

EVALUATION REPORT OF THE UNIT

GQE-Le Moulon - UMR Génétique Quantitative et Evolution - Le Moulon

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Université Paris Saclay

AgroParisTech

Centre national de la recherche scientifique –
CNRS

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

EVALUATION CAMPAIGN 2024-2025 GROUP E

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High Council for evaluation of research and higher education



In the name of the expert committee:

Michele Morgante, chairman 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:

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Mr Pierre Saumitou-Laprade, CNRS, Villeneuve-d'Ascq

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Mr Denis Merlet, Dean of the Faculty of Sciences, University Paris-Saclay

Ms Sandrine Ongeré, Vice President of University Paris Saclay, in charge of Doctoral Schools

Mr Alexandre Pery, AgroParis Tech

CHARACTERISATION OF THE UNIT

- Name: UMR Génétique Quantitative et Evolution – Le Moulon
- Acronym: GQE-Le Moulon
- Label and number: UMR0320 (INRAE), UMR8120 (CNRS)
- Composition of the executive team: Ms Christine Dillmann (DU), Ms Karine Alix (DUA) and Mr Alain Charcosset (DUA)

SCIENTIFIC PANELS OF THE UNIT

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

SVE1 : Biologie environnementale fondamentale et appliquée, évolution

ST5: Sciences pour l'ingénieur

THEMES OF THE UNIT

The unit conducts research on domesticated species (mainly plants) as well as on model species through diverse approaches: genomics, quantitative and evolutionary genetics, experimental evolution, phenotyping, mathematical and statistical modelling, genomic and phenomic selection.

The unit has four research themes, all shared by multiple teams: (a) evolutionary genomics (linking the genome to the species evolution and adaptation); (b) adaptation to the environment (interactions between a genotype or a population and the biotic or abiotic environment); (c) integrative biology (linking the genotype to the phenotype in different varieties and cropping systems); (d) new breeding methods (development of new varieties and farming practices).

The unit includes seven research teams:

1. BASE ("Biologie de l'Adaptation et Systèmes en Évolution")
2. DEAP ("Diversité, Evolution et Adaptation des Populations")
3. ECLECTIC (Ecological Genomics of multi-species interactions)
4. GEvAD ("Génomique Evolutive et Adaptation des plantes Domestiquées")
5. GE2MorF ("Génétique, Évolution et Écologie de la Morphologie Florale")
6. GQMS ("Génétique Quantitative et Méthodologie de la Sélection")
7. SECF (Structure and Evolution of Chromosomes of Fungi)

The unit also includes a scientific infrastructure for proteomics (the PAPPSO platform for "Plateforme d'Analyse Protéomique de Paris Sud Ouest"), considered as an independent team.

GQE also has two transversal support teams which did not provide an individual report, one for molecular biology (ACEP) and one for informatics/bioinformatics (ABI).

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The former unit "Génétique Végétale du Moulon" was renamed Génétique Quantitative et Evolution (GQE)-Le Moulon in 2015. Located at the University Paris Saclay, the unit presently hosts 97 staff (55 permanent and 42 non-permanent) and moved to the new IDEEV (Institut Diversité, Ecologie, Evolution du Vivant) building in 2022. The unit is affiliated to the University Paris Saclay (UPS), to the CNRS (Ecology and Environment), to INRAE (plant Biology and Breeding division) and to AgroParisTech.

RESEARCH ENVIRONMENT OF THE UNIT

The unit GQE-Le Moulon is one of the three founding members of IDEEV which also hosts the Ecology, Systematics and Evolution unit (ESE), formerly based in Orsay, and the Evolution, Genomes, Behaviour and Ecology unit (EGCE) formerly based in Gif-sur-Yvette. GQE was also actively involved in the creation of the BASC (Biodiversity, Agroecosystems, Society, Climate) and SPS (Saclay Plant Sciences) Labexes. GQE also developed close links with the other UMRs involved in plant biology and agriculture at UPS. The unit is involved in the EUR SPS and SFRI (Structuration de la Formation par la Recherche dans les Initiatives d'excellence) programs at the Graduate School Biosphera. At the request of three INRAE departments, GQE also led a working group that resulted in the

creation in 2023 of the INRAE Unité Expérimentale Versailles-Saclay, UEVS). UEVS manages an agricultural estate of around 100 ha, including 25 ha near IDEEV and 50 ha in the park of the Château de Versailles. UEVS and GQE-Le Moulon are actively involved in the VivagriLab living lab developing educational projects on agroecology. The experimental unit will also be used for high-throughput phenotyping of plant development.

GQE is thus located in a hub of scientific and interdisciplinary excellence which enables close collaborations.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	3
Maitres de conférences et assimilés	10
Directeurs de recherche et assimilés	6
Chargés de recherche et assimilés	9
Personnels d'appui à la recherche	29
Sous-total personnels permanents en activité	57
Enseignants-chercheurs et chercheurs non permanents et assimilés	4
Personnels d'appui non permanents	10
Post-doctorants	2
Doctorants	20
Sous-total personnels non permanents en activité	36
Total personnels	93

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	10	21
CNRS	0	6	6
U Paris Saclay	9	0	1
AgroParisTech	4	0	0
Total personnels	13	16	28

GLOBAL ASSESSMENT

In spite of the Covid pandemic and of the time devoted to preparing and moving to the IDEEV building, the GQE-Le Moulon unit produced excellent science demonstrated by the publication output aligned with the unit's research goals in genetic and plant breeding. They developed an interesting and competitive trajectory based on advances in fundamental and applied knowledge on the evolution of quantitative traits and the genetic interaction. The unit was successful in setting up several excellent platforms such as the proteomics platform (PAPPSO), the bioinformatics platform (BIOSS) and the long read sequencing platform that help to perform its research projects. Some teams have strong collaborations with private sector and farmers organisations, and other teams have very strong dissemination and outreach activities. The unit is strongly involved in education through its participation in the EUR (École Universitaire de Recherche) SPS and SFRI (Structuration de la Formation par la Recherche dans les Initiatives d'excellence), programs at the Graduate School Biosphera, MSc (Evogem Master 2 and the Plant Sciences Master 1 & 2) and Bachelor (Biology and Mathematics bachelor degree) programs. In general, the unit has a strong visibility and a high impact at the national and international level. The research themes that will be organized in the three axes (Axis 1: Understanding and shedding light on evolutionary mechanisms; Axis 2: Understanding and predicting the genetic bases of interactions; Axis 3: Understanding and mobilizing cultivated diversity to provide solutions for agriculture and its 'actors') are all very relevant both nationally as well as internationally. The unit runs a strong PhD training program thanks to the

involvement of UPS and AgroParisTech. This program satisfies the students who have plenty of opportunities in finding jobs both in the private and public sector.

There are concerns about the limited technical staff support that forces researchers to take over technical responsibilities, and about complex administrative procedures. In this context, the future level of involvement of CNRS is a major issue for the CNRS support staff.

The organization of the unit in axes and teams is based on a collegial governance which favors a good functioning of the unit which is appreciated by all the staff. However, the unit expressed difficulties in attracting researchers and non-permanent staff due to the high cost of living in the area and the constraints to access to the site. With regard to the internal organisation, there is a lack of internal set of regulations and support to introduce the new non-permanent staff, especially those coming from abroad, could be improved on an institutional level (it currently falls on the teams). Bioinformatic capabilities within teams could be improved for the current status of genomic research and support for functional validation of genes involved in quantitative traits is currently backed by only the small Ge2Morf group. Since the unit was installed in the new IDEEV building, the practice of teleworking has been increasingly adopted and is well accepted by many staff. However, it has resulted in a certain degree of isolation and discomfort expressed by the technical staff who are obliged to come on site every day because their tasks can only be carried out on site.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Encourage scientists to defend their HDR.

During the period assessed, the HDR to C/EC/IR ratio decreased from 16/26 to 12/31 both because of the retirement of 6 HDR and of the arrival of 8 scientists, mostly young, without HDR. This disequilibrium was not compensated by the two HDR obtained during the contract (2019 and 2022). However, three scientists were authorized in 2023 to submit their application, and five scientists obtained a derogation to supervise PhD students and should be authorized to submit their application in the next few years.

Recommendations concerning the functional organization of the UMR

The previous committee encouraged the unit to continue formalizing its functional organization by drafting internal regulations. A first draft was discussed in spring 2019 but the drafting was interrupted by the COVID19 pandemic. During the post-pandemic period, preparations for the unit's transfer to the IDEEV building caught most of the staff's attention. As a consequence, the drafting of internal regulations is not yet finalized.

The previous committee recommended organizing a smaller Scientific Advisory Board and electing representatives to the Service Board. Although these recommendations were not strictly followed, three different councils were set up to disseminate and discuss information through a highly collegial structure, while promoting efficient decision-making: (1) the "Unit Council" which operates in an advisory capacity, discusses aspects of the unit's activities during a monthly meeting attended by all permanent staff and, as previously recommended, by representatives of non-permanent staff, following a predetermined agenda. (2) A second council considered as the decision-making body of the UMR, meeting weekly and including the leaders of the research and support teams (integrated, since February 2024, by axis leaders). (3) The board of directors manages the unit's budget, the logistical aspects related to the building's occupancy and the human resources issues. The unit has also followed the recommendation to involve technicians in publications, where appropriate. The lack of permanent staff to manage budgets, administrative matters, and experimental infrastructure remains a problem.

Work on the emergence of federative research projects

This recommendation has been highly considered since the unit remained active in successfully applying to grants and coordinating important projects, such H2020-, PIA- or ANR-funded projects, involving different teams and local collaborations.

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 are excellent and in line with the state of the art in the field. They address a major societal issue by aiming to develop breeding methods for future agriculture (including varietal mixtures and species mixtures). The unit also aims to understand how domesticated species evolve and adapt to their environment. The link between the genotype and the phenotype is also extensively studied. The unit also aims at quantitative assessment of traits and at the use of mathematical models for the study of genetics and evolution, which is a clear distinctive approach of the unit.

