

EVALUATION REPORT OF THE UNIT

BioForA - Biologie Intégrée pour la valorisation de la diversité des Arbres et de la Forêt

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

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

Office national des forêts - ONF

EVALUATION CAMPAIGN 2022-2023 GROUP C

Report published on July, 13 2023



In the name of the expert committee¹ :

Michele Morgante, Chairman of the committee

For the Hcéres² :

Thierry Coulhon, President

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

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

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

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

MEMBERS OF THE EXPERT COMMITTEE

Chairperson: Mr Michele Morgante, Università di Udine, Italy

Experts : Ms Karine Hugot, INRAE, Sophia Antipolis (supporting personnel)
Mr Patrice Lerouge, Université de Rouen
Ms Sylvie Muratorio, INRAE, Saint-Pée-sur-Nivelle (representative of ONF)
Mr Jérôme Salse, INRAE, Clermont-Ferrand (representative of CSS INRAE)

HCÉRES REPRESENTATIVE

Mr Christophe D'Hulst

CHARACTERISATION OF THE UNIT

- Name: Biologie Intégrée pour la valorisation de la diversité des Arbres et de la Forêt
- Acronym: BioForA
- Label and number: UMR 0588 INRAE ONF
- Composition of the executive team: Mr Marc Villar

SCIENTIFIC PANELS OF THE UNIT

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

THEMES OF THE UNIT

The research of the BioForA unit is focused on the development of forest genetic resources for sustainable wood production in a changing climate. It is organised along three axes, one dealing with understanding the construction of the phenotype for complex traits, another with analysing the responses of natural populations and those under artificial selection and the third one dealing with optimising the sustainable management of genetic diversity in natural and breeding populations. In addition to the research carried out in the frame of the three axes, the unit is also managing two technological platforms, LICA (Tree Cellular Engineering Laboratory) and ISC Phenobois (Collective Scientific Infrastructure dedicated to the phenotyping of the physico-chemical properties of wood and hydraulics of trees). While the first axis is well differentiated from the other two, being focused on the dissection of the genetic bases of complex traits using molecular and genomic tools and working at the individual level, the other two, that are both acting at the population level (as it often coincides with the management level) seem to be potentially quite overlapping and it is not entirely clear from the self-assessment document what are the distinctive characteristics of the two.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

BioForA has emerged from the fusion of the INRA "Amélioration Génétique et Physiologie Forestières (AGPF)" and of the ONF "Conservatoire Génétique des Arbres Forestiers (CGAF)" units. BioForA unit has been created as an « Unité Mixte de Recherche » (UMR) since January 1st, 2018 under the supervision of both INRAE (Department Ecology and Biodiversity Research (ECODIV)) and ONF (Department Research, Development and Innovation (RDI)). BioForA is located on the Orleans site of the INRAE Val de Loire Centre, next to the University campus.

RESEARCH ENVIRONMENT OF THE UNIT

At the regional level, BioForA collaborates with the unit "Écosystème Forestiers" (EFNO, Nogent/Vernisson) another unit of the ECODIV department (10 joint research projects) and with the "Unité de Recherche de Zoologie Forestière" (URZF). There is also a historical collaboration with the University of Orleans and its laboratory "Laboratoire de Biologie des Ligneux et des Grandes Cultures" (LBLGC) (of which the team Arche- Trees and Responses to Water and Environmental Constraints- is a INRAE contracted unit (USC)).

At the national level, the main collaborators are ONF, INRAE units "Biodiversité gènes et communautés" (BIOGECO) and "Écologie des Forêts Méditerranéennes" (URFM), the technological institute "Forêt Cellulose Bois-construction" (FCBA), the "Centre National de la Propriété Forestière" (CNPFF/IDF) (representing private forest owners) and the "Centre de coopération internationale en recherche agronomique pour le développement" (CIRAD) in Montpellier. It should be noted that collaborations with other INRAE units are taking part also within European projects (H2020 type) where the units BioForA, BIOGECO and URFM have coordination roles.

BioForA co-directs the international associated laboratory (LIA) FORESTIA between France (INRAE), Argentina (INTA) and Peru (University Huanta).

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

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	7
Scientist (Chargé de recherche, CR) and associate	10
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	19
Subtotal permanent personnel in active employment	36
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	0
PhD Students	4
Subtotal non-permanent personnel	5
Total	41

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

Employer	EC	C	PAR
Inrae	0	15	15
Others	0	2	2
Total	0	17	17

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	2 271
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)	993
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	1 650
Own resources obtained from international call for projects (total over 6 years of sums obtained)	1 083
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	50
Total in euros (k €)	6 047

GLOBAL ASSESSMENT

The research of the BioForA unit is focused on the development of forest genetic resources for sustainable wood production in a changing climate. It is organised along three axes, one dealing with understanding the construction of the phenotype for complex traits, another with analysing the responses of natural populations and those under artificial selection and the third one dealing with optimising the sustainable management of genetic diversity in natural and breeding populations. In addition to the research carried out in the frame of the three axes, the unit is also managing two technological platforms, LICA (Tree Cellular Engineering Laboratory) and Phenobois (Collective Scientific Infrastructure dedicated to the phenotyping of the physico-chemical properties of wood and hydraulics of trees). The objectives appear to be perfectly in line with the priorities of the supervising bodies, and scientifically very relevant and ambitious.

