic control of TEs in pollen and hybrid seeds already generates original publications deciphering the epigenetic control of the textbook "triploid block" (i.e., parental incompatibility) by siRNAs (Nature Communications 2024) and chromatin modification (unpublished) as well as great insights into the miR845 microRNA. The proposed trajectory therefore appears highly promising and is tackled in the frame of excellent collaborations. Despite its small size, the team initiates a new, ambitious, and excellent cycle of research.

During the evaluation period, two PhD students and two post-docs joined the team under the supervision of F. Borges, demonstrating a good attractivity.

The same impetus is evident in terms of fundraising, as seen with the participation in a highly selective international ANR grant, the setup of the EasyHybrids project, and ongoing applications with an emerging team with complementary expertise at ENS Ulm and to an individual ERC Consolidator grant.

Weaknesses and risks linked to the context

Maintaining, if not increasing, the team size is evidently a challenge, especially without possibilities in CNRS staff recruitment.

The new PI shows great dynamism in fundraising, but relying on short-term contracts, the PI may consider international consortia, and possible outreach and translational research to interest breeders and other private stakeholders. No crop and, more generally, non-Arabidopsis species are mentioned in the proposed trajectory. In the long term, this specificity may not allow for maintaining strong support from INRAE or gaining attractivity to the private sector. Unless obtention of an ERC or other significant grant, this may be reconsidered.

Aiming at high-impact publications, the scientific trajectory will integrate a highly competitive field of research that may need the identification of niche research axes, top-level collaborations, and intensive or targeted efforts on specific research questions.

Analysis of the team's trajectory

In agreement with the recent retirement of the supervisor of this team and the progressive ending of the research lines she carried out on Nicotiana TEs, the trajectory focuses on a new cycle of research. It builds on one hand on interesting preliminary data on the role played by DNA (de)methylation in triploid block (now funded by an ANR PRCI grant), and on the other hand, on parallel projects exploring the role played by a specific microRNA in TE silencing (as a follow-up of his post-doc project) and on small interfering RNAs (siRNAs). The latter extends to a broader exploration of the impact of TE natural variation on the fertility of polyploids and on genome evolution. The scientific trajectory therefore integrates a highly competitive field of research with potentially important outcomes on the molecular mechanisms affecting inter-specific, inter-ploidy, or inter-variety hybridization. Given these great promises, the team manpower should be increased by permanent staff.

RECOMMENDATIONS TO THE TEAM

The panel acknowledges the successful grafting of the Borges' team into the new EPIREP entity, and it encourages effort aimed at giving more visibility to the new team, hence attractivity, to facilitate the recruitment of talented fellows.

Having been integrated into a top-level US laboratory, the PI may also exploit both his international network and local great expertise at IJPB in TE control, seed biology, meiosis, genetic and epigenetic variation, or plant reproductive transitions, among others, as well as translation to crops.

To sustain and expand the current team, the panel also encourages applying to prestigious and heavily-funded grants, such as HSFP, European scientific networks, and consortia as well as other opportunities at the national and international levels.

Team 23: Epigenetics and Small RNAs (EpiARN)

Name of the supervisor: Mr Hervé Vaucheret

THEMES OF THE TEAM

The team focuses mainly on the epigenetic and transcriptional outcomes of newly emerging genetic elements in the genome of the plant model species *Arabidopsis thaliana*. Using methods like transgene integration, CRISPR/Cas9, virus-induced gene silencing and pathogens stress responses, the team deciphers genome defense mechanisms. Over 30 years, it played a leading role in the identification of the numerous factors contributing to PTGS and made key discoveries on the antagonistic role of RNA quality control pathways, which eliminate aberrant RNAs (abRNAs), and PTGS mobile silencing signals. Current work explores the role of RNA interference in the processing of abRNAs into siRNAs, the epigenetic regulation of gene expression, and examines PTGS in the contexts of DNA repair, chromatin remodeling, RNA splicing, and cellular trafficking.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

A first recommendation from the previous evaluation committee was to pursue the line of research using 'classic' genetic approaches. This has clearly been done successfully using a new original suppressor screen.

The panel also encouraged the PI to increase the visibility and prominence of its lab's foundational work and maintain the team's attractivity, participating to summer schools, international events and consortia. During the evaluation period, the PI contributed to a summer school and wrote an outstanding review summarizing 25 years of continuous discovery of novel small RNA molecules in plants. There may still be room for additional outreach activity, yet we understand that the PI's uncertainty about the team's trajectory may led to prioritizing the scientific production and training of PhD students and post-docs.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**2**
Total personnels	**6**

EVALUATION

Overall assessment of the team

This highly successful team is internationally recognized and its visibility shines brightly within the whole Plant Sciences research performed at INRAE. Through multiple genetic screens, the team made textbook discoveries on the fundamental mechanisms of genome defence through post-transcriptional gene silencing (PTGS), including its primary initiation steps and the switch to systemic PTGS. Work during the 2018-2023 period further opened new research avenues. The team has also been highly successful in fundraising and continued producing groundbreaking scientific insights. EpiARN has been assessed as outstanding.