Assessment on the unit's resources

The unit's resources are excellent including a range of different infrastructures: laboratories (L0, L2), informatic/bioinformatic/software development facilities, field/greenhouses (S0, S2)/mesocosms stations. Except for the internationally renowned proteomics PAPPISO platform, the unit's resources are managed collectively, and even shared with other units. They are excellently managed, both financially and materially. The new building (IDEEV) provides world-class scientific installations. Human resources are globally good, but the decreasing number of technical staff and the high turnover of non-permanent staff raises concerns for the maintenance of skills.

Assessment on the functioning of the unit

Rules and guidelines for human resources and environmental management are excellent. The unit has developed a training and development plan to improve knowledge and methods. Each project is associated with a data management plan. By mastering the whole chain of data cycle, the data protection policy is excellent. Newcomers follow a mandatory tour of the IDEEV building and must complete the MOOC created by INRAE or CNRS. Despite the distance of the Saclay plateau from Paris, which tends to encourage teleworking, the unit's general atmosphere is good and the level of satisfaction of all categories of staff is in general excellent.

1 / The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

The unit originally focused on domesticated plants in order to integrate heterogeneous information to predict quantitative variation at the plant or stand level and applied this knowledge to develop new breeding methods. While these activities continue, the unit also dedicates to activities providing fundamental and applied knowledge including (a) diversification in ecology, (b) deciphering the mechanisms of evolution from the genome structure and plasticity to the population and species divergence or hybridization, (c) understanding and predicting the genetic bases of interactions, and finally (d) proposing original solutions for diversity management like intra plots diversification including varietal/species mixture.

Thanks to its expertise and skills, the unit benefits from a state-of-the-art scientific infrastructure, including advanced technological platforms for genomics, proteomics, bioinformatics, modelling and phenotyping. Its location within the IDEEV building at UPS, a hub of scientific excellence, enables close collaborations with other research structures in ecology and evolution, mathematics and informatics. This interdisciplinary and collaborative environment is conducive to innovation and discovery.

Researchers at GQE take great advantage but also make a major contribution to provide a range of students from undergraduate to doctoral level with a high-quality training combining mathematical biology, computer science and statistics for the study and modelling of evolutionary processes.

The unit has identified breeding and seed companies as main non-academic players with whom strong interactions are ongoing at least for part of their research activities.

Weaknesses and risks linked to the context

The lack of bioinformaticians slows down research in this domain at the Unit. Students and postdocs have to train on their own because of lack of expertise from researchers, and when non-permanent staff leave, "the knowledge is lost".

Outside of the GQMS and DEAP teams, the identification of non-academic players that could interact and benefit from the breeding and pre-breeding activities related to the agroecological transition and the organic farming is still ongoing and does represent a weakness in the transferring of a significant fraction of the unit research activities into the socioeconomic system.

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 number of scientists has increased during the period, demonstrating the attractiveness of the unit. A large number of staff were also promoted in all categories.

The unit has obtained many contracts and coordinated most of them. These include 3 international (287 k€), 14 European (1700 k€) and 30 national contracts (2000 k€). At the local level they include 31 PIA (450 k€), 28 partnerships with the social and economic environment (1120 k€), 1 contract funded by BNP foundation (328 k€). The unit benefits from synergies with the two other units located in IDEEV, and from the dynamic local SPS network. GQE pools part of the subsidies obtained, to fund small equipment, to support partial funding of heavy equipment, to ensure the maintenance of existing equipment, and to have a staff training policy.

GQE's SPS network manages many facilities. For example, GQE coordinated the participation of 5 research units for the creation of UEVS for field experiments and ensured the original governance of this experimental unit. GQE also coordinates and benefits from many complementary infrastructures and platforms such as IE experimental installations, BIOS (Bioinformatic Open Science & Systems), GQE common wet lab, PAPPSO platform. Other useful platforms are coordinated by IDEEV, such as "Les serres de l'IDEEV, PHOCUS" (Plant mesocosms), Information Technology Group, enabling the unit to conduct its research in an exceptional environment. The arrival of new scientists is stimulating for the unit. They are supported through the allocation of funding allowing them to initiate their projects. In addition, the unit supports high level educational programs combining biology and mathematics and is continuously developing new teaching programs with interdisciplinary perspectives, as well as innovative educational projects in agroecology.

Weaknesses and risks linked to the context

A rising source of concern is the decreasing number of support staff, adding to researchers' workload. The number of support staff is now inadequate with regard to the objectives of the unit. There is not enough permanent support staff to ensure the maintenance of the infrastructures although this is crucial to maintain the excellent scientific level of the unit. Likewise, additional permanent staff is needed to maintain open science and software development that are very important for the research and visibility of the unit.

The low number of support staff puts them under pressure, especially those working in the transversal wet lab, where forces have decreased by half over the past few years. Due to the cost of lodging, support staff have to live far away from the campus, but must be present daily in the Unit, which induces transport expenses, tiredness, distress and dissatisfaction for many of them. It is felt as an unfair disparity that many researchers can work remotely. Students regret the lack of permanent support staff in the wet lab, making it harder to learn new techniques.

The lack of administrative staff makes procedures very slow. Researchers and professors must do a lot of administrative tasks on their own, instead of carrying out research.

Foreign students expressed concerns about difficulties in doing their paperwork and understanding how things work in the Unit. Most students learn administrative procedures from one another, not from permanent staff.

The benefits from the support from INRAE, AgroParisTech and UPS. Since GQE manages new facilities, which represents an additional cost potentially impacting other actions, they expect additional support from all governing bodies.

The staff has to train and evolve rapidly along with new technologies. Given the difficult recruitment of permanent staff and turn-over of non-permanent staff, this is problematic.

The recruitment of non-permanent staff to support experiments accounts for an important part of the total budget of the unit (50%) and is constrained by strict administrative rules.

Both support staff and scientists experience a dramatic increase of tasks that are not related to their primary mission due to the low support staff to research staff ratio (0.73 in 2023).

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

The unit's training policy is ambitious and resulted in the promotion of many staff members. The unit provides a training plan to the CNRS and INRAE, and training issues are discussed at the annual general meeting. For the technical staff, the cost of attending scientific and/or technical meetings is covered by the unit. Technicians (half of them) are associated with articles whenever their contribution is deemed relevant.

Health and safety issues are managed by two staff members, and common rules have been put in place for the 3 units hosted in IDEEV. These include a visit to the site, training MOOCs and webinars set up by the supervisory bodies. To compensate for teleworking and maintain social interactions, several social events are organised each year.

The unit is deeply involved in open science (open software, R-Packages deposited on the French data repository, publications), through the open science and software development ABISOFT facility.

Biological materials stored in cold environments are secured by two cooling units at IDEEV. IDEEV has two autonomous fuel-powered generators that are programmed and regularly tested. Data is secured at University level. Environmental risks are now very seriously taken into account, with a policy of reducing greenhouse gas emissions and a clear change in mentalities. For data protection, the unit has contributed to the conception of a safety plan produced by UPS.

Weaknesses and risks linked to the context

The HDR to C/EC/IR ratio is still low (12/31) because of staff retirements and the arrival of young scientists. However, three scientists were authorized in 2023 to submit their application. None of them are assistant professors, even if some have a good publication activity. They must be encouraged and helped to apply too.

An important point of attention concerns the issue of isolated working, which is not addressed at present. The committee noted during the visit that the rules concerning attendance at the laboratory outside opening hours are formalized and respected. Teleworking, although accepted by all staff, encourages inequalities, and care must be taken to ensure that the environmental policy does not come at the expense of research quality and interpersonal relationships. Face-to-face exchanges must be maintained, whether locally through the presence of staff benefiting from teleworking, or with external collaborators.

There is a gap in the data security system concerning the use of laptops and unsecured messaging or WhatsApp. Updating e-mails and telephone numbers is difficult, and the Suricate application has met with moderate success.

The lack of permanent staff weakens the transmission of knowledge, particularly with regard to protocols. The committee noted during the visit that the data management plan is not formalized.

The unit has its business continuity plan but the document and set up procedures still need to be written for its regular update.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractiveness is excellent, based on success in competitive funding, excellent equipment and state-of-the-art platforms. Despite the large number of important national competitive projects of the unit, often in a leading role, the number of European projects is still low. A potential drawback to the attractive localisation of the unit in the new IDEEV building is the relative isolation of the UPS campus, the high cost of living, and the suboptimal transportation facilities, which sometimes makes it difficult to attract young staff especially, due to low starting salaries.

- 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

The unit has an excellent scientific reputation and contributes to the construction of the European research area. Over the period, the unit has attracted over €7 million in funding from a diversified range of sources, including European and international (1366 k€), French (2460 k€, including 30 ANR, 27 coordinated)) and industrial contracts and services (3256 k€) (especially in the seed sector). They have published 305 journal articles, of excellent quality, with 42% published with PhDs or postdocs as coauthors, demonstrating the unit's ability to attract outstanding researchers. Member researchers hosted 6 major international conferences, and members communicated results in international congresses 147 times, well integrating the unit in the European and international scientific community. The unit is internationally recognized for its expertise in quantitative genetics and evolutionary biology, especially in European crop plants, in addition to the PAPPSO platform, and the new IDEEV facilities are world-class and well able to support these activities and others outlined in the trajectory for the institute.

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

The major weakness of the unit is of no fault of its own, and it is related to the difficulty in attracting workers to the very expensive Ile-de-France region given the wages that can be offered. This is an issue across the board, from researchers to technicians. The other potential weakness, especially in light of axis 3, is the massive loss of agricultural land to the construction of the UPS campus. While the unit still has 20 ha adjacent to IDEEV, and has feasible plans to work with neighbouring farmers, these plans are potentially also time limited as selling off land – given high land prices – is going to increasingly threaten the unit's ability to closely monitor field projects. Securing additional nearby land to expand the area available for field experimentations should be a priority for the governing bodies.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The unit achieved an excellent publication output aligned with its research goals in genetics and plant breeding. More than 48% of the articles are led by GQE members and several appear in high-impact multi-disciplinary journals. The publication list illustrates excellent internal collaborations (22% of joint inter-team articles) and strong involvement of PhD students in the scientific production. The publication strategy emphasises open access. However, GQE needs to clarify its position regarding potentially predatory journals. A greater effort in scientific production dedicated to non-academic stakeholders and the general public is also needed.