The profile, resources and organisation of the unit are rated as being from very good to excellent. The resources are excellent in terms of the financial resources and available equipments. However, the human resources are constantly decreasing, and this represents a clear threat for the short-term development of the unit. A clear strength of the unit is to carry out activities that go from fundamental research to breeding research and breeding activities. The unit has a very good organization with a detailed chart and different transversal missions (different councils, platforms, pole and shared technical competences) globally well described, a balanced budget and a global consideration of the general expectations for a research unit in terms of human resources management, data and environment. The interrelation between the 3 teams and the 3 scientific axes may require some adjustments.

The attractiveness of the unit is very good, as attested by the participation to or organization of national-international conferences, editorial activities, participation to the management-evaluation of research and learned societies and scientific academies, and by the scientific visibility-expertise (with partnerships with the agriculture-forest sector-actors) in the field of forest genetics and tree improvement. Attractiveness is also shown by the participation as well as coordination of scientific programs, which has been a strength of BioForA unit during the evaluation period. The attractiveness in terms of young scientists (PhD students and postdocs) could be improved to provide new scientific contributions to the unit.

The overall quality of the scientific production is very good. The unit has been very active in publishing papers with a high rate of international co-publications. However, BioForA is the leader of only a low number of major publications. Moreover, there is a considerable heterogeneity of the scientific production among staff members. The BioForA unit published numerous articles in specialized journals in their research fields but did not manage to publish as leading authors their results in high-ranking general journals. This aspect may decrease the attractiveness of the unit towards PhD students, postdocs and young researchers.

The level of inclusion of BioForA research in society is excellent. The unit has developed a large number of non-academic interactions that are related to two main areas of activity: the breeding programmes and conservation of forest genetic resources and the technological platforms in the area of wood physiology and genetic modification and plant in vitro regeneration. The interactions involve both public as well as private non-academic partners, seed companies/nursery growers. The two platforms should make an effort to open their facilities to a larger number of external users, especially from private companies.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The unit responded to the recommendations of the previous evaluation regarding the: (i) scientific production, (ii) attractiveness, (iii) social debate, (iv) organization of the unit, (v) formation, (vi) project strategy. Regarding the scientific production the Unit improved (i) the interaction between research topic groups (with a new structure into 3 axes and with recruitment at the interface between groups and disciplines), (ii) the publications (similar in number to the previous evaluation but with higher quality indexes), (iii) the maintenance of the infrastructure's capacities (in joining forces at the national and European level and funding necessary to upgrade the phenotyping facilities).

The unit reinforced its attractiveness during the evaluated period by: (i) participating to 68 projects (including 8 European projects that allowed recruiting doctoral students (13) and postdocs (3)) and co-coordinating international networks (LIA) and (ii) developing the web site of the Unit (aiming its contents at scientists, partners as well as at a larger audience) as it relates to the infrastructures (PhénoBois, ex. GenoBois, now recognized as national Infrastructure). Regarding the organization of the unit, actions have been taken in improving the (i) involvement of ITA staff as co-author of publications, (ii) procedures for the arrival of students-docs-postdocs (with one representative now member of the unit Councils), (iii) FAIRisation of the data. Regarding teaching through research, 38 students (31% from Orléans University) have been part of the unit from the Master "Agrosciences, Environnement, Territoires, Paysage, Forêt" and the "École Doctorale: Santé, Sciences Biologiques et Chimie du Vivant" (ED SSBCV) Orléans-Tours.

B - EVALUATION AREAS

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

Assessment on the unit's resources

The unit's resources are excellent mainly with regard to its financial resources and available equipment. However, the human resources are constantly decreasing which will threaten the short-term development of the unit.

Assessment on the scientific objectives of the unit

The overall assessment on this criterion is excellent. Overall, the unit's objectives are fully in line with the objectives of the two supervising bodies of the unit that are INRAE and ONF. They aim at the valuation of forest genetic resources for sustainable wood production in a changing climate. A clear strength of the unit is to carry out activities that go from fundamental research to breeding research and breeding activities. In order to achieve its objectives, the unit has developed an impressive network of interactions at all levels, locally, nationally, internationally, with professionals and private companies. Given the breadth of research interests and activities and the large number of interactions there is a concern that the current trend in the evolution of human resources that is seeing a decline would require redefining objectives and priorities to be able to meet them with a reduced staff.

Assessment on the functioning of the unit

The organization of the unit is considered to be from very good to excellent. The unit has a detailed chart and different transversal missions (different councils, platforms, pole and shared technical competences) globally well described, a balanced budget and a global consideration of the general expectations for a research unit in terms of human resource management, data and environment. The major weak point of the unit is the drastic reduction of staff over the period concerned.

A strong asset of BioForA is the experimental and analytical organization with a direct access to the GBFor experimental unit, and a large mutualization with an organization around technical platforms (Phenobois and LICA), but also in an opening towards the outside of their technical expertise and original and specific equipment with their inscription in the national dynamics of infrastructures (Xyloforest, Phenobois, In-Sylva).

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

Strengths and possibilities linked to the context

The scientific project is supported by 36 permanent people of which 32 are affiliated to INRAE and 4 to ONF. In addition, the unit has a strong relationship with the GBFor experimental unit (9 permanent staff members and 2 long-term contracts) and BioForA largely benefited from this particular interaction.