Strengths and possibilities linked to the context

Although consisting of only two permanent researchers and two technical staff, the scientific output of the EpiARN team is outstanding in terms of number (12 peer-reviewed articles) and quality, as evidenced by three last-authored publications in selective generalist journals (NAR, Nature Communications, PLOS Pathogens).

The team is active in student training, currently supervising two PhD students, one who began in 2022 and the other who has already published a first-author paper. The lab also hosted three postdoctoral researchers during the evaluation period.

The team's success in securing research funding has also been outstanding, with a total of €1,195 K raised from national sources, including funding from three ANR-PRC projects as coordinator, two as a partner, one FRM PhD fellowship, one PIA as coordinator, and one INRAE priming grant as coordinator.

Weaknesses and risks linked to the context

Despite the exceptional success of the team since its creation, its attractiveness does not reflect its scientific visibility or its capacity to host and train a new generation of top-level scientists.

The major threat to the team is the forthcoming retirement of its two permanent staff, including the team leader. Considering the nature of the team in developing basic science in the general context of the impossibility of recruiting CNRS researchers, INRAE, IJPB, and the EpiARN team should identify new opportunities to maintain activity and know-how in epigenetic screens. Importantly, if the team was to close in a few years, the committee alerts on the urgent need to anticipate how to maintain and give open access to the plant collection developed by the team over the last three decades, which constitutes a unique and precious genetic resource.

While the team leader has always been highly successful in national fundraising, it surprisingly not had the opportunity to obtain international prestigious grants such as ERC or HFSP-funded grants.

Outreach activities and diffusion of scientific knowledge toward the general public, as well as translational research of the scientific outputs, do not seem to be in adequation with the team's objectives.

Analysis of the team's trajectory

In agreement with the team's sound and strong trajectory, the scientific projects planned until 2029 are, not surprisingly, highly promising. There is still much to uncover in this field, and the ongoing research remains vital. Among other aspects, the proposed integration of knowledge in PTGS acquired over the last decades mainly using artificial models to other genome defence mechanisms active in nature involving pathogens and abiotic stress responses (redox, DNA damage and repair, TE mobilization, etc.) should open a new era of studies matching current interests in this field of research and climate change prospects. This proposed trajectory is both solid and feasible due to the grant funding available until the PI's retirement.

RECOMMENDATIONS TO THE TEAM

The team is one of the longest-running and most successful at IJPB. It maintained a high notoriety and impactful research during the evaluation period. Considering its outstanding scientific production highlighted by the most prestigious INRAE award attributed to the PI in 2021, it would be essential to discuss the future of the team's research and of the seed collections that have been generated over the years. Furthermore, it may still be possible for the team to train a few more PhD students and post-docs, if not a permanent researcher.

Team 24: Meiosis Mechanisms (MeioMe)

Name of the supervisor: Ms Mathilde Grelon

THEMES OF THE TEAM

The research carried out by the MeioMe team focuses on the processes of meiotic recombination, a critical step in sexual reproduction and trait heritability. The team develops a wide range of molecular, cytogenetical, population genetics, and genomics methodologies in the diploid model plant species *Arabidopsis thaliana* as well as in allopolyploid models such as rapeseed and Camelina, as well as in the moss *Physcomitrium patens*, with the aim to assess the evolution of meiotic mechanisms with different genome architectures and apply this knowledge to improve plant breeding programs.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The former panel called for a clear strategic plan to avoid competition between the current MeioMe team and the new team established by a former member, now head of MPI in Cologne (Germany). With the publication of three significant articles in Nature Plants (2023), Nature Communications (2022), and PNAS (2021), the collaboration with this spinoff team appears to be highly positive. Yet, given the leading position of R. Mercier in these prominent publications, a clear strategic plan for the development of current and future studies developed independently or through collaborative work is needed.

To strengthen MeioMe leadership position, the former panel suggested prioritizing the development of high-resolution microscopy and genomic tools. In collaboration with the MIN Team at IJPB, the team quantitatively characterized the rapid and uncoordinated movements occurring during meiotic prophase. The findings indicate that such movements are unaffected by major changes in chromosome organization or homologous recombination (Nature Communications, under revision). Another manuscript currently in preparation will describe the machinery involved in telomere attachment to the nuclear envelope.

The panel further advised deeper employment of cereal plant species as a second model. The fusion of the team POLYMEIO head by Eric Jenczewski with the MeioMe team addressed this recommendation by bringing high expertise with allopolyploid species inheriting non-homologous chromosome sets. This is demonstrated by seven publications in which E. Jenczewski is the last author during the evaluation period, including one in Nature Coms. Using Brassica napus and Camelina sativa, they notably employed allelic mutant series of well-known meiotic genes (FANCM, MSH4, FIGL1, HEI10) generated by TILLING and CRISPR/Cas9 mutagenesis. This work revealed that, for instance, BnaMSH4 duplicates loss affects crossover formation between non-homologous chromosomes in a dose-sensitive manner (Gonzalo et al., 2019).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	3
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	**8**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	3
Post-doctorants	3
Doctorants	4
Sous-total personnels non permanents en activité	**10**
Total personnels	**18**

EVALUATION

Overall assessment of the team

Considering its international scientific visibility, its quantitative and qualitative publication track record, and exceptional funding, the MeioMe team was assessed as outstanding. The team leads cutting-edge research in plant meiosis on diploid and allopolyploid species, a critical process for plant breeding, including 1) deciphering the mechanisms of homologous recombination, including breakage and repair, 2) studying the regulation of meiosis using mutants, allelopathic compounds, and advanced microscopy, 3) investigating the interplay between chromosome dynamics and meiotic recombination. Translational approaches further aim at increasing recombination rates in crops for improved introgression of agro-economic traits.