- 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

The GQE-Le Moulon unit has a very good record in terms of number of publications and excellent in terms of quality for the period under evaluation with 313 peer-reviewed articles (1.6 publication/FTE research/year). More than 48% of published articles involve first, last or corresponding authorship, about 21% involve PhD students, but the position of the PhD student in the authorship strongly differs among teams.

About 22% of the productions are joint articles between teams, which demonstrate excellent internal collaboration. Ninety-one percent of the publications include external collaborators, showing the exceptional dynamism of the unit and its active role in the networking at international level. Many articles are published in good to excellent disciplinary journals, and several in top-ranking biology journals (e.g. 2 in *Nature genetics*, 1 in *Nature methods*, 7 in *Nature communication*, 2 in *Trends in Plant Science*, 2 *Trends in genetics*), as first or last author in 20% of the 20 publications in the highest ranks. The number of articles varies between teams but is generally proportional to its number of researchers. The scientific production aligns well with the scientific objectives fixed for the unit's trajectory (past and future). The unit produced and published knowledge through experimental and theoretical approaches of the genetics and evolution of quantitative traits in populations with finalised objectives related to plant breeding and agriculture. The publications are well distributed in the three axes (1) *Understanding evolutionary mechanisms* (53 articles), (2) *understanding and predicting the genetic bases of interactions* (48 articles), and (3) *methodological advances* (33 articles). The latter are representative of the skills and investment of GQE in biology (7 articles in molecular biology: from genetics to genomics and 4 articles dedicated to phenotyping), but also in data science and mathematical modelling with publications in statistical methods: either optimization of design (3 articles) or data analysis (5 articles), or genomic data (10 articles) and 4 publications dedicated to numeric twins and information systems.

GQE has a strong commitment towards open access, fair and transparent accessibility of publications underlying data and scripts. The unit encourages the submission of preprints in webservers such as bioRxiv (9 preprints submitted during the evaluated period). The vast majority of scientific productions are freely available on "HAL Open Science" and, in addition, around 97% of the 313 scientific articles published are freely available on the respective publishers' websites. GQE also develops an active policy encouraging the submission of productions (e.g. 4 protocols, 11 courses for masters or PhD students), and raw data to open repositories and databases (e.g. GenBank, GitHub, InDores).

The unit's representation at international conferences is also excellent with 145 oral presentations (including 35 invitations) and 92 posters over the period.

Research conducted at GQE is internationally recognized for the development of new breeding methods and innovative tools for predicting the suitability of varietal and species mixtures as well as its expertise in participatory breeding. The unit's work showed that mixtures of wheat varieties bred through participatory methods outperform commercial varieties in traits like yield stability and nutrient composition, showing the potential of these strategies for agroecological and climate-resilient farming. These strategies will be further explored in axis 3 of the future contract.

The expertise of the unit in new breeding methods includes the improvement of plant genetic resources to sustain breeding programs' efficiency. In a recent work published in PNAS, GQE researchers showed that genetic diversity is better preserved in variety development when taking into account phenotype of potential diversity donors rather than genomic predictions (Sanchez et al. 2023).

Another highlight of the research conducted at GQE is their work on wild relatives of maize, which identifies key morphological, physiological, or genetic traits that allow teosintes to thrive in high-altitude regions. In a paper published in PLOS Genetics, Fustier et al. (2019) reveal how these traits collectively constitute an adaptive response to environmental pressures such as lower temperatures, reduced oxygen levels, and varying soil conditions at higher elevations.

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

The road to open science policy is still at the beginning and needs to be encouraged and consolidated. The unit has invested a lot in making 97% of its publications freely accessible. This effort should enable results to be widely disseminated in the scientific community. However, the unit must also be careful not to fall into the trap of predatory journals, especially when those journals disregard the quality in favor of the quantity (and associated financial benefits). During the assessed period, 20% of the articles have been published in such journals (36 articles in *Frontiers* and 24 in *MDPI* journals), with several led by or including PhD students.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The interactions of the unit with the society are very good. The concern to share knowledge with the non-academic world is clearly reflected in the report, thanks to a diversity of research projects, the massive contribution of the unit in educational programs and the formal interactions with the society and the farmers. The unit tries to maintain a delicate balance between strong partnerships with the private seed sector and reinforcement of relationships with farmers associations and innovative seed producing actors. This would be a venue to the market for its breeding efforts that are more closely related to the agroecological transition. The unit also has strong ties with citizen organisations and the general public.

- 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

The unit has a longstanding history of cooperation with non-academic members of the seed sector, including the seed industry (Lidea, Limagrain Europe, Maïsador Semences, Corteva, RAGT 2n, and Syngenta Seeds grouped in the frame of the ProMais SAM-MCR program), farmers and institutions (CTPS, GEVES, Institut Carnot Plant2Pro). It is recognized for its pioneering work in wheat participatory breeding and for the development of multi-public-private partnership programs in maize. The unit lists 28 partnerships with the socio-economic and cultural environment, 4 contracts with local authorities, and 1 contract financed by the BNP Paribas Foundation.

These programs give GQE access to the private partners' large-scale phenotyping and/or genetic material creation facilities and considerably accelerates technology transfer. This cooperation model has been influential for the establishment of the European EVA private-public network for the characterization of maize genetic resources. The cooperation also includes breeding companies involved in other species like flax (*Terre de Lin*) or sugar beet (*Florimond Deprez*). For over 15 years, the unit organized a yearly training course for the French Breeding Association on the use of molecular markers in selection and set up the teaching unit "*Modélisation statistique et analyse de données biologiques*" which is open to staff from private companies. Scientists from the unit are regularly solicited by the seed sector for conferences to guide their strategies. The unit took advantage of the opportunities created by the ecological transition to develop programs in collaboration with new industry organizations: e.g. the Biocosma project, funded by the ANR, whose coordinating partner is Bioline Agrosience, and the Phenofore project, funded by SEMAE (and includes Arvalis among the partners), the project BNP-FRUIT RESCUE on apple trees. Altogether, these programs financed six CIFRE PhD students and another PhD student. Unit members are involved in structures like CTPS that popularise new wheat varietal mixtures or deliver COVs (Certificat d'Obtention Végétale), like the interprofessional fund for oleaginous plant species research, and ITAB (the technical institute of organic farming). GQE-Le Moulon is a long-standing partner of the joint IVD_BLADE and IVD_Innov'Asso programmes between INRAE and AgriObtention to create new wheat varieties and integrate varietal and crop mixtures in breeding targets. GQE has extended its collaboration with farmers through the association Réseau Semences Paysannes (RSP). Local partnerships within the *Terres & Cité* association were considerably strengthened through the unit's participation in the Vivagrilab living lab. The collaboration including social sciences resulted in methodological developments for on farm experimental designs and seed-lot tracking.

GQE also participates in the scientific mediation program *Des Plantes et des Hommes* organized by the EUR SPS. In 2019, GQE contributed to an event organized by CNRS-INSB to celebrate the "Year of Biology". It organized conferences on plant genetic resources and plant breeding and invited the general public to take part in its experiments. In association with S [Cube], a scientific mediation association, a group of 15 IDEEV scientists led by a GQE member set up the *Chroniques de l'Evolution* exhibition which was inaugurated in 2018 and is still shown through the S [Cube] network across France. GQE scientists are active members of the IDEEVERTES IDEEV group, which tries to mobilize society to tackle the environmental emergency and contributed to studies and opinion papers.

The unit participates in public debates related to ecological transition, crop adaptation to climate change and biodiversity management, via various media, social networks and structures such as the IDEEVERTES IDEEV group or the national program launched by the French government to make public servants aware of the challenges of biodiversity conservation. Within the H2020 INCREASE program or the OSER project funded by UPS, unit members conduct *participatory science* experiments with thousands of amateur gardeners or undergraduate students. The greatest contribution to knowledge sharing relies on the investment of the unit in student teaching and training. Forty-two % of the permanent staff give classes, lectures and practicals within L1 through to M2 UPS curricula related to population genetics, evolution, plant breeding, ecology, molecular biology and genomics. They also train undergraduate students in population and quantitative genetics at AgroParisTech and created the Master M2 EvoGEM which offers an integrated program from L1 to M2, focused on the mechanisms of evolution and adaptation from populations to ecosystems. A significant proportion of the PhD students trained in the unit find employment in the private seed industry and this represents a major contribution of the unit to the economic world.

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

Despite a strong involvement in the elaboration of standards associated with the concept of plant variety and leadership position in the PEPR (Priority Research Equipment Program) "Sélection Variétale Avancée" in relation to New Genomic Technologies, the TRL of GQE productions remains low. The involvement of the unit in active collaborations with the private seed sector and the non-profit (farmer's associations) seed sector, is unequal between teams, and is mainly linked to teams GQMS and DEAP. The reorganisation of the seed industry tends to favour bilateral cooperation rather than collaborative projects within large consortia. The unit will also extend collaboration to smaller companies with less inertia towards agroecological transition which plays an important role in the unit.

Outreach activity is limited in terms of written production, with no blog, no encyclopaedic output for the general public, no patent produced and only 3 chapters published in French by CNRS and QUAE for a wide readership. This might be due to the lack of a permanent position devoted to communication.

ANALYSIS OF THE UNIT'S TRAJECTORY

A few structural changes have occurred at the team level in the Unit. The ABI team is now the BIOS team and does not provide support for bioinformatic analyses anymore. One research engineer who provided bioinformatic support in a transversal manner to the entire Unit is now part of the GEVAD team. This is appropriate to better support the research projects of this team and ease the pressure from multiple teams on a single person.

Two of the teams have disappeared at the end of the evaluated period (ECLECTIC and SECF). The ECLECTIC team was dismantled following the departure of the team leader that is currently on secondment to New York University in Abu Dhabi (United Arab Emirates). The support staff who developed the SEQ plateau will also leave for a two-year secondment to follow the team leader. The Unit wishes to maintain the SEQ plateau functional in spite of the move of the support staff, especially because the SEQ plateau recently allowed the development of the SAM-seq technology in GQE (in collaboration with the Institute of Plant Sciences Paris-Saclay). The SEQ plateau is likely to be central to the Unit in the coming years to develop its research. The SECF team reduced in size following multiple retirements of staff. The remaining Professor joined the BASE team for the few years she has left at GQE before retiring.