The UMR BioForA is involved in numerous regional (16), national (37), European (8) and international (3) research projects. It also received two financial supports from PIA. Altogether, these projects contributed to 62% of the overall unit budget. Part of these unit resources are dedicated to the maintenance of common scientific equipments, to finance new equipments as well as for the financing of Master II students, the mobility of PhD students, the registration to international meetings and the publication of scientific articles.

UMR BioForA benefited from appropriate premises for laboratory activities and permanent offices, as well as for offices for PhD students and training. Common facilities of the unit are also hosted in the BioForA building: the LICA (Tree Cellular Engineering Laboratory) and the ISC Phénobois platform (Phenotyping of the physico-chemical properties of wood and tree hydraulics). BioForA unit has a strong relationship with the GBFor experimental unit that is also hosted in the BioForA building which has greatly facilitated the scientific interactions between both units. The unit also benefited from new 210 m² confined L2 laboratories for cell engineering and micro-phenotyping experiments.

All unit members have been equipped with new high-performance laptops to facilitate their management and maintenance capacity. This also greatly facilitated the teleworking during the Covid and post-Covid periods.

Weaknesses and risks linked to the context

The number of engineers/technicians is constantly decreasing over the period. Moreover, massive retirements are forecast for the next period (notably, 2 out of 4 unit managers and 6 out of 7 research directors). In the meanwhile, the level of recruitment of permanent staff is low (e.g., 5 recruitments over the period 2016-2021 versus 13 departures). This context of limited human resources is a main source of weakness/risk for BioForA.

The self-assessment document mentions the need to consolidate the INRAE-ONF collaboration, which materialized in 2018 with the creation of this UMR with a unique INRAE-ONF identity, after more than 26 years of the CGAF's presence (as a contracted unit) in INRAE's premises. This request for consolidation seems to come mainly from the staff, even though the record of the integration process seems rather successful from the data provided to us (14 joint projects, continuum of basic and applied research).

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

Strengths and possibilities linked to the context

The ambitious scientific objective of BioforA is the valorisation of forest genetic resources for sustainable wood production in a changing climate. The objectives are defined in agreement with the strategic plans of its supervising bodies (INRAE ECODIV division and ONF RDI department). A strength of the unit is to carry out activities that go from fundamental research (characterisation of genes and understanding of the molecular and physiological mechanisms involved) to breeding research and breeding activities that lead to the development of varieties and populations that should respond to the need for wood production under a changing environment.

In order to reach its stated objectives, the unit has developed a dense network of interactions. The unit is well established in the local and national environment with strong interactions with local universities (University of Orleans, University of Tours) and with historical national partners with whom it has carried out a large number of joint projects (DT ONF (14 projects); INRAE BIOGECO (11 projects); FCBA (10 projects); CNPF/IDF (8 projects);

URFM INRAE Avignon (6 projects); CIRAD Montpellier (3 projects). At the international level it has had a strong and long-standing involvement in European collaborative research (a total of eight projects in the period under evaluation, for which BioForA members have developed coordination or leadership roles in work packages, between collaborative research projects, infrastructure networks and Marie-Curie exchanges). Additionally, BioForA co-leads the International Associated Laboratory LIA FORESTIA between INRAE (France), INTA (Argentina) and the University of Huanta (Peru).

It has a strong commitment to training of students, with 38 students that were trained in the 2016-2021 period as well as to collaborations and interactions with professionals and to strong links with private partners such as Tonnellerie Radoux and the company InPlanta.

Weaknesses and risks linked to the context

The evolution of staff forces (5 arrivals via recruitments and 13 departures, for a net loss of 8 permanent staff during the period) is critical in maintaining the involvement of the Unit in the different projects (at the regional, national and international level) and networks (CTPS, CRGF, CT VG-PNRGF, GDR, Pôle de compétitivité, LIA...). The planned departure of six of the seven (85%) Research Directors and two of four (50%) of the managing staff may necessitate a revision of the unit and teams' priorities and associated involvement in the initiatives, projects and consortium.

Although the creation of the UMR BioForA embodies the desire for collaboration between the ONF and INRAE, there are some differences between the scientific objectives of INRAE-ECODIV and the ONF-RDI department with regard to the research conducted at BioForA.

The context of climate change has made these partially divergent objectives converge, with the need for ONF to complement natural regeneration with plantations of reproductive material adapted to new environmental conditions, and with the realisation by INRAE that breeding has to integrate traits related to adaptation to new environments. But these objectives are huge, and the matter of a whole research community beyond BioForA. There is a risk of dispersion on too many ambitious projects if local objectives of the collaboration are not carefully defined.

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

Strengths and possibilities linked to the context

The unit pays particular attention to the management of its human resources, especially concerning career development, with specific support from the CODIR and the team leaders for the training, promotion and competitions of their staff. There is a perfect balance between men and women at several levels: among trained doctoral students and within the management (2 women and 2 men). As far as prevention is concerned, a large number of "Sauveteur Secouriste du Travail" (SST) (10 SST in the unit) and the recent significant investment in a DATI system to adapt to the reduction in the number of staff on site are assets showing the involvement of the management in this subject. Everything is in place for optimal protection of genetic and computer resources. Concerning the environmental aspect, the ISO 14001 certification of the experimental unit GBFor embeds a strong dynamic of environmental management of the BioForA unit as the main user.