Strengths and possibilities linked to the context

The team consists of 8 permanent scientists and is highly recognized. It attracts young researchers, as demonstrated by nine post-doctoral researchers and seven PhD students during the evaluation period. The scientific output is of outstanding quality, and the team has obtained extensive funding, exceeding 4 M€ from 19 different grants, including many in highly selective agencies including six national and international ANR projects as coordinator and four as partner. Highlighting its influence at the international level, the team organized a prestigious EMBO workshop on meiosis as well as the Plant Biology Europe 2023 with broad attendance. In a highly active research environment, the loss of a prominent team member who established a concurrent team at MPI in Cologne has been very well managed, with regular scientific exchanges and common lab retreats, thereby synergizing work and minimizing competition.

Weaknesses and risks linked to the context

Despite having an outstanding publication record, the ratio of first-author publications to the number of PhD and post-doc positions is low.

A prominent team member, recently retired. This may lead to a loss of expertise (e.g. genomics approaches) and reduce the capacity to develop multiple research axes in addition to its multiple collaborative studies.

Analysis of the team's trajectory

Despite a reduction in the number of permanent positions, the proposed trajectory appears ambitious but sound and realistic as it relies on established know-how as well as excellent collaborations with academic laboratories and private stakeholders that already secured exceptional fundraising. The team articulates its research in five distinct research areas: 1) follow up recent work on the synaptonemal complex (Vrielinck et al., 2023) to characterize new candidate central elements identified through a clever transcriptomic screen approach; 2) deciphering the molecular mechanisms of HR repair in plants through BRCA2-related proteins developed in collaboration with the DRAGON team at IJPB; 3) the development of live imaging in collaboration with the MIN team, a strategy that already led to publications and opens up new perspectives on the understanding of chromosome dynamics during meiosis; 4) pursue their investigations of the role played by SCEP1 and SCEP2 as part of the synaptonemal complex using the newly-established high-end microscopy approaches; and 5) extend their fruitful investigations of recombination and crossover in the context of homologous or extra chromosomes. Each of these complementary axes is supported by ongoing grants (including 1 PRCI and 3 PRC ANR grants and ongoing private funding) or further nourishes additional grant applications.

RECOMMENDATIONS TO THE TEAM

As successfully achieved in recent years, maintaining a scientific and publication strategy coping with the establishment of a large team in the same field of research by a prominent former team member is advisable. In the same vein, the retirement of another prominent team member may oblige the team to adjust its proposed trajectory and/or aim at maintaining the necessary know-how.

Team 25: Organelles and Reproduction (OrgaRepro)

Name of the supervisor: M. Hakim Mireau

THEMES OF THE TEAM

The research carried out by the OrgaRepro team aims to understand the influence of organellar genomes on plant phenotypes, notably hybrid compatibility. It deploys three complementary axes addressing the role played by RNA-binding proteins in the nucleo-cytoplasmic crosstalk affecting cytoplasmic male sterility (CMS), how this relies on translational control, and, more broadly, the molecular mechanisms enabling specific control of organellar RNA splicing, processing and translation by nuclear-encoded factors in Arabidopsis and several crops, especially rapeseed and maize.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

While acknowledging its leading position, the panel expressed concerns about the team's positioning about competition from Chinese groups and suggested cooperating with academic groups as well as industry/breeders.

As seen by the increasing number of co-authored publications, including the first description of plant mitochondrial ribosome cryo-EM structural analysis (Nature Plants 2019) and collaborative fundraising, this is now well engaged. Additionally, the team envisages associating with a former talented Chinese post-doc as a joint lab with Shanghai Jiao Tong University. The proposed opening to animal and yeast CMS problematics also fits this concern.

Considering the absence of patents involving industrial partners, the panel also considered that OrgaRepro did not fully exploit its capacity in collaboration and interaction with breeding companies.
This has not been addressed.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**3**
Total personnels	**6**

EVALUATION

Overall assessment of the team

The OrgaRepro team was rated as excellent to outstanding. It deploys an excellent project using outstanding expertise and cutting-edge technologies in nuclear and mitochondrial genetics. Despite a scientific production that keeps excellent to outstanding quantitatively and qualitatively, the forthcoming retirements of two permanent staff raise serious concerns about the workforce and funding capacity necessary to undertake the proposed ambitious trajectory promisingly initiated. The team does exploit its leading position in engineering CMS to develop translational research.

Strengths and possibilities linked to the context

The team is well-established, benefits from a high notoriety, and is at the forefront in the field of plant CMS, as illustrated by invitations (5) at prestigious conferences (Gordon Research Conference, International Conference for Plant Mitochondrial Biology, etc.) and regular organization of specialized colloquia.