The previous axes were modified into: 1) Understanding and shedding light on evolutionary mechanisms, 2) Understanding and predicting the genetic bases of interactions and 3) Understanding and mobilising cultivated diversity to provide solutions for agriculture and its 'actors'. Because of the complexification of the research questions, the new axes are relevant and the trajectory of the Unit is excellent, in line with past achievements and the proposal makes sense. The new Axes should improve output and collaboration between teams which are maintained for organisation and proximity management. Axes also compensate for heterogeneity between teams in terms of number of scientists.

However, the CNRS support to the Unit will be key to determine whether this trajectory can be achieved in future. Indeed, the maintenance of the SEQ plateau, the wet lab and administrative services rely in a large part on CNRS support staff. The IDEEV Institute could strengthen the research federation, with more collaboration between units.

In consideration of the fact that axis 3 will be largely devoted to developing genetic resources for the agroecological transition, it will be of paramount importance for the unit to develop a sustainable strategy for the transferring of the genetic materials to the farming system and to collaborate to the development of an appropriate legal framework for the protection and marketing of new materials developed such as the organic heterogeneous materials. Three members of the unit participate in commissions that are in charge of maize and wheat variety registration (CTPS), demonstrating the unit's commitment to this critical topic.

The CNRS consideration of a possible disengagement from the Unit is putting researchers under anxiety. They fear they will not be able to recruit new CNRS researcher colleagues in the future and fear the departure of the support staff and the impossibility to hire support staff in the future.

RECOMMENDATIONS TO THE UNIT

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

The move to the IDEEV building has globally improved the working conditions but the three units and the “*Unité Expérimentale Versailles Saclay*” (IEVS) need to define efficient procedures for managing the building. Within GQE it is necessary to increase technical support staff for field, lab work and administration. The unit may invest into computational biologists both to reinforce axis 3 to run participatory breeding networks, manage field experiments and cultivate relations with the private seed sector and to reinforce axis 1 and 2 in the area of large-scale genomic analyses. The committee is concerned that some choices in the area of genome analysis may be driven more by the lack of properly trained staff for computational analysis of genomic data than by the selection of the most appropriate methodology for the specific biological problem. One of the main objectives of the unit during the next contract remains in the functional validation of the Genotype-Phenotype map. The unit must now be able to transform the cells of its biological models to access the functional validation of the candidate genes identified. Therefore, the committee recommends that the unit establishes a new platform for functional validation.

The committee recommends providing a “guide for new arrivals” translated into English and including a list of contact persons in the unit able to answer the specific questions that arise most often.

The widespread practice of teleworking is creating a feeling of unequal treatment among technical staff, most of whom must be present on site to carry out their tasks. Moreover, the absence of researchers on site several days a week leads to a feeling of “abandonment” and is sometimes annoying for decision-making. For these reasons, the committee recommends that the unit rethink remote work policies. Similarly, the committee recommends the organization of face-to-face team meetings by stressing the exceptional nature of online participation in these meetings.

Particular attention must be paid to the procedures followed for the conduct of annual professional interviews for technical staff to align them with the recommendations from supervising bodies: e.g. the report of the annual interview should be written by the N+1 at the end of the interview with the technical staff who should not be writing his own report.

Recommendations regarding the Evaluation Area 2: Attractiveness

The unit should continue to maintain strong ties with the international scientific community and in particular at the European level it should continue to play an active part in organising research efforts through an increased participation to European level projects in a coordination role. There is a clear need for some teams to increase efforts to get competitive grants, including ERC-level ones, as well as to strengthen ties with the socioeconomic actors. The unit should increasingly focus on providing favourable working conditions for new staff members, especially in consideration of the difficulties posed by the specific geographical location of the unit, which is at the same time a great asset (within a major scientific hub) and a disadvantage due to the very high costs of living in the area. The unit should maintain and reinforce the existing technological platforms and introduce a new technological platform aimed at functional validation of genes. The PAPPISO platform is viewed as strategical and the panel considers it of fundamental importance for the future attractiveness of the unit that it is maintained within the unit.

Recommendations regarding Evaluation Area 3: Scientific Production

Increasing in the future the diamond open access publications is commendable and will allow reducing the budget allocated to publications. Trying to decrease the number of publications in journals that are heterogenous and sometimes of suboptimal quality standards (MDPI journals, Scientific reports and the like), should be seriously considered. This is particularly true for PhD students and young researchers whose early career could be heavily influenced by their first publications. Favouring diamond access or society journals, which are scientist-for-scientist journals, should ensure quality stability over time and some control upon the budget. For example, the committee encourages the unit to continue and increase their contributions to the *Peer Community In* initiative (PCI), and to favor publications in non-profit, learned society, or university-associated journals, such as those listed in the DAFNEE database. Encouraging teachers-researchers and providing them with support would enable them to increase their production level, which could be even higher.

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

The unit tries to reconcile the move towards participatory breeding with the need to continue interactions with private seed companies that has been one of its strengths in the past. The committee encourages the unit to maintain (or improve for some teams) the interactions with the private sector in order to pursue one of the unit's major objectives, which focuses on mobilizing crop diversity by developing methods for the characterization of genetic resources and, when relevant, breakout scenarios for coping with the agroecological transition. The committee highlights the value of the conservatory orchard of wild apple trees on Plateau Saclay and suggests maintaining it despite the changes in the Eclectic team. The educational project of the unit based on systemic approaches, evolutionary theories and the coupling of genetics and mathematics is excellent and innovative. Care must be taken to ensure that this investment does not compete too much with the quality of research carried out in the unit, particularly for young teachers-researchers who need to strike a good balance between teaching and research.

TEAM-BY-TEAM ASSESSMENT

Team 1: BASE
Name of the supervisor: Ms Judith Legrand

THEMES OF THE TEAM

The BASE team works at the intersection of genotype, phenotype and environment. Focus is on three main themes; 1) the dynamics of adaptation, 2) genotype-phenotype interaction and 3) genotype-environment interaction. They address these questions across scales and time using a very broad range of approaches from systems biology, mathematical modelling, experimental evolution and quantitative genetics, including field experiments. The group works in diverse biological systems, especially maize and yeast, but also in species related to biocontrol, pest management and microbiome.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The BASE team performed very well in the previous period, and recommendations were minimal, and mostly solved through the move to the new building. The committee suggested application to more diverse funding sources and, while the team has secured very good funding, their grants are still all from French sources and they could make more of an effort to secure funding from European Union and private sources. However, the previous report warned that retirement of several key researchers of the team may result in scientific dispersion if all themes were maintained. While the research is excellent in this team, the themes studied are diverse and could still be better integrated across scales.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	3
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	10
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	1
Post-doctorants	2
Doctorants	5
Sous-total personnels non permanents en activité	9
Total personnels	19

EVALUATION

Overall assessment of the team

The team gathers experts in quantitative genetics, proteomics and mathematical modelling. Individually, the quality of science produced is excellent. Diversity is a strength to successfully address the extremely broad themes of the team. Yet, the coherency of the team is not optimal, especially as all research staff have only part-time affiliations. How this may be affecting their ability to generate synergies between the individually excellent sub-topics is a concern. Likely related to this, there are some concerns about the management of students. Overall, the trajectory is excellent if the individual researchers can coordinate and realise the links outlined in the themes of the team.

Strengths and possibilities linked to the context

The BASE team is composed of excellent researchers, with excellent quality of scientific output (7 articles as first/last author in Genetics alone) and good quantity of output, especially considering the retirements, new hires and only part time affiliation of all researchers in the group. The team focus, i.e. understanding genotype by environment interactions across scales from the biochemical to the population level, is incredibly important with large potential applied value to society under the climate change scenario. The team is highly diverse with respect to scientific background and approaches, which is appropriate for generating synergies and realising the potential for linking GxE across scales (e.g. Djabali et al.). A good mix of more junior and senior researchers brings important perspective and experience and new ideas that have contributed to a very good record of generating funding. The team has coordinated 7 French grants totalling over 1 100 k€ for the period at a rate of 205 k€/full-time equivalent, and participated in over twice as many.

Weaknesses and risks linked to the context

The team's strength lies in its diversity but there is also potential for incoherence if the organisational structures are not in place to encourage synergies. Because the researchers of the team are all split with other teams, there is a concern that the focus of the admittedly excellent individual researchers is scattered, and they will not be able to work together to solve the big problems that they aim to address. A criticism from the non-permanent staff highlighted some members of the BASE team as overly focused on their own research projects, to the detriment of those of the students. Ideally, with a more coherent team, the research goals of the students should be the same, or linked, to those of the researchers. The insufficient level of synergies makes the team less competitive for European and private grants, decreasing the attractiveness of the department, which currently only has French funding.

Analysis of the team's trajectory

Topically, the team is very well positioned moving forward in terms of societal importance and potential for attracting funding, retirements and new recruitments over the period provide an opportunity for the team – if they can organise and work together their trajectory is excellent. Individually, there are many excellent researchers associated with the team, but coordination to realise the potential synergies that could bring forward really innovative, multifiscalar and multidisciplinary research could be improved.

RECOMMENDATIONS TO THE TEAM

Implementing a more cohesive team environment would help to realize potential synergies between researchers working across scales - meetings in person and perhaps journal clubs or social events would encourage synergies that will help realise the potential of the BASE team.

Team 2: DEAP
 Name of the supervisor: Mr Timothée Flutre

THEMES OF THE TEAM

The DEAP team works on the optimisation of genetic diversity in wheat, especially at intra-plot scale, and on landscape diversity. The team develops statistical models, field experiments, and simulation tools to optimise crop mixtures between different wheat varieties but also between winter wheat and pea, and manage dynamic crop populations, addressing challenges such as disease resistance and yield stability. Its work includes creating tools for tracking genetic changes in crop populations (e.g. SHiNeMaS and CropMetaPop) and using advanced modelling techniques to improve mixture prediction accuracy. The team collaborates with farmers in participatory breeding programs, adapting a decentralised breeding approach to European regulatory and environmental contexts.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous committee stressed the fact that most projects were to end in 2019 and recommended efforts to recruit more postdoctoral fellows through new funded projects. This recommendation was largely addressed as the team did submit several new projects, securing a budget of around 200 k€ per year, and signed seven postdoctoral contracts corresponding to a total duration of 110 months over the period.