Weaknesses and risks linked to the context

In the context of decreasing human resources, there is a risk that the staff are burdened with additional collective tasks (quality, environmental management, etc.). The uncertainty about future staffing levels and the readjustments to the unit's research policy that will have to accompany the planned reduction in staffing levels may degrade the working conditions. In this context, more attention needs to be carried out to the development of individual careers.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractiveness of the unit is very good. The evolution of the staff forces-human resources during the evaluation period (net loss of 8 permanent staff) and in the future (85% of Research Directors and 50% of the management staff will retire, questioning the ability of the unit to coordinate PhDs) may urge to define the priorities and involvement in projects, initiatives and networks in order to maintain the Unit's attractiveness.

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

Strengths and possibilities linked to the context

Attractiveness can be evaluated through (i) the participation (20 with an average of 4 per year) or organization (7, between 1 and 2 per year) of national-international conferences, (ii) editorial activities (3 unit's members), (iii) participation to the management-evaluation of research (11 unit's members) and learned societies and scientific academies (3 unit's members), (iv) obtaining prizes (4 PhD granted for presentations and posters), (v) scientific visibility-expertise (with partnerships with the agriculture-forest sector-actors) in the field of forest genetics and improvement.

Weaknesses and risks linked to the context

Such attractiveness relies on the availability of a considerable budget from external funds (of 6.1 M€ consisting for 62% of accepted-funded projects) allowing the recruitment of 67 non-permanent staff (1.9x of the total of 36 permanent staff). The maintenance of such rate of success in obtaining project funding is crucial to maintain the unit activities (including the platforms), especially in the context of recent and future departures (a total of 16 Unit's members, 44% of the total of 36 permanent staff).

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

Strengths and possibilities linked to the context

During the evaluation period, nine PhD students have defended their thesis and three are ongoing at the BioForA unit. Among the twelve PhD students, seven were supported by a national grant and two by a PhD funding from their country. Except for one PhD student (duration > 4 years), the average PhD duration is about 39 months which is a rather good average duration considering the experimental constraints of their research topics and the COVID pandemic.

Among the nine former PhD students, one was hired in a private company, three are currently postdocs and two got a researcher position in a public institution.

The PhD students are provided with the same facilities as the full researchers to carry out their research work (office, laptop, etc.). To meet the university's requirements, thesis committees are mandatory. Moreover, UMR BioForA supports the mobility of doctoral students (7 out of 13 doctoral students have carried out a training course abroad over the period, despite the recent pandemics). The unit regularly welcomes high-level scientists, for stays from 1 month to one year (9 scientists over the period).

Weaknesses and risks linked to the context

Especially in consideration of the availability of considerable amounts of external funds, we consider that the total number of PhD students and postdocs that have been recruited in the period is rather low. This does not help to improve the attractiveness of the unit.

No scientist has been hosted in the framework of the European projects that BioForA carries out or to which it contributes.

The funding for three PhD students is not indicated.

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

Strengths and possibilities linked to the context

Participation as well as coordination of scientific programs has been a strength of BioForA unit during the evaluation period. The unit has participated to regional (16), national (37 ; i.e. ANR BIOC4, EPITREE, FLAG, PRAISE, StressInTrees and SYBIOPOP ; 5 as partner and 1 as coordinator), PIA (GENIUS and XYLOFOREST), European (8 ; 2 FP7 ending in 2016, 1 COST, 1 ERA-Net and 4 H2020 B4EST, FORGENIUS, GenTree and TOPWOOD ; 4 as partner and 4 as coordinator) and non-European international (3, ECOS-Nord, MAE - CLIMAT AmSud and the LIA FORESTIA ; 1 as partner and 2 as coordinator)) research projects.

During the evaluation period, the unit hosted thirteen PhD students and four postdoctoral fellows. PhD students have been either funded on national, regional or INRAE supports (11) or through foreign grants (2). Post-docs have been funded on European and national projects. In addition, scientific projects allowed the funding of 15 fixed-term contracts.

Weaknesses and risks linked to the context

Members of BioForA are mainly collaborators instead of coordinators of ANR funded projects. Despite the fact that we recognize the effort made to hire PhD students and postdocs on project grants, we feel that there should be an even greater effort to attract additional young scientists.

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

Strengths and possibilities linked to the context

BioForA is particularly well equipped and organized to be very attractive with two platforms, LICA and a site of the ISC phenobois, that offer specific and original state-of-the-art equipment and skills in the fields of wood phenotyping and production and evaluation of genetically modified trees. The unit shows a good rate of renewal of its equipment from different resources: EquipEx Xyloforest, "Contrats de Plan État-Région" (CPER) or leftovers from European projects. The ISC label of Phenobois contributes to the visibility and attractiveness of its equipment and specific skills. This label, already in place for Phenobois, could facilitate the labelling of LICA, as desired by the unit, which will also contribute to its durability and visibility (especially since the head of Phenobois, who is familiar with the expectations of the labelling, is a member of BioForA). The ISO 9001 certification of Phenobois will also contribute to the optimization of this tool for the opening to the external users, to the listening of their needs, and thus to the attractiveness of BioForA. The quality expertise developed for Phenobois can also be used by LICA. Finally, genetic resources are also part of BioForA's attractiveness assets, and here the project to join Rare constitutes an important opportunity to gain visibility and attractiveness.