As shown by 15 primary articles, two reviews and one book chapter (1.66 publications/FTE/year), of which 12 as first, last or corresponding author during the evaluation period, OrgaRepro pursues its highly active route. These publications appeared in excellent to outstanding journals such as Nucleic Acid Research (2), PNAS (2), Molecular Plant (1), Plant Physiology (1) or Plant Journal (1), and in Science (1) and Nature Plants (2) as co-authors.

The project is articulated into three complementary axes addressing the role played by RNA-binding proteins in the nucleo-cytoplasmic crosstalks affecting hybrid sterility in Arabidopsis and crops, how this relies on translational control, and more broadly the molecular mechanisms enabling specific control of organellar RNA splicing, processing and translation by nuclear-encoded factors. The team most notably sorted out the mechanism by which a 20-year-long known process triggered by the Ogu-INRA locus prevents CMS of rapeseed hybrids yielding 6-10% higher production, a trick originating from IJPB and currently used worldwide in industrial breeding (PNAS, 2021). In another case study using Arabidopsis inter-ecotype incompatibility and employing a genetics approach, the team identified that APOK3, a mitochondrial protein preventing gamete (pollen) death, is encoded by a nuclear gene surrounded by two pollen-killer loci, *i.e.*, loci that are detrimental to non-carrier gametes in certain cytoplasmic contexts (Genetics, 2022). Another asset of the OrgaRepro team during the evaluation period, and tackled in the frame of collaborative studies, is the development of mitochondrial ribosome RNA profiling and structural studies aimed at gaining a broad view of the numerous translational control events involving PPR RNA-binding proteins. This last axis is highly productive and central to the long-term efforts of the team in deciphering the molecular mechanisms of organellar gene expression.

The team developed fruitful collaborations, as seen by an increasing number of co-authored publications leading to outstanding publications (Science, Nature Plants) and collaborative grants.

Fundraising is good and secured until 2025 (790 k€ or 73 k€/FTE/year) with, during the evaluation period, eight contracts including three ANR grants and several local or INRAE grants, among which seven as coordinator.

The team identified a former talented Chinese post-doc as a candidate for establishing a joint laboratory with Shanghai Jiao Tong University.

Weaknesses and risks linked to the context

In spite of its high visibility, the team levered no international funding.

The research is tightly linked to crop breeding, CMS a major agro-industrial issue and the team benefits from a leading position in deciphering and engineering this process in several crops, yet no fundraising was achieved involving private stakeholders. As compared to its potential huge impact on the socio-economic world and society, the outreach activity of the team seems minimal. No partnership with the socio-economic sector has been developed during the evaluation period and its trajectory will likely prioritize fundamental studies.

The team currently has no post-doc and the non-permanent staff is composed of two PhD students.

While making excellent research and being very dynamic, the team workforce is limited. Several support staff members retired during the last period and could not be replaced. The forthcoming retirement of a senior researcher and of the remaining research technician could place the team in a more difficult position.

Analysis of the team's trajectory

On one hand, the team will pursue its long-term efforts in deciphering the mechanisms regulating mitochondrial translation, with a focus on the role played by RNA-binding proteins at specific transcripts in ribosome association/activity. This is complemented by a more recent research axis on peptidyl-tRNA recycling in enabling mitochondrial ribosome rescue. The analyses of mitochondrial translation further involve explorations of organellar intron splicing, a mechanism originating from prokaryotic auto-catalytic introns, by RNA folding and associated proteins. The latter axis involves excellent international collaborations.

On the other hand, the team deploys complementary strategies to address the role played by cis-regulatory elements of the mitochondria genome plausibly involved in CMS. This relies both on TALEN-enabled mitochondrial genome editing and mutant selection screens in the moss *Physcomitrium patens* before extending this to plants.

Last, the long-term analysis of CMS and fertility restorers is pursued in the frame of a highly relevant international collaboration (Japan) with the aim to exchange CMS-inducing mitochondrial genes between plants to facilitate the production of hybrids for species with robust CMS. If successful, this research line could become the main research focus of OrgaRepro.

The team's trajectory therefore appears sound and ambitious, plausibly opening new opportunities in translational research and favouring agro-industrial partnerships. Yet it is unclear at this stage if workforces and funding available make such objectives realistic.

RECOMMENDATIONS TO THE TEAM

The team faces a challenging situation in maintaining a sufficient workforce and would need recruiting permanent staff, especially upon the forthcoming retirement of a senior researcher and a research technician. The team needs to tackle this issue.

The team's activity and trajectory are excellent. It could, therefore, opportunistically take advantage of its recent breakthrough in CMS to leverage the conceptual and biotechnological potentialities developed in recent years, raise funding from multiple stakeholders such as the rapeseed French agro-business, and maximize outreach activities. Optimizing financial partnerships and fundraising could enable the team to cope with the planned reduction in manpower, possibly prioritizing technical support.

As identified by the PI, increasing the team's attractivity to students and post-docs attending Summer Schools, national and international conferences with a broad audience, or participating in large consortia (e.g., European doctoral networks) also appears essential to reinforce the team with young fellows while being distant from Paris Saclay and Parisian universities.

Timely breakthrough findings in CMS and organellar genome editing offer significant opportunities to boost team visibility by intensifying communication.