Another recommendation was to prioritise the different objectives and expected outcomes of each research axis, with special attention regarding the integration of the newly recruited CR. The report does describe the two research axes (optimisation of intra-plot genetic diversity and network management, decentralised participatory selection and landscape diversity). The first axis displays no obvious hierarchy as it comprises three different approaches that are complementary (genetic modelling, ecophysiological modelling and field experimentations). The second axis on the other hand strongly focuses on management and breeding using participatory science. Regarding the arrival of the new CR, the number of co-authored publications (4), co-supervised PhD students (3), the leading of a work package under the flagship MoBiDiv project and the position of team leader indicate that this integration has been very successful. Lastly, the previous evaluation recommended to reduce the workload of the two permanent staff dedicated to the life and scientific cohesion of the team by increasing the involvement of PhD students and non-permanent staff in these tasks. There is no indication that this was specifically considered, although the arrival of a third permanent staff has probably allowed a better sharing of that workload.

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	1
Personnels d'appui à la recherche	0
Sous-total personnels permanents en activité	3
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	4
Sous-total personnels non permanents en activité	6
Total personnels	9

EVALUATION

Overall assessment of the team

DEAP reports a steady publication record in line with the team's research objectives. The quality of the articles is very good but could be improved with more high-profile publications. The number of articles is excellent in relation to the size of the team. Links with non-academic partners are excellent, especially with farmers and other stakeholders, which support co-designed tools and research projects. The attractiveness is excellent thanks to the scientific reputation of senior researchers, success in competitive grants and implication in European projects. However, staff departures left only three researchers, potentially limiting student supervision, increasing teaching demands and impairing fieldwork and networking tasks.

Strengths and possibilities linked to the context

From its outset, the team has developed an interdisciplinary approach, mobilising and building skills in population genetics for the diversity of cultivated wheat populations, as well as in ecology, ecophysiology, modelling and social sciences. In recent years, it developed an internationally recognized expertise in mathematical modelling for the study and prediction of genetic performance in mixed variety and species crops. One of its strengths is to combine theory with experimentation, via field trials on the station and in an on-farm approach. The team thus produced experimental results in which variety and species mixtures over-yield pure stands. To reach this objective, DEAP developed, in collaboration with ABL, a participatory approach for crop diversity management and plant breeding through a trans-disciplinary research that involved researchers in quantitative and population genetics and bioinformatics, statistics, social sciences, food science as well as several stakeholders. The attractiveness of the "participatory research" and "cultivated diversity for agroecology" themes is reflected in the numerous calls for proposals on the "agroecology & genetics" theme to which DEAP has successfully applied and which have enabled it to benefit from 5 H2020 programmes (3 as WP leader: leadLiveSeeding, Diversifood, RustWatch; and 2 as task leaders: Remix, CropBooster), from the Labex BASC (two programmes: Casabio, Indiss), from the ANR (3 coordinated programmes: Mobidiv, Breedwheat, and Wheatamix). These funding enabled the recruitment of 6 post-docs. The strong interest of the themes also attracted a diversity of young trainees: 25 engineering/master's trainees recruited from 12 different establishments, including the major agronomy schools and various polytechnics training in agro-ecology and environment) plus other training courses at UPS.

The will of the team to build the agroecological transition with stakeholders through participatory research, is a promising approach. While enabling the acquisition of convincing data on mixtures of varieties or species, the field results pave the way to a new management of cultivated genetic resources and ensure better transfer of knowledge to end-users.

DEAP's scientific production is very good quantitatively (32 articles published in peer-reviewed journals, including 43% as first or last or corresponding author). The quality of the articles is shown by the international recognition of the journals used, e.g. *Agronomy for Sustainable Development*, *Advances in Ecological Research*, *Ecological Economics*, or *New Phytologist*. Several articles were published in highly recognised disciplinary journals such as *Trends in Plant Science*, *Technological Forecasting and Social Change*, or *Genome Biology*. Six of these articles were co-authored with other GQE teams, particularly with the GQMS team (3 articles). Most articles concern the genetics and genomics of crop and plant pathogens or breeding and crop improvement, including participatory breeding schemes as well as the implication for ecosystem services and agrobiodiversity. In addition, some articles strongly focus on methodological advancements for crop data analysis using statistical and modelling approaches.

The team portfolio highlights the proportion of articles involving PhD students (33%).

Despite numerous movements of staff, the team maintained a steady level of scientific production and secured continuous external funding over the period. The excellent attractiveness of DEAP is illustrated by its success in competitive calls and the reputation of its senior researchers who hold prominent positions in high level national committees such as the French Academy of Agriculture, the MNHN or the CTPS. Pertaining to international attractiveness, the team has gained visibility through responsibilities as WP leaders in large European collaborative projects such as DIVERSIFOOD, RUSTWATCH and LiveSeeding.

The links with the non-academic stakeholders are well developed, especially with farmers through the participatory breeding network and the Réseau semences paysannes, and also agri-business companies interested in plant breeding (AgriObtentions, Terre de Lin, Biocer, Cocebi). These links led to the co-design of new approaches with stakeholders, collaborative research projects such as the selection of winter wheat

varieties. The team's research also led to diverse outputs, including tools designed for stakeholders such as the Optimix online tool to assemble wheat varietal mixtures, or the creation of databases such as SHiNeMaS or DiverCILand referencing in collaboration with the ABI team.

Weaknesses and risks linked to the context

Several people left the team during the last contract, including two technicians (TR), an engineer (AI) and a freshly recruited lecturer (MCF). This leaves one researcher (CR) and two research directors (DR) all from INRAE, on whom all responsibilities and tasks fall. With such a small team, the number of students that can be supervised is limited. The lack of teaching staff is likely to exacerbate a weakness already identified by the team, which is the numerous requests for lectures. The limited technical staff is even more problematic with time-demanding participatory breeding networks and field trials to manage. This was also identified by the team as a weakness.

A significant part (28%) of articles were published in journals that are considered sub-optimal (MDPI or Frontiers -edited journals). Five of these articles involve PhD students whose early career may be negatively impacted by publications in such journals. Publications in very high-profile journals are lacking.

The international attractiveness could be improved with collaborations beyond Europe and responsibilities in international authorities such as FAO for example.

Analysis of the team's trajectory

The scientific trajectory is excellent, with promising developments, including the finalisation of two large collaborative projects in the next two years: *MoBiDiv* (PIA- France) and *Liveseeding* (Horizon Europe), which will likely result in multiple scientific outputs. In addition, the team could be in the position to coordinate *Omics4prediMix*, a transversal project within the unit, which has been submitted to the PEPR *AgroEcologie et Numérique*. The team will also be involved in the future European project *OnfarmDIV*, which will focus on breeding for diversification.

Within the new organisation, the research conducted by DEAP has largely contributed to the definition and development of axis 3. DEAP is the smallest team with only three permanent researchers but remains focused on only two of the three new research axes. Yet, achieving the objectives will highly depend on the retention of their newly recruited technical staff (AI) to ensure the smooth operation of fieldwork and the management of stakeholders' networks. The committee congratulates the team for recruiting a technical staff (AI) with ten years' experience in facilitating farmer networks but is concerned about the sustainability of the recruitment if the person's seniority is not recognized in INRAE's definition of her index level.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team maintains its excellence in terms of funding acquisition, of collaboration with stakeholders in the agro-ecological transition, of tools development in the on-farm decentralised networks approach, and of impact on society through interaction with the public.

We encourage team members and particularly PhD supervisors to favour publications in non-profit, learned society, or university-associated journals, such as those listed in the DAFNEE database. Senior scientists are encouraged to increase their international outreach, including outside Europe, for example through responsibilities in international bodies, societies or commissions.

Team 3: ECLECTIC
 Name of the supervisor: Ms Amandine Cornille

THEMES OF THE TEAM

The ECLECTIC research group focuses on understanding how host-parasite interactions between fruit trees and their pests drive adaptation and diversification in domestic plants in the context of climate change. The team focuses on the apple tree and its main pest, the aphid, and involves genomic sequencing, simulations and field experiments with controlled pest infestations and some participatory science. Recently, the scope was expanded to the role of transposable elements in shaping genetic diversity and adaptability in fruit trees. This research has implications for biodiversity conservation (especially at the gene level), agriculture, and ecosystem health amidst changing global conditions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The ECLECTIC team was established during the course of the last contract and therefore did not receive recommendations from 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	0
Chargés de recherche et assimilés	1
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	1
Post-doctorants	2
Doctorants	4
Sous-total personnels non permanents en activité	7
Total personnels	10

EVALUATION

Overall assessment of the team

The publication record is exceptional in quantity given the small size of the team. The quality of the articles is very good. The team demonstrates impactful research on plant-insect interactions, exceptional research funding and global reach through international collaborations. Their work aligns with pressing environmental issues (including climate change), which amplifies their relevance and potential long-term impact in ecological genomics. Interactions with the society are very good and based on innovative approaches to study ecological adaptation. They involve classrooms and other public in education and scientific community service.

Strengths and possibilities linked to the context

The ECLECTIC team published 20 peer-reviewed articles, reaching the excellent number of 3.3 papers/FTE researcher/year. Three of the articles were written in collaboration with other teams. The team also contributed to chapters in two books that are well cited.

The research conducted by ECLECTIC addresses complex ecological and evolutionary questions, such as the genomics of adaptive divergence. This research contributes to advanced understanding in areas like insect pest colonisation, plant-parasite coevolution, and the genetic history of apple domestication. These findings are both timely and significant, given the increasing pressures of climate change. To achieve this, the team relies on a well-developed collaboration network including teams across Europe as well as China, Morocco, Iran and the USA.

The team leader actively participates in scientific committees, juries, and selection panels and manages international networks, such as the European Society of Evolutionary Biology Special Topic Network.