Weaknesses and risks linked to the context

The staff members who dedicate their time to the functioning of the equipment and biological resources grouped on the two platforms and the genetic resources pole are numerous but the individual dedicated time seems rather low: the dispersion of the human resources on which the equipment and the genetic resources build constitutes a risk for their functioning and their attractiveness in the long term, especially since the ambitions are great: ISC labelling, ISO 9001 certification, integration in Rare. The representation of BioForA in Phenobois is relatively low - 3 staff members out of 17 for 4 sites- with a management role for one of the three members. The integration of some of the genetic resources into Rare may represent a risk, especially in the context of staff reductions, since Rare expects a CRB (Biological Resource Center) level organization. The real role played by all these tools and technological competences in the attractiveness of the unit is difficult to evaluate because no figures are given on their opening or their use in the framework of collaborations of research teams.

EVALUATION AREA 3 : SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The overall quality of the scientific production is very good. The unit is very active in publishing papers with a high rate of international co-publications. However, BioForA is the leader of only a low number of major publications listed in the SAD. Moreover, there is a considerable heterogeneity of the scientific production among staff members.

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

Strengths and possibilities linked to the context

The BioForA unit was very active in publishing original and good-quality scientific outputs mainly in the fields of forestry, plant sciences, genetics and ecology. Of the 131 peer-reviewed articles that were published in the period under evaluation, the majority of which were in the best journals available for this field. The unit also published two books and numerous book chapters (19). For 47 of the 131 listed articles, members of BioForA are first and/or last authors (36%) and 30 articles were co-published with PhD students (23%). With regard to articles where BioForA researchers have the leadership, main journals are *Phytopathology* (1), *Frontiers in Plant Science* (3), *Planta* (1), *Forest Ecology and Management* (1), *Annals of Forest sciences* (6) and *BMC Plant Biology* (1).

In the framework of international projects, 59% of the BioForA articles were co-published with foreign research units from United States (16), United Kingdom (15), Italy (14), Sweden (13), Belgium (12), Germany (12) and Spain (15).

Weaknesses and risks linked to the context

The BioForA unit published numerous articles in specialized journals of their research fields but did not manage to publish research results in the best general journals as leading authors.

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

Strengths and possibilities linked to the context

The unit has a very good production in terms of peer-reviewed articles with an average of 1.43 articles (ACL) per researcher per year over the period. The involvement of PhD students and Postdocs in a number of publications means that the unit is capable of involving a large fraction of its scientists in training in the research activities.

Weaknesses and risks linked to the context

There is a considerable heterogeneity in terms of scientific production among staff members (going from 0 to 22 articles), with a significant number of members (11, of which 4 are permanent researchers) that did not publish any peer-reviewed article in the 2016-2021 period. While the production is proportionate to the research potential in terms of quantity, when it comes to quality, the lack of articles published in more generalist and high-profile journals could decrease the attractiveness of the unit.

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

Strengths and possibilities linked to the context

The BioForA unit is particularly involved in open science with data repositories in two dedicated tools developed by INRAE: INRAE dataverse, GnplS institutional database. Moreover, the unit has coordinated the networking of databases within the European framework (Trees4 Future) and mentions a willingness to move towards more open access. A data management plan (DMP) has been initiated during the period.

Weaknesses and risks linked to the context

The BioForA unit does not mention the identification of an RDO (Réfèrent Data Opérationnel) as expected by the INRAE supervising authority, nor any link with the RDS (Réfèrent Data Stratégique) of ECODIV. Associated with this absence, one could identify a risk of lack of appropriation of the stakes and expectations of open data by all scientists. On the subject of data, a risk is identified concerning the management which appears to be totally distinct between the INRAE staff members and the ONF members of the unit.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The level of inclusion of BioForA research in society is excellent. The unit has developed a large number of non-academic interactions with the public as well as private partners. BioForA provides several high-quality products to the socio-economic world, which are related either to forest tree selection and breeding programs, to the choice of forest reproductive material, or to technological innovations. Finally, the unit is involved in many actions to disseminate research results to society.

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

Strengths and possibilities linked to the context

The unit has developed a large number of non-academic interactions that are related to two main areas of activity: the breeding programmes and conservation of forest genetic resources and the technological platforms in the area of wood physiology and genetic modification and plant in vitro regeneration. The interactions involve both public as well as private non-academic partners (Ministry of Agriculture and Food (MAA), seed companies/nursery growers, Vilmorin, Lemonnier, Syndicat National des Pépiniéristes Forestiers). The interactions take the form of both partnerships/collaborations with individual subjects as well as participation in collaborative projects (10 projects in the evaluated period). In the climate change area, the unit has teamed with the Syndicat National des Pépiniéristes Forestiers to improve the species used in forestry and agroforestry.

Weaknesses and risks linked to the context

The self-assessment document does not contain a full description of the users of the two platforms (within the unit and outside of the unit), Phenobois (local site) and LICA, so that it is not entirely possible to understand to what extent they are open only to the unit or to INRAE or nationally or internationally. The hosting of professionals seems to be limited to the area of training in somatic embryogenesis and does not involve the crucial area of tree breeding. The unit has declared that it has not hosted doctoral students whose research is financed entirely or partly by non-academic partners.