Team 26: Epigenetic Natural Variation (VarEpi)

Name of the supervisor: Mr Nicolas Bouché

THEMES OF THE TEAM

The project carried out by the VarEpi team exploits natural and artificially induced epigenetic variation to decipher the role played by DNA methylation in genome regulation, and the contexts in which it influences plant development in *Arabidopsis thaliana* and tomato. While much of the research focuses on fundamental aspects of molecular machineries regulating DNA (de)methylation, mRNA processing, small RNA biogenesis and function, in the long term the team aims at exploiting the biotechnological potential of epiallele regulation on agronomical plant traits.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

While acknowledging the excellent accomplishments of the team as compared to its size, the panel recommended putting attention to ensuring that PhD students get first-author papers in a timeframe of their own carrier's agenda.
>From the data available, such an opportunity seems not achieved with the last PhD student.

The former panel also acknowledged the great interest in pursuing the investigations of Arabidopsis *IBM2* but, again, considering the size of the team, it expressed serious concerns about the manpower capacity to develop simultaneous research on two model species. Given the funding situation in France and Europe, the panel viewed tomato as more likely to attract funding and students and recommended re-focalizing 1) on the natural variation between wild and cultivated tomato and 2) focusing on previously identified single loci that can form epialleles. Relatedly, the panel was also concerned by the very extended portfolio of projects.
>The projects using Arabidopsis made progress and *ibm2* mutant alleles have now been created in tomato. However, whether this corresponds to a transition toward extending or re-directing the Arabidopsis work to tomato is unclear. Gaining a broad view on how the two research axes on Arabidopsis and tomato will be balanced in the future is advisable.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**2**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**0**
Total personnels	**2**

EVALUATION

Overall assessment of the team

VarEpi has been running on a single researcher developing an ambitious research axis on the origin, heritability, and impact of epigenetic variation in Arabidopsis and tomato. Given its critically small size, the publication record is excellent while fundraising is good but ending soon. Boasting unique resources, expertise and high potentialities for translational research, the team may explore additional strategies to secure its excellent research with international consortia, private stakeholders, or other teams. Overall, given its fragilities and excellent scientific production, the team was rated as very good to excellent.

Strengths and possibilities linked to the context

Considering its critically small size, the team shows a remarkable publication record, with three publications signed as last author during the evaluation period, among which two in excellent plant-specialized journals (Plant Phys., The Plant Cell) and a more recent one in Cell Mol Life Sci (2024). This is complemented by good fundraising (441 k€ during the evaluation period), including a collaborative ANR grant coordinated by the PI who brought together top-level partners. Hence, despite facing a difficult situation, the team shows excellent research activity and the foundation to optimistically engage a new virtuous cycle.

Considering the gain of interest in tomato epigenetics observed in recent years, each of the two research axes foresees high-impact insights in a very competitive field of research.

The PI boasts several major assets. He developed a set of unique plant resources that awaits to be fully exploited, has a wealth of expertise in plant genetics and epigenetics, excellent track record, and benefits from high notoriety for developing original and careful investigations of DNA methylation. This combines all the fundamental elements to (re)gain attractivity and success in team building.

As shown by recent joint publications in PLoS Genetics and NAR with the MeioMe and EpiARN teams, respectively, the local scientific environment at IJPB evolved toward a great concentration of expertise in plant epigenetics and implications in plant development. This asset can be exploited to expand the team's scientific insights in the frame of relevant collaborations.

Finally, recent team empowering with a second senior researcher with great experience opens new perspectives in project development and long-term running of the team.

Weaknesses and risks linked to the context

Evidently, despite correct fundraising, the size of the team has reached a critical size during the evaluation period. The recent recruitment of an INRAE research scientist should plausibly help overcoming this threat.

While successful with the highly selective ANR grant program, only little fundraising from local programs, from international sources or EU consortia (e.g., doctoral networks, etc.) or from private stakeholders.

The team attracted only one PhD student and no post-doc during the evaluation period - with a post-doc just arriving at the time of the interview, which in the mid/long term may not be sufficient to compensate for the small number of permanent staff.

While each individual research axis proposed in the trajectory shows significant advances and great promises, they require an important workload for experimental and bioinformatics analyses. The lack of manpower may consequently significantly slow down the work, delay the timely publication of results in a field where numerous competitors are supported by a larger workforce, and also affect the capacity to simultaneously pursue them.

Analysis of the team's trajectory

The proposed trajectory is a follow-up of ongoing research on Arabidopsis and tomato with a potential bridge between both axes with the generation of tomato ibm2 CRISPR/Cas mutant alleles.

The first axis focuses on deciphering the molecular mechanisms by which IBM2, a very interesting RNA-binding protein linked to polyadenylation regulation. IBM2 has been identified by the team for its capacity to alleviate the epigenetic silencing of heterochromatic intron-embedded TEs. This mechanism can serve as a model to

explore the interplay between RNA processing and epigenetic regulation through DNA methylation. This axis benefits on the one hand of the biochemical identification of seven IBM2 protein interactors, whose characterization should provide original insights on chromatin modification mediated by the IBM2 complex. On the other hand, a successful suppressor genetic screen already yield candidate factors of IBM2-associated function.