The team leader has gathered an exceptional amount of funding during her time as team leader with a total of over €4 million obtained from many different projects. The team leader is WP leader in one European project (FRUITDIV) and coordinator in all other projects, which include two European contracts (Proverbio and Pré Verger Conservatoire LEADER), one ANR (Pleasure), one BNP Foundation contract (BNP Fruit Rescue), one CNRS ATIP-Avenir project, and many others.

The team has exceptional outreach activity with involvement of classrooms in the Orchard, the publication of nine popular science publications and one research film. This outreach ensures that their findings are accessible to the broader public, enhancing public awareness and engagement with ecological issues.

Weaknesses and risks linked to the context

The main risk identified by the team is its very small size and the fact that it effectively relied on one permanent researcher and three technical staff. With the departure of the team leader and one technical staff who moved to the New York University in Abu Dhabi and the resignation of another technical staff, the team will no longer exist in the future contract.

Three PhD students who have not defended their thesis yet will remain based at GQE under the co-supervision of collaborators in other teams. The ECLECTIC team leader stays in touch with them through remote videocalls and plans to have them visit her in Abu Dhabi.

Analysis of the team's trajectory

The work on climate adaptation in fruit trees is particularly innovative, as it combines ecological and phenotypic data to predict future adaptation responses. This transdisciplinary approach situates their research at the forefront of evolutionary genomics. However, the team will no longer exist in the future contract following the departure of the main staff and re-distribution of remaining staff and PhD students in other teams.

The team leader showed optimism as to the prolongation of her projects remotely through collaborations with other GQE teams and co-supervision of the remaining PhD students. However, the committee remains dubious about this plan.

RECOMMENDATIONS TO THE TEAM

We recommend the head of the team to be particularly mindful of the potential disturbance of her departure for the people she was supervising, especially PhD students.

The committee is also worried about the continuity of the work as well as the maintenance and the future use of the experimental apple Orchard.

Team 4: GEvAD
Name of the supervisor: Ms Maud Tenaillon

THEMES OF THE TEAM

The GEvAD team studies crop evolution, diversity and adaptation in maize and its wild relative teosinte, as well as different species of Brassica to study the molecular basis of the success of polyploidy. Newly funded projects of the team consist in studying the reproductive isolation of crops from their wild relatives (ANR DomIsol), characterising food legumes and their intercropping with maize (H2020 INCREASE) and investigating the role of cis-regulatory elements in response to abiotic stress (ANR NETWITS and European funding EASI Genomics).

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The GEvAD team was previously advised to increase the communication of their results to the general public. The team has clearly followed this recommendation since they actively communicated their results (in a radio interview and an Arte documentary). The team even involved citizens in an experiment.

Another previous recommendation was to improve the number of articles of PhD students which was previously low. The GEvAD team has greatly improved this aspect. Indeed the 6 PhD students who successfully defended each published 2 to 4 articles.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maitres de conférences et assimilés	2
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	2
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	3
Sous-total personnels non permanents en activité	3
Total personnels	11

EVALUATION

Overall assessment of the team

The GEvAD team has a very good research output in terms of quantity and excellent in terms of quality and is also excellent in obtaining competitive fundings. The team contributes significantly to the training of new scientists, collaborates with all other teams of the Unit and also internationally. The team is attractive for new researchers. It participates actively in highlighting gender bias in Academia. The work of the GEvAD team has important implications for the future of agriculture, involves citizens in science and has a very good impact on society through media coverage and participatory science.

Strengths and possibilities linked to the context

The GEvAD team published 47 research articles during the period assessed, which corresponds to 1.88 articles/FTE researcher/year. For 19 papers, GEvAD is the first and/or last co-author, showing very good leadership in projects. Three papers were published with equally shared leadership with other teams in the Unit. Twenty-one articles are issued from collaborations with other teams of the Unit on projects where GEvAD is not the leader. Out of the 19 articles led by the team, 15 were published in excellent journals (Nature Methods, Molecular Biology and Evolution, Trends in Genetics, Cell Reports, PNAS...) and many others in very good journals of the specialty (Plant Journal, Genetics, Plos Genetics, Molecular Ecology). The committee appreciated that the team publishes half of their papers in DAFNEE journals, especially papers involving PhD students.

The team is heavily funded with up to 9 research contracts over the evaluated period, totalling to over half a million €. Almost 50% of these contracts are coordinated by the team, highlighting its leading role in funding acquisition and creative scientific thinking. It should be noted that the team focuses on fundamental topics of research (genome evolution) which are harder to attract funding compared to more applied research topics. The funding gathered by the team is therefore excellent in that regard.

The team has long established collaborations with Mexico and other countries internationally.

Although one professor and one technician retired during the period, one Postdoc was recruited as a new permanent researcher in the team and one permanent researcher left the team to create her own team at GQE. This illustrates the capacity of the team to attract new researchers and to provide them with the necessary training and freedom to bud and form their own group. Six PhD students successfully defended their thesis, demonstrating the efficient training. These new doctors find jobs afterwards, either in Academia or in the Industry. Three Postdocs were also hosted in the team during the period.

The team contributes to meeting and conference organisations.

The team led a study published in Genome Biology and Evolution (GBE) on gender bias in visibility of researchers at conferences, showing the involvement of the team not only in high-quality science but also fair science.

The GEvAD team has been visible to the society through media coverage in a radio interview on France Inter and a documentary on Arte. A citizen science experiment is also conducted in the team, allowing any European citizen to participate in a research project by breeding beans at home.

Highlights are: (i) a study published in Molecular Biology and Evolution on the role of small non-coding RNAs in forming successful polyploids; (ii) a paper published in PLoS Genetics on polymorphisms identified in wild relatives of maize allowing adaptation to different altitudes (iii) an article published in Frontiers in Genetics describing the contribution of TE-derived regulatory elements to yield traits.

Weaknesses and risks linked to the context

Like many other teams in France, GEvAD faces a global decrease in support staff and difficulties in financial management and administrative hurdles. Current bioinformatic support appears to be insufficient given the team's various studies relying on sequencing data, especially when contributing to large multi-omics and multi-species projects producing important amount of data.

The team comes with candidate genes of interest for agriculture; however, functional validation of these candidates is missing.

Analysis of the team's trajectory

The team GEvAD trajectory is excellent. It has multiple new projects that were recently funded and keeps applying to obtain new funding and maintain its dynamics. Multiple ongoing projects have important implications for the future of agriculture (response of maize to water stress, breeding of maize in co-culture with beans) and are likely to keep attracting the attention of funding bodies and of society. In parallel, the team also keeps exploring more fundamental questions on adaptation and evolution of crop species. The team is therefore at the interface between fundamental science and applied research on the agroecological transition. The team recently collaborated with Leandro Quadrana on developing SAM-seq (the joint sequencing of DNA, chromatin accessibility and DNA methylation) on maize in a paper they published in Nucleic Acids Research in 2024. This work opens great perspectives to study epigenetics in maize in a fundamental way. This work is likely to have a strong impact on the understanding of gene regulatory networks, with potential applications in the private sector for genes of interest in agriculture (water stress for example). The head of the GEvAD team, was recently appointed Editor-in-Chief of the Society journal Genome Biology and Evolution, which is a highly honorific title recognized internationally.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team maintains its dynamic and excellence in terms of publications quality and choice of journals, funding acquisition, training of new scientists and its impact on society through interaction with the public.

The committee encourages the team to keep trying to attract ERC funding, especially given the encouraging result of one team member who was selected for the oral presentation at the ERC starting grant. Also, the excellent quality of research publication of the team may justify that other members candidate to ERC funding as well.

We also advise that researchers who do not have their HDR yet plan on acquiring it in the coming years.

The committee noted that the team focuses on fundamental topics and therefore their lack of contract with the private sector is not judged as an issue. The committee nevertheless encourages the team to try and motivate the private sector to apply their work on crop co-culturing. Past PhD students now working in the private sector could be a way to initiate such collaborations.

Team 5: GE2MorF
 Name of the supervisor: Mr Yves Deveaux

THEMES OF THE TEAM

The GE2MorF team works on evo-devo problems related to the evolution of flower morphology, using two model species, *Nigella damascena* and *Staphisagria picta*. They use a phylogenetic approach and try to address both the gene to phenotype relationship as well as the phenotype to gene one. The methodological focus is on gene regulatory networks and transcription factor families involved in petal morphogenesis. These themes are related to the preservation of ecosystems and the development of sustainable agriculture, through the role of flower morphology in pollinator attraction. The team is now focusing on new areas such as phylogenetic botany and flower morphology and anatomy to strengthen the connection with agricultural sustainability and agroecological transition. The aim is to identify the key characteristics of petals involved in pollinator attraction to select suitable lines for pollination services.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous committee recommended that the team increase the success rate in the competitive calls for proposals to ensure appropriate external funding for its research activities, to attract a greater number of non-permanent staff (post-docs and PhD students) and to strengthen the interactions with the society in order to ensure proper valorisation of their results. The previous committee also advised the GE2Morph team to seriously consider the functional autonomy of this team. It appears from the current report, where the previous recommendations are never referred to, that no significant improvement has been achieved in the period currently evaluated for the aspects considered to be critical by the previous committee.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	3
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	4
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	6

EVALUATION

Overall assessment of the team

Overall, the team is assessed as good. The amount of scientific production is fair (1.26 papers/FTE/year), and the quality is very good. The attractiveness and the capacity to attract resources are limited, with no competitive project funded during the period. The team is heavily involved in educational programs and has a good level of interaction with the society. The trajectory is very good, with an increased focus on the role of flower morphology in pollinator attraction, relevant for the agroecological transition. The expertise of the team in genetic modification techniques could be very helpful for the project of the unit related to the functional validation of candidate genes for complex traits.

Strengths and possibilities linked to the context

The GE2Morf team published a total of twelve research articles during the period evaluated for an average of 1,26 articles/FTE researcher/year. Seven of these had researchers from the team in a leading position among the authors. They were able to identify the molecular origin of the floral dimorphism in *Nigella* which is caused by a MITE-type transposable element that inserted in the second intron of the NdAP3-3 gene and inactivated the allele found in the [T] morph. Interestingly, they were able to show that all horticultural [P] morphs are in fact revertant and not wild plants, suggesting that the excision of the MITE is sufficient to restore the presence of petals. [1] This is considered as an excellent scientific achievement.