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

Strengths and possibilities linked to the context

The development of products for the socio-economic world is clearly one strength of BioForA. These products are first related to forest tree selection and breeding programs (i.e., creation of varieties, of seed orchards, or of operational tools for selection) for a variety of species (Douglas, poplar, larch, wild cherry...), and they also include operational tools for guiding the choice of genetic resources for forest regeneration and adaptation to climate change. Moreover, BioForA has been able to follow and even anticipate the deep mutation that has taken place in the field of forest tree breeding: while originally individuals or stands were selected on the basis of shape, biomass production and tolerance to pathogens, BioForA research has gradually been extended to other aspects such as adaptation to climate change, FGR conservation and maintenance of genetic diversity. Over the period, BioForA has produced ten new varieties of wild cherry, two new varieties of black poplar and two new varieties of larch. One larch seed orchard and 3 Douglas seed orchards were installed, and material for future *Quercus pubescens* seed orchards were selected. New methods for surveying fructification have been developed.

Second, and in line with INRAE ambitions, other areas of innovation have been developed, relying on new technologies and competences well mastered at BioForA (high-throughput phenotyping, genomics, genomic

selection, transgenesis and genome editing). In collaboration with a cooperage (Tonellerie du Radoux), a new tool has been developed based on NIRS to estimate the polyphenolic richness of wood (patent application in the project). Several projects related to the valorisation of Robinia wood and its extractives, some of them supported by the Vegepolys Valley cluster and involving private companies, have been and are currently set up, with the objective of developing cosmetics and phytosanitary products for crop production. The development of transgenic poplar lines for rapid/increased biomass production has led to the drafting of a declaration of invention. A partnership between BioForA and the company InPlanta at Limoges targets the production of conifer plants by somatic embryogenesis, for the commercialisation of in vitro ornamental plants (Plantaphore®).

Finally, BioForA is active at disseminating its results among actors in the socio-economic world. BioForA developed several types of products for forest practitioners (3 webinars on assisted migration, several oral presentations to forestry actors, videos, 21 publications in practitioners' journals) and public authorities (2 expertises, 16 recommendation sheets for the Ministry of Agriculture and Alimentation).

Weaknesses and risks linked to the context

The constant decrease in the number of researchers and especially permanent technical staff in BioForA (but also in the experimental unit GBFor) over the last few years is a major threat to the improvement and valorisation programmes.

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

Strengths and possibilities linked to the context

The participation of the Unit to the public debate can be evaluated through its constant and major involvement in: (i) key events at the regional ("Fête de l'arbre et de la forêt", "Fête de la Science"), national ("Salon International de l'Agriculture", "Clim'Action") levels, (ii) social medias (Twitter as well as numerous interviews-videos), (iii) visiting scholars and teachers ("Accompagnement en Sciences et Technologie à l'École Primaire", "Génome à l'école", "La Semaine en entreprise", "Vivre la Science pour l'enseigner"...), (iv) tutorial activities ("Initiatives d'Excellence en Formations Innovantes"), especially on the topic of the forest adaptation in the context of global climate change.

Weaknesses and risks linked to the context

The evaluated Unit notes that 'It therefore seems obvious that the reduction in technical resources and personnel should (if it is not corrected in future years) clearly affect the unit's capacities for research, innovation and future development' as well as its involvement in the science-public debate. This would also deeply affect interactions with society.

C - RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, resources and organisation of the unit

While the committee recognizes that the profile, resources and organization of the unit are to be rated as from very good to excellent, it also encourages the BioForA unit to discuss with their supervising bodies on its future human resources in accordance with their unit scientific strategy and given the future retirement of many permanent people.

The organisation of the unit with teams and axes must be re-evaluated to better fit the scientific objectives. Scientific animation at the interface between axes needs to be strengthened.

The integration between ONF and INRAE needs to be surveyed and strengthened, for the proper development of the UMR. For this reason, we encourage BioForA to perpetuate its collective mode of administration of the unit (e.g., by involving an ONF staff member in the strategic decision processes at the management level in the future). In addition, beyond the "big" research projects involving both INRAE and ONF staff, it would be relevant to design more focused collaborative projects between local INRAE and ONF staff (e.g., co-supervision of a thesis or postdoc on a targeted topic). Other internal activities can be considered to reinforce the common culture of the staff members (internal seminars on common achievements).

Recommendations regarding the Evaluation Area 2: Attractiveness

The committee, while it recognizes that the attractiveness of the unit is very good, it also encourages BioForA to increase its attractiveness through: (i) the participation and especially the organization of national-international conferences, (ii) the involvement in editorial activities, (iii) the evaluation of research and learned societies and scientific academies, (iv) partnerships with the agriculture-forest sector-actors, (v) its capacity in obtaining prizes and grants in participating and especially coordinating scientific programs at both the national and international (EU) levels. To that regard, the necessity for BioForA to maintain a high rate of success in obtaining project funding is crucial to maintain the Unit's attractiveness. Funding, as well as promoting novel HDR for junior scientists, will allow to increase the number of PhD students and postdoc recruitments and to support mobility (in and out) of doctoral students as well as scientists. In addition to the unit's scientific project, the unique equipment and specific skills hosted by the two platforms, LICA and phenobois, as well as the genetic resources constitute an important opportunity to gain visibility and attractiveness. The evolution of the staff forces-human resources during the evaluation period and in the future may need to define the scientific priorities to reinforce the projects, initiatives and networks ensuring the unit's attractiveness.