The second axis is entirely developed on tomato lines displaying natural or artificially induced epialleles, and aims more broadly at exploring the origin, heritability, and impact of epigenetic variation. While ambitious, this sub-compartmentalized project builds on a solid groundwork and recent partnerships with the top-level Quadrana lab (IPS2) and with the Gallusci lab (INRAE, Bordeaux) that generated *MET1*-RNAi tomato epigenetic Recombinant Inbred Lines (EpiRILs), a unique resource to develop the proposed investigation on epiallele variations. Finally, the trajectory opens a new research line on inter-individual epigenetic variation that, despite offering interesting perspectives, require manpower that may cruelly lack.

RECOMMENDATIONS TO THE TEAM

Despite facing a difficult situation, the team showed excellent research activity built on great assets described above (unique plant resources, expertise, solid reputation). This should set the ground for increasing the team's attractivity for students and post-docs, possibly prioritizing fundraising to secure the recruitment of post-docs or technicians with targeted know-how and work capacity (bioinformatics, molecular genetics). As a first intention, prioritizing short-term engineer contracts may compensate for the lack of technical support and manpower. Lacking any possibility to recruit a CNRS research scientist, the PI and IJPB direction may also explore additional opportunities to perennialize this research axis.

Publishing the last PhD student's work as a first-author paper, even in a low-profile journal, would increase the team's attractivity to Master and PhD students.

Finally, as previously identified, the scientific strategy is excellent yet the planned workload using two model species may be mitigated according to the workforce or re-enforced by additional manpower.

Team 27: Variation and Abiotic Stress Tolerance (VAST)

Name of the supervisor: Mr Olivier Loudet

THEMES OF THE TEAM

The VAST team is dissecting the genetic basis of variation in growth-related traits when plants are affected by different environmental stressing conditions, mainly drought and low temperatures during this period and, more recently, drought combined with nitrogen deficiency. The team combines high-throughput multi-scale phenotyping technologies, different *Arabidopsis thaliana* populations, quantification of the stress perceived by the plants, quantitative genetics and genomic approaches to reveal the genetic architecture of integrative traits and their plasticity. All of this has required heavy investment in the development of tools that are now available for purposes that encompass the work of the VAST team and ensure fruitful collaborations with plant physiologists.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The last Hcéres panel considered that:
(1) Securing first author publications for the team's postdocs and PhD students was a priority.
There is still a too large time lag between the appointment of a PhD student or post-doc and the publication of their first paper. The last PhD student in the group started in 2016, defended his thesis in december 2020 and has just published his first paper in 2024.

(2) It might be desirable to consider focusing on less important and perhaps less complex traits, and to develop a solid plan for going beyond correlative connections, ideally using functional assays. The use of additional model plants was also questioned.
The team has diversified the type of traits studied during this period considering hydraulic related-traits, and traits related to ecological strategies (plant fitness) in addition to shoot growth related traits, Genome editing was used to investigate individual gene function, yet for the moment most analyses kept on correlative connections and focused on Arabidopsis.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**0**
Total personnels	**4**

EVALUATION

Overall assessment of the team

The overall assessment of the team is very good to excellent.
VAST is a very small team, currently just one researcher supported by excellent support staff (but a technician is leaving) and exceptional phenotyping platforms. The team's output is quantitatively very good and qualitatively excellent. Over the period, VAST has had low translational activities. The team's trajectory is very original and ambitious but seems difficult to implement given its current resources (manpower and fundings).

Strengths and possibilities linked to the context

The PI of the team develops an ambitious and original concept of population phenotyping-based integrative physiology to understand plant adaptation to abiotic stress without a priori, for achieving the identification of molecular factors controlling plant plasticity and evolution. This requires mastering systems genetics, high throughput phenomics and bioinformatics, which can be achieved only in a few labs.

The PI of the team played a pivotal role in the development of the IJPB high-throughput plant phenotyping platform. The team thus contributed to the development of robust phenotyping technologies but also create original Arabidopsis thaliana populations that are available for the team's and other projects. VAST also attracts prestigious plant physiologist collaborators for shared questions dissecting the genetic architecture of new plant traits such as plant fitness or plant hydraulic-related traits. It could be a real strength and seen as an opportunity if the size of the team was not so small.

The team has been able to gather 998 k€ of grant funding during the period (118 k€/FTE/year), mainly as 3 ANR grants (2 PRC, 1 JCJC), one from grant from PEPR.

VAST has published 12 articles and 1 book chapter during the period (i.e. 1.55 publications/FTE/year), usually in excellent and sometimes outstanding journals reaching beyond plant science (such as 3 Nature Communications or 1 PLOS Genetics), but only five of them were published as first, last or corresponding author (in Nature Communications, PLOS genetic and Development Genes and Evolution; Journal of Experimental Botany).

The team is internationally recognized in its scientific domain. It has still a good visibility at the international level. The PI has been invited to 4 international conferences, 2 in France. His visibility is also attested by the fact that he is an associated editor of The Plant Journal.

One engineer in the team has developed competencies in science communication with different publics during the period.

Weaknesses and risks linked to the context

The team's research staff is very small, the PI and one lecturer that left in 2023.

The plan for the selection of new traits, new environmental scenarios and new model plants is not clear and seems to be related to collaborative opportunities. This can be a real risk for team dispersion.

The complexity of the approaches implemented, teaching and collective responsibilities, and large number of external collaborations, limit the publication output of the team.