A new assistant professor has been hired who brings new and useful competences in phylogenetic botany and flower morphology and anatomy to help the group in better integrating with the overarching teams of the unit dealing with agroecological transition and agricultural sustainability through the opening of new research areas dealing with pollination services and pollinator attraction.

Weaknesses and risks linked to the context

A significant fraction of the scientific articles are published in a single journal (5 out of 12 in *Frontiers in plant science*) that is among those considered to be sub-optimal (MDPI or *Frontiers* -edited journals). Only two of the articles were published in very good journals. Two of the 12 papers are reviews rather than original articles. On average, the production of the team is not very high especially from the quantitative point of view. The team has received very limited external funding with only three contracts in the evaluated period for a total amount of 32 k€.

The team is not well integrated with the research activities of other teams of the unit and this is quite clear also from the collaborative network between research teams provided in the report.

The team is not very active in valorisation of research activities despite the previous recommendations to strengthen these activities.

Analysis of the team's trajectory

The team trajectory is scientifically interesting even though it does not appear to be well integrated within the overall strategic plan of the unit because it only has some loose relationship with the topic of agroecological transition. The scientific activities should be made much more relevant towards this direction with a greater focus on the new research areas dealing with pollination services and pollinator attraction. New perspectives from their integration into axes and their role for functional validation should be added.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team improves its scientific production both qualitatively and quantitatively, that it increases its activities in connection with societal actors, that it increases the level of external funding through application and success to competitive grants at the national and international level and that it considers seriously the possibility of forming a new larger team through a restructuring of the teams in the unit. This would allow the team to benefit from an increased critical mass of scientists and funds. The team is also advised to increase focus on pollinator interactions to attract support from INRAE. The panel recommends that the team increase its efforts in the development of skills and competences in the area of genetic modification technologies that could make the team a crucial component of the future research strategy of the unit through a new role that goes across all teams for the functional validation of candidate genes for quantitative traits.

Team 6: GQMS
Name of the supervisor: Ms Laurence Moreau

THEMES OF THE TEAM

The GQMS team studies genetic diversity to create new varieties adapted to environmental constraints and new demands. The research is mostly conducted on maize on which generic methods and tools are developed. The three main research topics are: 1. Understanding maize diversity to evaluate diversity along the genome and identify the source of diversity-new funding projects aim to characterise Europeans maize landraces for their adaptation to low-input farming (European Suscrop MineLandDiv, ECPGR EVA project) 2. The use of molecular data to decipher architecture traits and perform genomic predictions and 3. Optimization of breeding schemes using genomic predictions.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The high quality of the research related to the characterisation of genetic diversity and the development of methods and material is maintained. As previously recommended, disciplinary fields have expanded beyond the model community "maize". Although mainly applied to maize, methods, tools and expertise are generic and applied to other species via collaborations and open software. The agroecological transition is integrated in the research objectives with a reconsideration of the breeding objectives towards more diversified varietal types like varieties cultivated in association with others or varieties favouring the microbiome. As an example, the team is developing research on the interaction between maize and arbuscular mycorrhizal fungi as a way to increase nitrogen use efficiency. A greater openness to projects on other species as partners or contributors was developed: bean, sugarbeet, wheat, tomato, flax.

The team has maintained a good dynamic and a culture of teamwork. The integration of two new scientists was facilitated by regular team meetings, their involvement in existing projects and the support given to encourage them to submit projects as leaders. The contribution of the technical staff is acknowledged by authorship in publications.

Financial and experimental dependence on the private seed sector for field experiments, with all that this entails for the maintenance of fundamental research, is still a relevant issue today.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maitres de conférences et assimilés	2
Directeurs de recherche et assimilés	3
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	11
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	1
Doctorants	5
Sous-total personnels non permanents en activité	8
Total personnels	19

EVALUATION

Overall assessment of the team

The research conducted by the GQMS team is excellent. The scientific production is excellent in quality and very good in quantity, regarding the number of scientists. The team succeeded to obtain excellent research funding at the national and European scales. Its international attractiveness is excellent. Most projects are conducted in strong collaboration with private breeding companies. Connection between research and applications in breeding is exceptional.

Strengths and possibilities linked to the context

The team has been a consistent world leader in the development and deployment of quantitative genetic approaches, developing both tools and approaches for breeding as well as innovative and informed population development – supported by leading research into European maize diversity and the genetic architecture of traits – to meet the challenges of our changing world. There is a good mix of senior and junior researchers that will ensure continued excellence in the team going forward. They fit exceptionally well into the new axes, especially two and three. They have exceptional connections to industry, with 7 of the 9 PhD positions funded with industry partners, and strong links to breeding (two members of commissions in charge of maize variety registration (CTPS), and one is involved in the steering committee of the Association of French Breeders), both directly and through downstream applications. They have natural connections to other teams, especially GeVAD, BASE and DEAP.

The team investigates the interest of new breeding methods in maize in pilot small-scale projects such as phenomic predictions (Phenomize project RR) or the interest of new breeding technologies to increase diversity breeding (PEPR SVA "Divedit"). GQMS promotes the development of tools, approaches and innovative varieties adapted to specific uses and/or suited for the coming agroecological transition. Through the PEPR AgroNum "Agrodiv" the unit contributes to complement the molecular characterisation of maize accessions carried out in the previous project Amaizing PIA. The funding acquired over the period amounts to 1.87 M€ (289 k€/FTE research) and this comes from both European and French funding sources. Three large national projects, i.e. PIA « Amaizing » (GQMS in collaboration with. GEVAD, BASE) and Promais « SAMMCR ») and « ValRG » finished during the period, but this funding was supplemented by six new projects led by GQMS researchers during the current period.

The excellent attractiveness of the team is witnessed by the organisation of two international congresses, the editorial responsibilities of two excellent journals and the welcome of nine PhD students, post-docs, visiting scientists from nine different countries.

Weaknesses and risks linked to the context

Short-read genotyping and bioinformatic capacity for NGS data analysis of the team is lacking, leading to the use of genotyping approaches (genotyping arrays, exome capture) that, while absolutely appropriate for the questions that they are designed to answer, are not reusable for future projects and can be biased for diversity estimation.

Analysis of the team's trajectory

The team's trajectory is excellent. They are very well positioned to significantly contribute to the agroecological transition and maintain their position as a global leader in quantitative genetics and in the analysis and development of European maize germplasm.

The recent recruitment of an INRAE scientist will help to maintain the quality into the future.

RECOMMENDATIONS TO THE TEAM

Recruitment of a researcher with a bioinformatic/computational biology focus would be a great asset for the team and push the team into the future of genomic prediction, allowing them to incorporate large-scale environment, haplotype, expression and evolutionary conservation information to move toward more durable prediction models. Alternatively, the team could consider reaching outside for collaborations to fulfil this role.

Team 7: PAPP
Name of the supervisor: Ms Mélanie Blein-Nicolas

THEMES OF THE TEAM

The PAPP proteomic platform focused mostly on various plant models, including Arabidopsis, tomato, grapevine, oil palm and sunflower. Global or targeted proteomic studies are carried out to understand the mechanisms underlying the responses to abiotic stress (water deficit) or biotic stress (Botrytis), fruiting or germination. Apart from plant research, other activities divide between proteomic studies in marine biology (algae and dinoflagellates), methodological and software development, human biology and microbiology (human and soil). The team's skills cover the fields of protein biochemistry, bioinformatics and proteomics.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous committee made 3 major observations and considerations. The first one concerned the retirement of its director, scheduled for 2022. The unit had not explained its policy for dealing with his retirement. He was not been replaced, but a research fellow has been recruited on a 50% basis in 2019. His activity is shared with the BASE team as deputy director of PAPP. Leadership is now provided by a senior research engineer. The unit thus provided only a partial response to the committee.

A second point raised by the previous committee was the lack of information on the unit's policy for purchasing new (or upgraded) equipment over the next 5 years. PAPP benefits the support of its supervisory bodies and is certified for its commitment to quality. The purchase of a new mass spectrometer, is in line with its development policy towards high-throughput analyses. The project is financially supported by IBISA, INRAE-CNOC, Université Paris-Saclay and SPS. No information is given on additional funding. No equipment has been renewed during the five-year period.

A third remark concerned PAPP's lack of international visibility. The publications, conference presentations, coordination of a European project and the numerous collaborations carried out with non-French teams during the present period demonstrate a real success in opening up to the international community and in responding to this recommendation contained in the previous report.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	4
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	0
Sous-total personnels non permanents en activité	2
Total personnels	8

EVALUATION

Overall assessment of the team

The quality management of the platform is exceptional. The human resources are excellent. The quality and the quantity of the articles are excellent and the policy of scientific integrity, ethics and open science is also excellent. Integration in the unit is good. Collaborations with external partners are excellent and with internal partners are correct. The very good scientific objectives were achieved. The attractiveness is excellent as shown by international development, high throughput experiments, acquisition of innovative equipment. The inclusion of the team's research in society is good.

Strengths and possibilities linked to the context

The team's results were published in 46 peer-reviewed articles. One article is co-authored with the GQMS team, and a second one with ABI. The articles are published mainly in generalist plant and/or genetic reviews (80%) such as *Plant Science* or *New Phytologist*, and some concern specialised proteomics journals (8) including *Journal of Proteomics* or *Proteomes*, and software development to the scientific community (2), in line with what is expected of the platform. Noteworthy, the platform published 2 high-throughput proteomic studies: one on 250 maize genotypes and the other on gut microbiota. The portfolio reflects the strong collaborative activity with national teams, and shows the development of European and international collaborations. Although 8 articles only are published as first/last author, this reflects the many collaborations developed by the platform. The link with the non-academic world is weak, but has been validated by a scientific publication with a company involved in oenology. All permanent staff publish. The team has recruited 7 interns and 3 non-permanent support staff.

Thanks to its efforts to develop quality (certified and supported by IBISA and CNOC), PAPSSO has gained national recognition and continuous support by various local and national bodies (263 k€ from INRAE). Investments were made for the training plan, health and safety, budget management, data protection and the division of responsibilities. These efforts enabled the platform to obtain local, national and international contracts, including 5 ANR as partner (Proveggas, Deeprot, Stress-Pept, Regul3P, Prot4breed), totalling 218 k€). Self-funding through local and regional contracts income from services rose sharply, the latter bringing 263 k€ over the period... PAPSSO was associated with 29 oral presentations: 1 international, 7 European (including 1 invited lecture) and 21 national. The team attempted to create a COST action on Plant Proteins and has joined the INPPO organisation as a member.