Recommendations regarding Evaluation Area 3: Scientific Production

While the committee recognizes that the scientific production is on average very good, it also recommends that the unit increases the scientific production from the qualitative point of view more than from the quantitative one. An attempt should be made at publishing original research in high-profile journals as a mean to give visibility to the unit and increase its attractiveness towards PhD students, postdocs and new researchers. An attempt should also be made at trying to have a leading author's position on a greater number of collaborative papers, especially those related to international collaborative projects. There should also be an effort to decrease the current considerable heterogeneity in terms of scientific production among staff members and also involve those members that did not publish any peer-reviewed article in the 2016-2021 period.

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

While the committee recognizes the excellence of the unit in this area, it also thinks there are still possibilities for further improvements. The work carried out by the BioForA unit is by nature directly oriented towards society, non-academic partners, industries and companies. This orientation could also result in more involvement of these partners in the financing of PhD theses, which are currently still financed by the two supervising bodies only. Another improvement that could be expected is more openness of the two platforms Phenobois and LICA: the state-of-the-art equipment, the expertise and the ad hoc organization (including ISO9001 certification), are all assets to promote direct requests from private partners with the possibility of hosting external personnel. A greater communication around the opening of these two tools could make it possible to optimize their use and the associated investments. These two axes of recommendations could go in the direction of compensating a little perhaps for the reduction in personnel which could in the first place reach this area. The second could also contribute to the financing of the maintenance contracts which weigh heavily on the budget of the unit.

CONDUCT OF THE INTERVIEWS

Dates

Start: 02 February 2023 at 08:00

End: 03 February 2023 at 12:00

Interview conducted: online

INTERVIEW SCHEDULE

Start	Duration	End		Status
<u>Thursday 2, February 2023</u>				
<u>Part 1: General presentation of BioForA</u>				
08h30	00:15	08h45	Introduction (Hcéres Scientific Advisor)	Open
08h45	00:45	09h30	<i>General presentation of the Research Unit, organization and scientific policy,</i> Leopoldo Sanchez	Open
09h30	00:20	09h50	Discussion with the committee	Open
09h50	00:30	10h20	<i>Theme 1: Understanding the construction of the phenotype for complex traits,</i> Gilles Pilate	Open
10h20	00:20	10h40	Discussion with the committee	Open
10h40	00:10	10h50	BREAK	
10h50	00:30	11h20	<i>Theme 2: Analyzing the responses of natural and artificially selected populations,</i> Véronique Jorge	Open
11h20	00:20	11h40	Discussion with the committee	Open
11h40	00:30	12h10	<i>Theme 3: Optimising the sustainable management of genetic diversity in natural and breeding populations,</i> Brigitte Mush	Open
12h10	00:20	12h30	Discussion with the committee	Open
12h30	01:00	13h30	LUNCH BREAK	
<u>Part 2: Meetings with lab members</u>				
13h30	00:45	14h15	Meeting with Researchers and (Associate) Professors (except direction)	Closed
14h15	00:45	15h00	Meeting with the technical & administrative staff (in French)	Closed
15h00	00:45	15h45	Meeting with PhD students & Post-docs	Closed
15h45	00:15	16h00	BREAK	
16h00	02:00	18h00	Closed Hcéres committee meeting	Closed
<u>Friday 3, February 2023</u>				
<u>Part 3: Meetings with University representatives and Unit Head</u>				
08h30	00:45	09h15	Meeting with the representatives of ONF and INRAE , Catherine Bastien (INRAE), Pascal Carrere (INRAE), Claudine Richter (ONF)	Closed
09h15	00:45	10h00	Meeting with the Research Unit Direction , Marc Villar, Leopoldo Sanchez, Véronique Jorge	Closed
<u>Part 4: Committee's final debriefing</u>				
10h00	02:30	12h30	Final closed Hcéres committee meeting	Closed

GENERAL OBSERVATIONS OF THE SUPERVISORS

Members of the HCERES expert committee

Chairperson : Monsieur Michele Morgante

Le Directeur de BioForA

IL/

Subject : General comments on the valuation report

Ardon, le 23 juin 2023

Madam, Sir,

This brief document contains some general comments on the evaluation report of the Unit BioForA.

These general comments can be broken down into three groups that are related to the most important recommendations at the end of the report.

The first comment is related to the **loss of staff due to retirements**. We are fully aware of this situation and of the serious risks that inaction can entail. This is at the forefront of our concerns. Since the middle of the last term, the CoDir and the staff have been very actively mobilized to set up and implement a long-term strategy on job demands, coordinated between the ONF and INRAE components of the staff, and in accordance with the expected loss of skills due to retirements and with the new orientation of the scientific project. In addition, two proposals to pool positions with other units are in different stages of development. The most advanced one consists of sharing the secretariat between three neighbouring units of the centre. The other proposal, still without a formal response from our department ECODIV, would consist of creating a breeding engineering group shared between several units of the department. Although we do not consider the pooling of human resources as the best global solution, it would be well suited to these two particular cases. In a more general way, our scientific project and the animation that will accompany it give much more importance to the integration of research and to the refocusing on certain themes.