Despite high visibility, the team did not obtain any international fundings during the period and only one of its grants (ANR JCJC) was coordinated by the team.

Despite significant funding the team did not hire non-permanent staff (PhD student or post-doc). There is no doctoral student or post-doc in the team in December 2023. The complexity of the approaches implemented and the fact that PhD students publish with long delay (2024 for a thesis defended in 2021) can be dissuasive for potential candidates.

The low level of coordination (decreasing since last Hcéres panel) in terms of publications and contracts can lead rapidly to a decrease in team visibility but also team motivation. The size of the team is worrying for the future: a single researcher with two engineers and a technician (who will leave the team soon). In addition, the

team has an excessive and heavy administrative workload. If the team is not strengthened, or if it does not merge with another team, it does not appear to be viable in the near future. For sure, all this will impact (and yet impacts) the capacity of the team to attract money, students and remain competitive in the domain.

The team has no interaction with the socio-economic world.

Analysis of the team's trajectory

The team's project is in line with what has been done to date: to go further in elucidating the genetic architecture of the traits underlying plant adaptation and evolution. What is new, however, is the systematic use of state-of-the-art phenomenological, bioinformatics and modelling approaches. Mathematic modelling in particular will be intensified, via new interdisciplinary collaboration with the MathNum division of INRAE (Miaige, Jouy), which will add more potential but also an additional level of complexity and require more input from the biological side.

Resource balance analysis models will be used to predict resource allocation in plants subjected to various isolated or combined stresses, to predict plant responses to complex stress scenarios and to inform quantitative genetic approaches with candidate genes or at least pathways.

An INRAE Digitbio programme has begun to fund this new approach, and the consortium has submitted an ANR project at the Math/Bio interface, an ANR grant has already been obtained on this subject in 2023 (Project *ModLSys 2024-2028)*. The project is very ambitious for the size of the team, and the contributions of the other teams in the IJPB unit are not described, if any.

RECOMMENDATIONS TO THE TEAM

The main obstacle is clearly the limited human resources available in the team, in an extremely competitive scientific context (plant adaptation and evolution are widely studied) and with the difficulty of obtaining funding for fundamental biology (the team is mainly known for its work on Arabidopsis thaliana). In this context, it is not appropriate to diversify the objectives by increasing the number of plant biological pathways studied by the team, even if it is in collaboration. The team should focus its work on a specific biological pathway (such as resource allocation) and how it is affected by specific isolated and combined stresses. This will be even more needed with introduction of mathematical modelling.

VAST could be pro-active in search for funding for its own projects, at the international level for example from programmes favouring interdisciplinarity. The team should seek for funding for its international collaborations. The very complex and fundamental approach implemented makes it difficult to transfer results to crop models and to get support from socio-economic world. More focus may help in this respect.

The committee recommends the team to pay more attention to ensuring that PhD students and post-docs obtain first-author papers during their contract period, as this is often a condition for obtaining a post-doc or permanent position.

To solve the now acute problem of team's size VAST should consider merging with another IJPB team interested in natural variation in plants, the genetic architecture of traits or the response of plants to abiotic stresses, in order to share expertise but also the workload (help student in writing for example and be more attractive and visible).

CONDUCT OF THE INTERVIEWS

Dates

Start: 19 novembre 2024 à 09h00

End: 21 novembre 2024 à 17h00

Interview conducted: online

INTERVIEW SCHEDULE

- **Plenary Session**

09:00-10:15	IJPB self-assessment (H. North)
10h15-10h30	*Coffee break*
10:30-11:30	IJPB trajectory (H. North)
11:30-12:30	*Committee meeting*

- **Concurrent Sessions**

Subcommittee 1

C. Foyer (President), J.-C. Domec, D. Heintz, S. Mongrand,
L. Nussaume, S. Salvi
Hcéres Delegate in charge of SC 1: S. Ball or C. D'Hulst
BAP Delegate: N. Rolland or M. Bendahmane
TRANSFORM Delegate: M-C. Ralet, A. Boire or C. Bourlieu-Lacanal

14:00-15:30	Plant Observatory
15:30-16:15	*SC meeting & Coffee break*
16:15-16:45	08 - SAS (S. Bonhomme)
16:45-17:20	03 - DYSCOL (T. Chardot)
17:20-17:45	04 - NPI (M. Fagard)
17:45-18:20	05 - NUTS (A. Krapp)
18:20-19:20	*SC meeting*

Subcommittee 2

D. Werck (Vice-President), O. Ali, F. Barneche, S. Chambeyron,
C. Granier, C. Sarazin, P. Lerouge
HcéreS Delegate in charge of SC 2: S. Ball or C. D'Hulst
BAP Delegate: N. Rolland or M. Bendahmane
TRANSFORM Delegate: M-C. Ralet, A. Boire or C. Bourlieu-Lacanal

14:00-14:25	21 - DRAGON (F. Nogué)
14:25-14:50	22 - EPIREP (F. Borges)
14:50-15:20	23 - EpiARN (H. Vaucheret)
15:20-15:45	26 - VarEpi (N. Bouché)
15:45-17:00	*SC meeting & Coffee break*
17:00-17:30	24 - MEIOME (M. Grelon)
17:30-17:55	25 - OrgaRepro (H. Mireau)
17:55-18:20	27 - VAST (O. Loudet)
18:20-19:20	*SC meeting*