PAPSSO has been involved in a large number of scientific projects (190), and 6 regional or local projects. Some of the activities correspond to transversal domain services as a partner for research in human and marine biology. International collaborations accounts for about 10% of projects.

The platform has 4 mass spectrometers and is at the forefront of current technologies, and is ready to anticipate future technological developments.

PAPSSO has participated in several meetings and seminars to develop partnerships with the private sector, including the SPS PlantInnov days in 2022 (including organisation), the MeetMyPlatform meetings in 2018- 2019, the SPS-Innov group in 2021-2023, and the annual IBMA France seminar in 2023. On the methodological front, its close links with Bruker have led to methodological developments. A project was financed by the Carnot Plant2Pro institute to help develop its partnership strategy.

The team took part in a number of activities for the general public, including science festivals, popularisation seminars, laboratory visits and radio broadcasts.

Weaknesses and risks linked to the context

Although the purchase of a high-throughput mass spectrometer is planned, the other spectrometers are ageing, which may impact the attractiveness and no specific policy appears to be in place to provide continuous funding for instrument replacement, making the technological future of the platform very sensitive to the decisions of the governing bodies.

Only one publication was co-authored with another GQE Le Moulon team. The question is how to integrate and increase the activities with the two teams and into the unit's overall scientific projects. Five publications are last-authored by a researcher who is due to retire in 2022. The platform is solicited for many external collaborations via services, which may impact its R&D activities.

Analysis of the team's trajectory

The platform must be cautious to maintain the certifications essential to quality research, and financial support of the supervising bodies. This requires a significant amount of work on a regular basis, as well as the constant involvement and motivation of all the staff. Obtaining funds to renew equipment is difficult and could impair the platform's development. PAPPISO will be challenged by maintenance costs and the need to renew its equipment over the next few years. The installation of the high-throughput spectrometer will require a major investment on the part of staff to set up and manage large-scale collaborations enabling the platform to analyze a large number of samples. The financial terms of this equipment were finalized shortly after the visit of the committee.

The development of high-throughput proteomics, metaproteomics is likely to increase the workload in sample preparation and processing. Psychosocial risks will need to be assessed and anticipated. Scientific objectives will have to be ambitious to avoid the risk of losing the support of the certification bodies.

The team is keen to develop and structure its European network. The acquisition of a high-throughput mass spectrometer should help as a major lever in the platform's attractiveness (local, national and international).

PAPPISO's scientific policy defined and anticipated the rapid evolution of proteomics and all omics activities. It requires the processing of a large number of samples and the purchase of a high-throughput mass spectrometer that is scheduled for 2025. As the platform is structuring its European network, the acquisition of the mass spectrometer should help in this respect.

RECOMMENDATIONS TO THE TEAM

The development planned for the platform will generate the processing of a large number of samples (high-throughput analyses, metaproteomics). The risks of work overload will need to be assessed, and human and financial resources adapted.

An active policy for recruiting non-permanent or permanent support staff is required in view of the possible overload due to the acquisition of the new mass spectrometer to compensate for the retirement of a researcher (partially offset by the arrival of a 50% researcher in 2019).

The purchase of a new spectrometer will have to be planned during the next term of mandate.

Team 8: SECF
 Name of the supervisor: Ms Cécile Fairhead

THEMES OF THE TEAM

The SECF team's research focuses on the sexual reproduction of yeasts, specifically, *Nakaseomyces* which includes *Candida* species found in human infections. This theme is original since pathogenic fungi are almost always first described as asexual. The team studies population genomics to reveal the presence of homologs of genes involved in sexual reproduction and the evolution of regulation networks of reproduction between asexual and sexual *Nakaseomyces*.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team followed the recommendations of the previous report which were all about increasing its profile by coordinating a GRDi. This was suggested in order to secure funding, including European funding, and increase the number of doctoral students by working more closely with the medical sector. This was not the case but GRDi coordination helped in organising six international congresses on yeast genomics. The move to IDEEV was also seen as an opportunity to strengthen collaborations. However, one assistant professor who was also a hospital practitioner left the team in 2023. The smaller size of the team and other considerations (pandemic, the move to the new building, health issues) did not make it possible to maintain the scientific productivity.

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	0
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	1
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	1
Total personnels	3

EVALUATION

Overall assessment of the team

The scientific production and recognition are good for this small team, which is disconnected from the other teams of the unit. The team failed to win any ANR contract. However, the team is leading a high level educational M2 program (GenE2). The interaction with the society is then correct. The research themes of the team do not seem well integrated with those carried out by the rest of the unit and this justifies the fact that the team is no longer going to exist going forward with remaining members being incorporated in the BASE team.

Strengths and possibilities linked to the context

Members of SECF team have produced a unique collection of yeast strains from different species that differ in their ability to reproduce sexually. The team has organised 7 international meetings on yeast genomics and developed an international collaboration with Spain. This enabled the publication of 7 original research papers and 3 reviews in very good papers. The team is involved in the coordination of the Master 2 Genetics, Genomics, Epigenetics and Evolution and in the teaching of genetics and genomics at all levels of university degrees.

Weaknesses and risks linked to the context

Continuing to be an outward-looking (with a particular focus on the human health sector) small team as recommended by the previous committee has not led to the hoped-for improvements in terms of funding, thesis supervision (just one PhD student) and scientific output (in quantity). Despite the very high quality of the research and its originality, the size of the team is too small to function efficiently. No publication has been produced in the last two years of the period under consideration. Joining the BASE team should inject a new dynamic and meet the need in data analysis, data interpretation and modelling.

Analysis of the team's trajectory

The team has developed an expertise on easily grown and modified yeast species, reverse genetics and molecular biology and functional analysis of genes. The work done on *Nakaseomyces* yeast complex to study the evolution of sexual reproduction contributes to a better knowledge of macro-evolutionary divergence, one of the fundamental questions raised by the Axis 1 "Understanding and shedding light on evolutionary mechanisms". The unit's interest in this team's research, particularly in its contribution to research on the emergence and consequences of sexual reproduction, a project carried out by the BASE team, led to the decision to join this team.

RECOMMENDATIONS TO THE TEAM

The committee recommends to value the research done in the project "Emergence and consequences of sexual reproduction" supported by the team BASE and the results that will be obtained to help to develop scientific questions and methodologies on the interactions between soil microbiome and species. The committee encourages the members of the team to develop projects in collaboration with members of BASE and also members of other teams (GEVAD, GQMS) and as a consequence increase master and PhD student recruitment. Future research deserves to be promoted in a context of agro-ecological transition in agriculture.

CONDUCT OF THE INTERVIEWS

Dates

Start: 14 November 2024 at 09:00

End: 15 November 2024 at 17:00

Interview conducted: on-site

INTERVIEW SCHEDULE

November 14, 2024

08h45	Welcome of the committee
09h00 - 13h00	Open sessions
09h00 – 09h15	Introduction (Hcéres Scientific Advisor) and Presentation of the committee
9h15- 10h35	The GQE unit: presentation and self-evaluation (40 min presentation, 40 min questions/discussion)
10h35	Break
10h50-11h30	Team « Biology and Adaptation, Systems in Evolution (BASE) » (20 min presentation + 20 min discussion)
11h30-12h00	Team « Diversity, Evolution and Adaptation of populations (DEAP) » (15 min presentation + 15 min discussion)
12h00-12h40	Team « Quantitative Genetics and Breeding Methods (GQMS) » 20 min presentation + 20 min discussion)
12h40-13h00	Team « Ecological Genomics and Multispecies Interactions (ECLECTIC) » 10 min presentation + 10 min discussion)
13h00- 14h00	Lunch (closed meeting committee + Hcéres Scientific advisor)
14h00-17h50	Open sessions
14h00-14h40	Team « Genomics, Evolution and Adaptation of Domesticated Plants (GEvD) » 20 min presentation + 20 min discussion)
14h40-15h00	Team «Genetics, Epigenetics and Evolution of the Floral Morphogenesis (Ge2MorF) » 10 min presentation + 10 min discussion)
15h00-15h20	Team « Structure and Evolution of Chromosomes in Fungi (SecF) » 10 min presentation + 10 min discussion)
15h20-15h50	Team Proteomic platform (PAPPSO) (15 min presentation + 15 min discussion)
15h50-16h20	Break (closed meeting)
16h20-16h40	Axis 1 (evolutionary mechanisms) 10 min presentation + 10 min discussion
16h40-17h00	Axis 2 (genetic bases of interactions) 10 min presentation + 10 min discussion
17h00-17h20	Axis3 (mobilizing cultivated diversity) 10min presentation + 10 min discussion
17h20-17h50	GQE trajectory (15 min presentation + 15 min discussion)
17h50 -18h30	Closed meeting of the committee
20h00	Dinner (committee + Hcéres Scientific advisor)

November 15, 2024

9h00- 13h00	Restricted sessions
8h45-9h00	Welcome of the committee
9h00-9h40	Discussion of the committee with the scientists (in the absence of the unit's direction)
9h40-10h20	Discussion of the committee with the support personnel (in the absence of the unit's direction)
10h20-11h00	Discussion of the committee with the non-permanent staff (in the absence of the unit's direction)
11h00-11h15	Break
11h15-11h55	Discussion of the committee with the governing bodies 'in the absence of the unit's direction)
11h55-12h35	Discussion of the committee with the unit's direction
12h35-13h45	Lunch (closed)
14h00-17h30	Closed meeting of the committee
17h30	End of the visit

GENERAL OBSERVATIONS OF THE SUPERVISORS

The institution responsible for submitting the application, which is also responsible for coordinating the response on behalf of all the research unit's supervisors, did not submit any general observations.

The Hcéres' evaluation reports are available online:
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Evaluation of Universities and Schools
Evaluation of research units
Evaluation of the academic formations
Evaluation of the national research organisms
Evaluation and International accreditation



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