The second comment is related to the **interactions INRAE – ONF**. Our joint unit is still relatively young, although the two components have known each other for a long time and have had a long experience of collaborations together. Both partners share management activities to the extent of their possibilities and sizes, and are also jointly involved in several research projects. In recent years, there have been numerous initiatives in the field of reproductive physiology within the joint INRAE - ONF team that deserve to be highlighted. This dynamic has created favorable conditions for the preparation of one or more new projects on the study of the environmental impact on seed formation

science for people, life & earth

UMR BioForA

2163 avenue de la pomme de pin
CS40001 ARDON

45075 ORLEANS CEDEX 2

Tél. : +33 1 (0)2 38 41 78 00

Join us :




<https://www6.val-de-loire.inrae.fr/biofora/>

and how this knowledge can be implemented into the management of seed orchards. The unit is working on a new team structure, in which a greater interaction between the two partners could be expected.

The third comment concerns the **scientific production**. At several points in the report, the experts insist on the importance of focusing on the highest-impact generalist journals in our publication strategy to improve our visibility and attractiveness. Although we agree with the fact that the unit can and should make an extra effort to publish more, especially considering that we have a good amount of data that is not yet fully exploited, we are not completely convinced of the effectiveness and feasibility of this measure for the mission of being more visible and attractive. First of all, our topics in most cases hardly fit in the collimator of these high impact "picky" publications, so the authors of our unit dismiss them as realistic options. Secondly, the whole unit already makes a considerable and often rewarding effort to publish in the best journals in our fields. These are in most cases the same journals where our European colleagues working on the same topics already publish, so the impact on our publications in such a circle is probably already very effective. And finally, we believe that a better way to gain visibility is through innovative collaborative projects that also provide tangible resources. This is not to say that members of the unit would not seek to publish in these higher impact journals if a result that falls within their thematic policy were to be obtained.

The CoDir takes this opportunity to thank the expert committee for their efforts and advice.

Le Directeur de BioForA
Leopoldo Sanchez-Rodriguez



Leopoldo Sanchez-Rodriguez
Dir BioForA

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

UMR (• nom de l'UMR)

Adresse

Code postal et ville

Tél. : 00 00 00 00 00

Rejoignez-nous sur :



Site internet de l'UMR



INRAE

The Hcéres' evaluation reports are available online:
www.hceres.fr

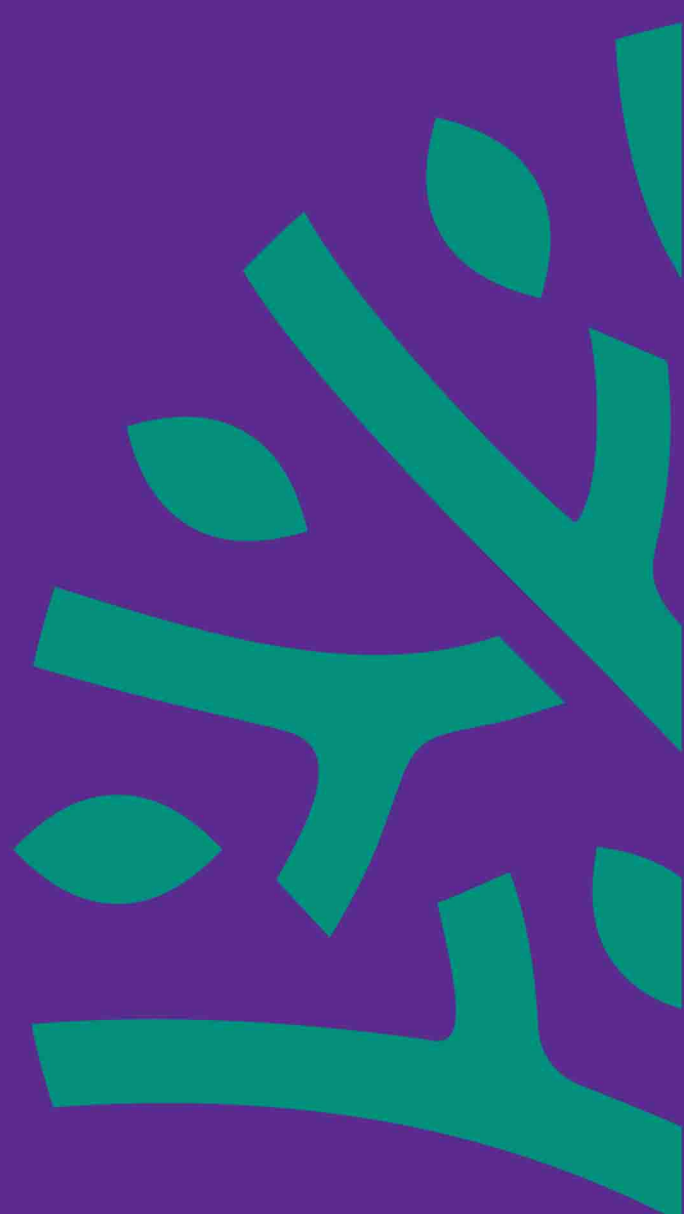
Evaluation of Universities and Schools

Evaluation of research units

Evaluation of the academic formations

Evaluation of the national research organisms

Evaluation and International accreditation



2 rue Albert Einstein
75013 Paris, France
T. 33 (0)1 55 55 60 10

hceres.com

[@Hceres_](https://twitter.com/Hceres_)

[Hcéres](https://www.youtube.com/Hceres)