Wednesday 20th of November

- **Concurrent Sessions**

Subcommittee 1

09:00-09:30	02 - CATS (S. Dinant)
09:30-10:00	09 - SATURNE (F. Chardon)
10:00-10:30	10 - SYNAPS (A. Dellagi)
10:30-11:00	13CHRODYNO (V. Gaudin)
11:00-14:00	*SC meeting & Coffee break*
14:00-14:30	22 - FTA (P. Laufs)
14:30-15:00	20 - SPACE (D. Bouchez)
15:00-15:35	14 - DIPOL (M. Froissard)
15:35-16:10	19 - SEEDEV (L. Lepiniec)
16:10-17:25	*SC meeting & Coffee break*

Subcommittee 2

09:00-09:35	06 - PHYGERM (H. North)
09:35-10:10	07QUALIBIOSEC (M. Reymond)
10:10-10:40	01 - APSYNTH (S. Baumberger)
10:40-11:10	18 - PAR (K. Haas)
11:10-14:00	*SC meeting & Coffee break*
14:00-14:25	11 - ACCI (G. Mouille)
14:25-14:50	16 - GAS (S. Vernhettes)
14:50-15:15	12 - BCR (P. Hilson)
15:15-15:40	17 - MIN (P. Andrey)
15:40-16:55	*SC meeting & Coffee break*

Thursday 21st of November

- **Plenary Session**

09:00-09:30	Committee Meeting with Researchers & Group Leaders
09:30-10:00	Committee Meeting with PhD students & Post-Docs
10:00-10:30	Committee Meeting with Technicians & Engineers
10:30-11:00	*SC meeting & Coffee break*
11:00-11:30	Committee Meeting with representatives of the IJPB's governing bodies
11:30-12:30	Committee Meeting with the IJPB board of directors

PARTICULAR POINT TO BE MENTIONED

Marie-Christine Rallet CA of the TRANSFORM INRAE department sent on November 21 a detailed document entitled "Hcéres IJPB – Points d'attention Département TRANSFORM, INRAE."

This document was forwarded to all members of the Hcéres review panel who read it with attention.

GENERAL OBSERVATIONS OF THE SUPERVISORS

A Palaiseau, le 4 mars 2025

Objet : Observations de portée générale sur le rapport DER-PUR260025382 - IJPB - Institut Jean-Pierre Bourgin

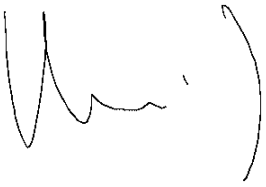
Au département d'évaluation de la recherche du HCERES

Comme demandé dans votre message du 11 février 2025, vous trouverez ci-dessous les observations de portée générale sur ce rapport, rédigées en concertation entre les tutelles, en anglais, en cohérence avec la langue du rapport.

INRAE (BAP and TRANSFORM divisions) and AgroParisTech would first like to thank the members of the committee for their impressive and thorough work of analysis and recommendations.

However, The TRANSFORM Division and AgroParisTech would like the trajectories of the DYSCOL and DIPOL teams to be reassessed by the HCERES committee. Indeed, although the dynamic forces present over the period 2018-2023 suggested a more solid DYSCOL collective for the future, this balance was completely reversed (i) following the tragic death in November 2023 of an APT assistant professor who was a member of DYSCOL and (ii) following the departure of a professor, a research engineer and a research technician from the DYSCOL team to the DIPOL team in June 2024.
Thus, the sentence "They will investigate whether LDs are degraded by lipolysis or autophagy during the recovery phase and follow the analysis of LD structure" which appears in the § "Analysis of the team trajectory" for DYSCOL on page 30 should be transferred to the DIPOL team on page 57, as this theme reflects the activities of the professor who joined them in June 2024. This professor is also the coordinator of the ANR RECOVOIL project and the last and corresponding author of the article in Plant Cell in 2018, elements which - while they should remain to the credit of the DYSCOL team on the analysis of assets for the period 2018-2023 - should be considered as strong elements of the trajectory of the DIPOL team only for the years to come, which is but could be more clearly shown on page 57. Moreover, changes in the size of the DIPOL team do not seem to have been fully considered in the sections "Analysis of the team's trajectory" and "Recommendations to the team" on page 57. As detailed above, three permanent staff have already joined DIPOL in 2024, which makes the sentence "We recommend the team to increase its size" less relevant. This is all the more true given that two new APT recruitments (a lecturer and a junior professorship) have been agreed. One appears only in the "Analysis of the team's trajectory" section and the other only in the "Recommendations to the team" section, which may lead to confusion. As a result, the DIPOL team should stabilise in 2025 at five researchers/lecturer-researchers and two technical support staff.

For INRAE, BAP Division
Norbert ROLLAND
Chef du département



For INRAE, TRANSFORM Division
Johnny BEAUGRAND
Chef du département

For AgroParisTech
Alexandre PERY
Directeur de la Recherche,
de l'Innovation et du Transfert Technologique

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19 rue Poissonnière
75002 Paris, France
+33 1 89 97 44 00